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REVIEW ARTICLE

Hydropower Generation and River Water Pollution in India

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ABSTRACT

Power generation (including energy generated from renewable sources) impacts local ecosystems and communities. There is a tendency to turn a blind eye to these impacts and treat all renewable technologies as unconditionally good because they do not emit greenhouse gases. Renewable power must be sited, designed, and operated in a manner that also protects the local ecosystem. Hydropower dam operations are responsible for the extinction and near-extinction of a number of species, and are a major contributor to the significant loss of aquatic biodiversity. Hydropower dams have flooded forests (causing the irretrievable loss of carbon sinks), damaged entire fisheries, and diminished recreational opportunities, and decimated the local – mostly rural – economies that depend on those resources. Hydropower dams are a significant source of water pollution. Scientists and legal scholars have long acknowledged that hydropower dams cause pollution by altering the temperature and chemical makeup of water that is impounded behind and released through dams, harming the biological integrity of river ecosystems. The cumulative impacts of multiple hydropower dams are often much greater than the simple sum of their direct impacts. Even a very small single dam can entrain fish, block fish passage and displace wildlife. A series of dams can severely impact an entire watershed, even if each of the individual dams seems relatively low impact when considered in isolation. The extent of this damage can be much greater when combined with a whole host of other threats to rivers: poor water quality, a growing demand for scarce water, encroaching urbanization, and poor land-management decisions. We must encourage the development of low emissions energy sources, but this development must be protective of our natural environment.

Keywords- Power Generation, Hydropower, Renewable power, Biological integrity, river ecosystems Biological monitoring

INTRODUCTION

Water is a source of life. It covers 70% of earth. But only a small portion of this precious nature resource is fit for human consumption. Out of the earth's total water, 97% is stored in oceans which are not fit for human consumption. The further 3% is stored in various sources like rivers, lakes, and underground aquifers. India is a blessed country when a water source comes into question which is available in the form of numerous rivers and lakes. It has 14 major, 55 minor and numerous small rivers. Because of these reasons, India is often referred as the Land of rivers.

Electricity is a concurrent subject meaning thereby that both the Central (Federal) Government and the state government have responsibility to promote this sector and authority to make necessary laws, regulations, formulate and implement policies and programmes. The whole country is divided into five power regions and planning is done on regional concept.

On the whole, India face shortage of electricity of 12% in peak demand and 11% overall shortage. India has no harness every available source of power generation and in this context hydropower has acquired priority and small hydropower has a special place. The total hydroelectric power potential of in the is assessed at about 150000 MW equivalent to 84000 MW at 60% load factor. The potential of small hydro power projects is estimated at about 15384 MW with 5718 potential identified sites.

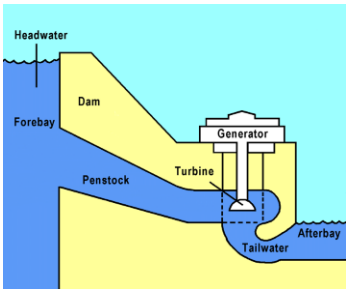
Water is a state government subject and hence hydropower development is the responsibility of the state government. Central government advices on the hydropower matter and play role for overall river basin planning and arbitrator.

The percentage of hydro power has come down from 45% in 1970 to less than 18% in 2013. Indian rivers carry more than two third of their annual flow in three monsoon months. We are wasting this huge amount of water flowing continuously which can be converted to energy. We cannot afford to waste the bulk of the energy of water by letting it flow down the drain unutilized in the monsoon months. The dams and reservoirs are designed to last over hundred years and also they provide us inexpensive energy.

Hydropower energy is the conventional source of energy. It uses and not consumes the water for generation of electricity, and leaves this vital resource available for other uses. Water is fed from stream/ canal to the turbine by a closed pipe through diversion works. The turbine in turn rotates the generator for electricity generation.

Power (kW) = 9.81 * discharge (m3/s) * head (m) * efficiency

India is posed for large deployment of hydropower in present conducive policy and investment environment. Growing energy demand and concern for carbon emission is making hydropower development more favorable. The government of India is ensuring a good performance of the new SHP stations by linking the incentives to the SHP developers with the performance of the station.



India has a vast untapped resource of HEP. The total hydro potential assessed by CEA is approximately 1,48,701 MW, of which economic potential works out to 84,044 MW at a PLF of 60%. As on 30.09.2014, about 49 schemes having an aggregate potential of about 14630 MW are under execution of 12th plan and beyond (excluding projects <25MW)

The spiritual reverence for rivers remains intact. But the physical well being of the rivers show that we have already failed totally in keeping our reverence of rivers. Rapid growth in industrialization to support the country's growing population and economy has polluted our rivers like never before. Studies show that domestic and industrial sewage, agricultural sewage carrying drains. This poses a serious health issues as millions of people continue to depend on this polluted water from the rivers. The bad effects of river pollution are not limited to human population only. Pollution of river has affected biological integrity like animals, fish, and bird's population, sometimes threatening their very existence. Polluted water seriously affects the reproductive ability of animal and fish species in rivers thus making them extinct in future.

Causes of pollution

Several steps have been taken to stop river pollution but still it is increasing day by day. There are several sources of water pollution, which work together to reduce overall river water quality. Industries discharge their liquid waste products into rivers. Our agriculture practice that uses chemical fertilizers and pesticides also contribute to river pollution as rainwater drains these chemicals into the rivers. As population grows, the size of towns and cities, the municipal drains carry our wastes to rivers. These are the examples of rivers catching fire because of high pollution levels. In our everyday life we can easily see symptoms of river pollution. The floating dead bodies of fishes on our river, any colored water in the river or a bad smell from the river point towards river pollution.

Harmful effects of Hydro Power Dams on biological integrity

The construction of dam in the riverine system changes the biological and ecological conditions of rivers. Alteration occurs in the floral and faunal characteristics near the dammed site (Ogbeibu and Oribhabor, 2002). The developments like construction of dams and barrages along the river results in low water flow (Hassan et al., 1998a, 1998b). Dams causes physical alteration of tail waters or downstream areas, The river basins have undergone extensive changes and exponential demographic growth, thus created adverse effects to aquatic bio-diversity especially the native fish fauna. The greatest danger occurs to the migratory fishes, as the dam obstructs their

migratory path, and so they may be totally displaced (Naidu, 1993; Shrestha, 1997; Shrestha et al., 2001; Arya et al., 2001). Fisheries resources in the reservoirs have been drastically reduced due to the barrier effect of dams, environmental changes, and pollution in waterways.

Damming sets a blockage to fish movement, upstream or downstream. In passing through the turbines, spillways or in the diversion, fishes are subjected to injury by physical contact, pressure change, shear force, or eddies (Naidu, 1993; Moss, 1998). It may change the flow downstream by making it more irregular. The nature of the river bottom will change, the water quality may change too (Moss, 1998; Gutzer et al., 2002). Study on the impact of dams on different rivers indicated its potential to alter the health and integrity of the rivers with effects being more serious upstream (Jha et al., 2007).Biological monitoring methods have been used to complement physical and chemical measurements in assessing river condition. Several bio-monitoring methods have been developed all over the world for the evaluation of water quality (Sharma, 1996). To study the biological monitoring processes, we need application of site-specific biological criteria assessment process (Roshenberg and Resh, 1993; Sharmaand Moog, 1996).

The ecosystem services of watercourses such as rivers and lakes directly or indirectly contribute to both human Welfare and aquatic ecosystem (Costanza et al., 1997). Rivers also play an important role in the assimilation and transport of domestic and industrial wastewater, which represent constant pollution sources, and agricultural runoff, which is temporal and commonly affected by climate (Singh, Malik, Mohan, & Sinha, 2004; Vega Pardo, Barrado, & Deban, 1998). Rivers are highly Vulnerable to pollution; therefore, it is important to Control water pollution, monitor water quality in river Basin (Simeonovetal.2003), and interpret the temporal and spatial variations in water quality (Dixon & Chiswell, 1996; Singh et al., 2004). Water resources are under pressure and are in danger because of potential pollution and contamination due to rapid industrialization, increasing population pressure, urbanization, modern agricultural activities, and other anthropogenic activities (Hatcher & Mc Gillivary, 1979; Hutley, 1990; Agarwal et al., 2006 and Singh et al., 2007).

Most of the physico-chemical quality parameters of River shave been changed and may and may not be suitable for domestic purposes. In general, it can be said that the bacteriological quality of the water is unacceptable, and would pose a serious risk to consumers without treatment. The poor bacteriological quality is due to direct contamination by animal and human wastes. Conductivity, TDS and most major ions varied seasonally with elevated levels in the rainy season. A research in the rivers of Nepal showed the increasing trends of pollution agents in the river water after the project operation because of the increased human activities in region than the project itself. The water temperature was found increasing pattern after the project intervention. The water quality was more contaminated during construction period and has not met the natural condition of water. Later, water quality analysis showed highly contaminated due to increasing load of

sediments, excessive discharge of household effluents as expansion of river side settlements and increasing runoff agricultural pesticides. The rivers may be suitable for primary and secondary contacts such as swimming and fishing after the construction of dams.

CONCLUSION

Controlling river pollution is in our own interest. As citizens of India we have constitutional duty to protect our environment. Similarly, the government also has a duty to protect the environment for the welfare of its citizens. There are many ways we can protect the river from pollution. The industries should install machineries to remove contaminants from their effluents and wastewater. One way to do so is installation of Effluent Treatment Plant (ETP). This way we can control pollution at the source itself. The towns and cities should also have facilities to clean the sewage effluent. All towns and cities must have Sewage Treatment Plants (STPs) that clean up the sewage. Farmers should give up chemicals and pesticides in the farming and should instead adopt organic methods of farming thus reducing chemical pollution of rivers.

How can I contribute to make the rivers clean?

It is our duty to start contributing to environment on individual basis. It should be always kept in mind that charity begins at home. If everyone will think that cleaning the river and not polluting it is their duty, then there will be no pollution in the rivers and the aquatic life will be saved. There are many ways in which one can contribute towards a clean river in their locality:

Promoting community's participation in local river cleaning up

Organizing awareness programs and meetings on the river pollution and its threats

Distribution of literature on the causes and ill effects of river pollution

Talking to our family and friends for spreading awareness on the importance of good water quality and clean rivers.

For a better tomorrow we must act today.

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