Hydro Electric Power Dams in Kerala and Environmental Consequences from Socio-Economic Perspectives.

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ABSTRACT *Energy has been a key instrument in the development scenario of mankind. Energy resources are obtained from environmental resources, and used in different economic sectors in carrying out various activities. Production of energy directly depletes the environmental resources, and indirectly pollutes the biosphere. In Kerala, electricity is mainly produced from hydelsources. Sometimeshydroelectric dams cause flash flood and landslides. This paper attempts to analyse the social and environmental consequences of hydroelectric dams in Kerala*

Keywords: *dams, hydroelectricity, environment*

Introduction

Electric power industry has grown, since its origin around hundred years ago, into one of the most important sectors of our economy. It provides infrastructure for economic life, and it is a basic and essential overhead capital for economic development. It would be impossible to plan production and marketing process in the industrial or agricultural sectors without the availability of reliable and flexible energy resources in the form of electricity. Indeed, electricity is a universally accepted yardstick to measure the level of economic development of a country. Higher the level of electricity consumption, higher would be the percapitaGDP. In Kerala, electricity production mainly depends upon hydel resources.One of the peculiar aspects of the State is the network of river system originating from the Western Ghats, although majority of them are short rapid ones with low discharges. Among the 44 rivers, 41 flow west to join the Arabian Sea, while 3 flow eastward and join the River Cauvery finally discharging into the Bay of Bengal. According to an estimate, Kerala with a total catchment area of 32,820 Sq. Km, has78,000 Mm surface water potential and a total runoff of about 59,160 Mm.[rivers.irrigation.kerala.gov.in].Thispaper is an attempt to analyse the major environmental consequences aroused on the working of hydroelectric dams in Kerala. This is a descriptive and analytical study based on secondary data. The data have been collected from various reports of government of India, government of Kerala, international organizations and research articles in authenticated websites.

Hydroelectric Dams in Kerala

Kerala has numerous striking and huge dams with unique building features. Dams in Kerala have been built to generate hydro-electricity. These dams are also useful in keeping a check on the surge of water. Table 1 shows major hydroelectric dams in Kerala.

Table 1 Hydroelectric Damsin Kerala

Name Of The Dam	Districts	The Year Dam Commissioned
Anathode Flanking Dam	Idukki	1967
Anayirangal Dam	Idukki	1965
Gaviaiar Dam	Pathinamthitta	1989
Cheruthoni Dam	Idukki	1976
Erattayar Dam	Idukki	1989
Idamalyar Dam	Idukki	1985
Idukki Arch Dam	Idukki	1974
Kakkayam Dam	Kozhikode	1972
Kakki	Pathinamthitta	1966
Kallada	Kollam	1986
Kallar	Idukki	-

Kallarkutty Dam	Idukki	1962
Kosani Saddle Dam	Kozhikode	1991
Kottagiri Saddle Dam	Wayanad	-
Kulamavu Dam	Idukki	1977
Kullar Dam	Pathinamthitta	1990
Kundala Dam	Idukki	1947
Kuttiyadi Dam	Kozhikode	1991
Madupetty Dam	Idukki	1957
Lower Periyar Dam	Idukki	1996
Thodupuzha Dam	Idukki	1994
Meenar Dam	Pathinamthitta	1991
Pamba Dam	Pathinamthitta	1967
Parambikulam Dam	Palakkad	1967
Peppara Dam	Thiruvananthapuram	1983
Ponmudi Dam	Idukki	1963
Peringalkuthu Dam	Thrissur	1957
Sengulam Dam	Idukki	1957
SholayarDam	Thrissur	1965
Upper Moozhiyar Dam	Idukki	1979
Vazhany Dam	Thrissur	1962
Vazhikkadavu Dam	Kottayam	2002
Kakkad Dam	Pathinamthitta	1990

Source:http://india-wris.nrsc.gov.in

The undulating terrain and heavy precipitation in monsoon are some of the best factors utilizable for power generation in the State. The vast potential for hydroelectric generation in the Kerala prompted the State authorities to take steps to establish stations for hydroelectric generation. The first of these ventures was the Pallivasal Hydroelectric Project, the construction of which was started in 1933.The first stage of the project was commissioned in1940. Its capacity was 13.5MW.Pallivasal Hydroelectric Project is associated with Kundala and Madupetty dams.There are 12 dams in Idukki district, 6 dams in Pathanamthittaand 3 hydroelectric dams in Trissur. All these districts are a part of Western Ghats. According to MadhavGadgil Committee Report on Western Ghats, it is ecologically important grasslands which are facing various kinds of threat. He arguesin the Report that grasslands in Idukki especially the Wagamon Hills, is one of the ten bio-diversity grasslands in Asia.[GadgilReport, 2011]

Environmental Implications of Dams

The high demand for energy in the State and various sources producing power have noticeable environmental implications; both directly and indirectly. Even though hydroelectric power is thecheapest, less polluting, and easily available source of electricity in the State, it has its own faults. Taking into account other ecological services lost due to diversion of natural ecosystems, fauna and flora, the supposed 'cheapest' energy from the hydroelectric projects is debatable.In the case of the Pooyamkutty Hydro Electric Project, the Kerala Forest Research Institute (KFRI) concludes that if the economic value of the forests to be flooded is taken into account, the cost-benefit ratio will be negative, and the project is not recommendable for execution. [Kerala Forests Research Institute, 1989].Hydropower generating stations in Kerala are located in different parts of the Western Ghats, one of the biodiversity hotspots of the world. Most of the projects were completed prior to the Environmental Impact Assessment (EIA) notification coming into effect, and therefore, the assessment of the costs pertaining to forest loss due to submergence and other related aspects was not conducted for many hydelprojects [Dume, B.2008]. In the case of hydroelectric projects, submergence of vast area of forest and collateral damages due to the activities of labour force involved in the construction of projects and effort of men and machinery are the direct effects. Many climate scientists have the opinion that one of the severe consequences of climate change will likely be the changes in weather patterns [Anon, 2000].Kerala is specifically vulnerable to the changing climatic dynamics owing

to its location along the sea coast and steep gradient along the western slopes of the Western Ghats. Organic materials-vegetation, sediment and soil—flow from rivers into reservoirs and decompose emitting methane and carbon dioxide into the water and then to the air throughout the hydro-electric generation cycle. Studies indicate that where organic material is the highest (in the tropics or in high sediment areas), hydro-electric dams can actually emit more greenhouse gases than coal-fired power plants.[Pandurangan and Nair,1996].

Displacement and rehabilitation of population in the catchments are another major impacts of the hydroelectric projects. About 4,544 people were displaced by the Idukki hydroelectric project [Ramachandran, 1985]. It is estimated that 5,300 people were displaced during execution of Panniyar, Sengulam, Neriyamangalam, and Idamalayar hydroelectric power stations [Murickan2003]. Hydro dams would change the gentle workings of the ecosystem, and occurrences of the same people being displaced more than once for different hydel projects were also reported. [Renjith, 2015]. The structural stability analysis of the Mullaperiyar dam by the department of earthquake engineering of the Indian institute,Roorkie,has concluded that the main Mullaperiyar dam and baby dam are likely to undergo damage in the event of an earthquake.Such damage will lead to failure of the dam [IIT RoorkieReport,2009]

The Athirapally and the VazhachalVanaSamrakshanaSmithy arguedthat the 163-MW Athirappilly hydroelectric project proposed by the Kerala State Electricity Board could wipe out Great Hornbills from this unique riparian forest. The Athirappilly Falls is situated on the Chalakudy River, which originates in the upper reaches of the Western Ghats. Many endangered and endemic species of flora and fauna are found in the forests of the Athirappilly-Vazhachal area. This area is the one of the few places in the Western Ghats where four endangered Hornbill species are seen. [Vazhachal Vana Samrakshana Samithy, 2007]. Dam safety problems are threat to the people living in downstream. Several deaths were reported with regard to dam failures all over the world. The Environmental Monitoring Committee of India has listed out in 1999 a number of dams in India including a few in Kerala to regularly monitor the safety.The River Chalakudy is witnessing the issue for the last few years, and is causing many other issues such as drinking water scarcity, impact on agriculture and fresh water fisheries etc.

More than half of Kerala's dams (57%) are hydroelectric projects operated by the Kerala State Electricity Board, and the rest are operated by the irrigation department. For both entities, the amount of water to store is motivated by demand for electricity and irrigation, rather than flood control measures. The scale of the natural disaster occurred inKeralain August 2018 boggles the mind. A deluge of biblical proportions has taken more than 370 lives,while the lives of more than two lakh people were in relief camps during the flood period.A reason for the high number of deaths from landslides is being blamed on widespread and uncontrolled quarrying, besides river sand mining.

The lessons learnt from previous experiences in Odisha and Chennai floods may not have been put to use. The balance between storage for hydropower and drinking water needs and sustained release to preclude flooding by huge water releases at one go may be hard. There are countries deciding to build no more dams while some dams are being removed in western US. [www.livemint.com].

Solutions for Current Environmental Consequences in the State

Taking the on-going arguments, friable geography, limited space and resources of the State, it will be wise to stimulate supplementary measures such as renewable energy production and energy conservation methods to meet the rising energy demands. Even though there are initiatives from the part of government, efforts should be made to implement them properly.Considering the above factors, it is understood thatKeralaneeds long lasting sustainable development in all sectors, especially when development begins from grass root level. Nowadays, Kerala needs a better dam management. Kerala government should encourage small and hydroelectric projects in a decentralized manner, and solar energy is emerging as a new paradigm.

Conclusion

Though water is a renewable source, hydroelectric plant cannot be constructed anywhere.Suitable weather condition, local habitat, climatic condition, and flow of water head are the various factors to be considered while constructing a dam for hydroelectricproject.The site should be suitable for the construction ofdam. Large area of land is required to install a hydro project. This may create disturbances to the local habitat.

The area should not be flood or earthquake prone. The less erosion area is highly preferable. Sedimentation in hydropower reservoir reduces the storage capacity, thereby creating problem for the water speed. Actions of silt damage the turbine and other equipment.

Hydroelectric plant construction is quite expensive. It requires more manpower compared to other power plants. Its maintenance cost is also high. Since various electric machinesand electrical drivesare associated with the plant, the loss factor is also high.Hence, it is better for the State to introduce more solar, wind and biomass energy projects for electricity generation rather than having more and morehydroelectric dams.

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