AN OVERVIEW OF HYDROPOWER DEVELOPMENT IN HANGRANG VALLEY, HIMACHAL PRADESH

Ankur Srivastava[1], Poonam Sharma[2] and Rachna Dua[3]

[1]Department of Geography, Delhi School of Economics, University of Delhi, India

Corresponding Author: ankurdse@gmail.com

[2] Shaheed Bhagat Singh College, University of Delhi, New Delhi, India,

[3]Shyama Prasad Mukherji College for Women, University of Delhi, New Delhi, India

Abstract

Mountains always have been a keen investigating area across the world. Supplying half of the world's population with fresh water, they are also considered as "water tower". As the mountains are home to some of the most fragile ecosystem on the planet, adequate environmental and social safeguard is needed while developing energy options in such eco-sensitive regions. In the present developing state of the world's economy, in order to bridge the demand-supply energy gap, there is need for additional energy sources. This gap can be filled by tapping the high velocity rivers suitable for hydro power generation in hilly and mountainous regions. Fortunately, the physiography of India is endowed fast-flowing rivers that cascade down from the parallel ranges of Himalayas having enormous clean and renewable energy potential. But, building hydropower projects have been a tough task due its fragile and geologically active nature. It has been estimated that 70 per cent of India's hydro power potential is in the Indian Himalayan region (IHR). Hangrang Valley, a Himalayan tehsil has emerged as a major hydro production site in recent years, having suitable topography for Run-of-River (RoR) projects. Although on the other hand, developing such projects may result in negative impacts on ecological settings of fragile high altitude ecosystem which prevails here. Thus, this paper is an attempt to highlight the people's perception and developmental aspects of hydro power projects in N-W Himachal Himalayas. Efforts have been made to map the possible outcome of the hydro installation in sensitive high altitude mountain ecosystem.

Keywords: Hydro-Electric Projects, Mountain Ecosystem, Indian Himalayan Region (IHR), Hangrang Valley

Introduction

The unprecedented growth in human population has resulted in surge in energy demand. In order to address this energy surge different alternatives are being adopted by countries such as shifting to alternatives sources of energy rather than traditional ones. The Government of India (GOI) has also taken several new initiatives such as fast-track hydropower projects. In the next few years, the GOI aims to construct more than three hundred hydropower projects including reservoir and run off the river based technology all through the Indian Himalaya. This will result in doubling-up current hydropower generation capacity and will also contribute 6 per cent to projected national energy

needs by 2030 (Ministry of Power, 2010). (National Hydro Policy, 2008) states that India, with its large river systems and favourable topographical features, has enormous potential for hydropower generation, estimated at over 148,000 MW. This energy source has been also identified as India's strategy to its low carbon energy growth policy and other possible alternatives are also being figured out to expand power generation by developing the country's hydropower potential which has been more or less in dormant stage so far. The Himalayan mountain ecosystem has started experiencing frequent geological hazards, such as landslides, mud slip, rock fall, seismic activities and soil erosion on a much larger scale which can be directly linked to developmental activities undergoing there. Hydroelectric projects may also give rise to environmental issues originating from submergence of huge area including untouched forests as in case of reservoir based hydro power projects (Misserli, 1981). A number of hydro projects either run of the river or reservoir type are functioning in the state without local residents support and public involvement. There have been nominal benefits due to developmental projects to local communities such as short term employment at construction or production sites but the threat perception regarding environmental conditions and conflicts over water resource right may further deteriorate this fragile mountain ecosystem. The main objective of this research article is to bring out people's perception about hydropower development in Hangrang valley.

Study Area

Hangrang valley is a sub tehsil of Kinnaur and is situated in the eastern most part of Himachal Pradesh, an entirely mountainous district. The study area extends between 31° 06' N and 32° 06' N latitudes and 77° 45' E and 79° 00' E longitudes, according to Survey of India degree-sheet nos. 53I, 53E and 52L. Total geographical area of the district is about 6401 sq. km covering 11.5 per cent of geographical area of Himachal Pradesh. It is bounded by Lahaul and Spiti district in the north, Kullu district in the northwest, Shimla district in the southwest, Uttarakhand in the south and shares international border with China (Tibet) in the east. The lifeline of the district is NH-22, which was once called as Hidostan-Tibat Border road. Lofty snow laden mountain peaks with scenic beauty of mighty Himalayas are some specific characteristics of the district. In past few years Kinnaur has emerged as prominent tourist destination. Leisure time can be well spent in popular tourist hotspots such as Kalpa, Sangla valley, Hangrang valley and others. Perennial and fast flowing Satluj can be considered as lifeline. The extensive variety of environmental attributes such as topography, climate and geographical conditions have endowed this landscape with a rich floral diversity dominated by conifers in the temperate zone, medicinal and aromatic herbs in the alpine meadows. The unprecedented installation of hydro power projects could be vulnerable to such fragile mountain ecosystem as the region doesn't suits to developmental projects, either geologically or environmentally.

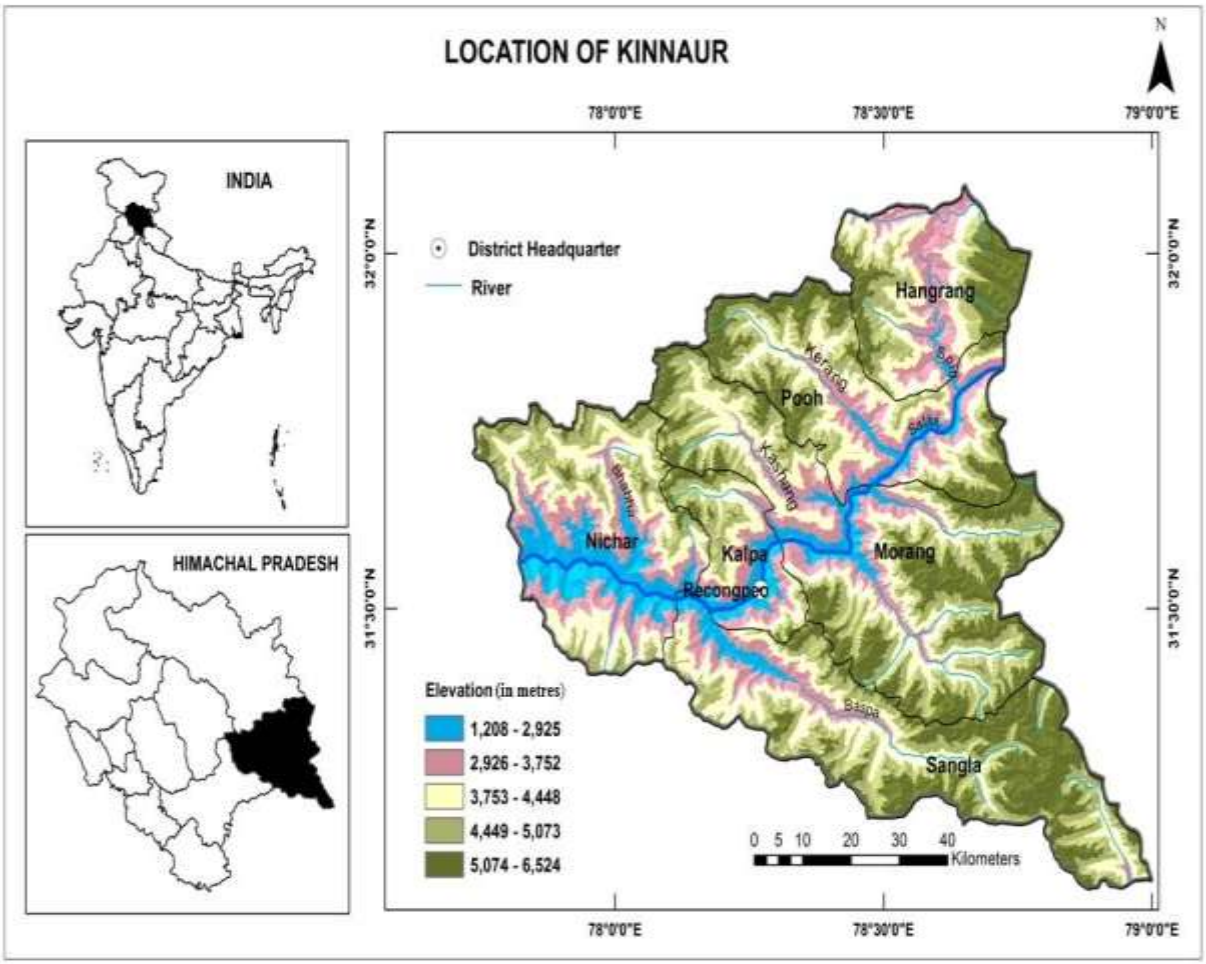

Figure 1: Kinnaur, Himachal Pradesh

Database and Methodology

The study comprises of primary and secondary data sources. A semi-structured questionnaire survey was prepared for gathering primary data on adaptive capacity of the local people to hydro power projects in north western Himalayas. For this purpose a sample survey was conducted in Kinnaur district (Hangrang valley) constituting requisite number of respondents from each selected hydroelectric site and different affected villages. The respondents were selected through stratified random sampling method. Secondary source include Survey of India topographical sheets, various maps from Geological Survey of India, datasets from Census of India, District Agriculture Statistics Handbook, pertinent articles and reports published from temporal basis by both government and non-government agencies. Database regarding status of ongoing and proposed hydro power projects was assessed from MOP (Ministry of Power) and NHPC (National hydro power corporation) websites and published reports. Detail Project Report (DPR) and Project Design Document (PDD) from the private hydro developers were further used as a data source for cross verification. Data on social and economic variables such as total population, population growth rate, population composition of the region, literacy rate, income level, house type, and occupational pattern and infrastructure facilities was obtained from the district census handbook as well as from Census of India 2011.

Result and Discussion

In order to assess the impact of HEPs construction and their impact on development of the region an extensive survey was conducted. The data was collected on various aspects of socio-economic profile of the villages located around proposed hydroelectric projects. The study area is thinly populated because of snow-capped peaks, forested steep slopes, unavailability of proper roads and other basic amenities. Male population is more i.e. about 65 per cent in the age group of 25–50 years. A semi structured questionnaire was designed to get information about ongoing and proposed hydro projects in the region. A total of 100 households were randomly selected from the three villages surrounding proposed Chango-Yangthang and Yangthang Khab Project. The selected villages were Leo, Yangthang and Nako. Either the head of the household or another family member were interviewed.

Table 1: Affected village details

Village name	**Tehsil**	**Population**
Leo	Hangrang	784
Nako	Hangrang	572
Yangthang	Hangrang	45

Source: Census of India, 2011

Plate 1: Primary Survey at Nako Village, 2017

The ChangoYangthang (261 MW) project was started in 2014 which led to first and foremost our question to the villages about the awareness of the project running in their vicinity and changes brought. More than 50 per cent of the population surveyed were aware about the project in all the villages. Interestingly, the staggering figure about the project that is to be set up was not known to almost 40 per cent of respondents (Fig.2).

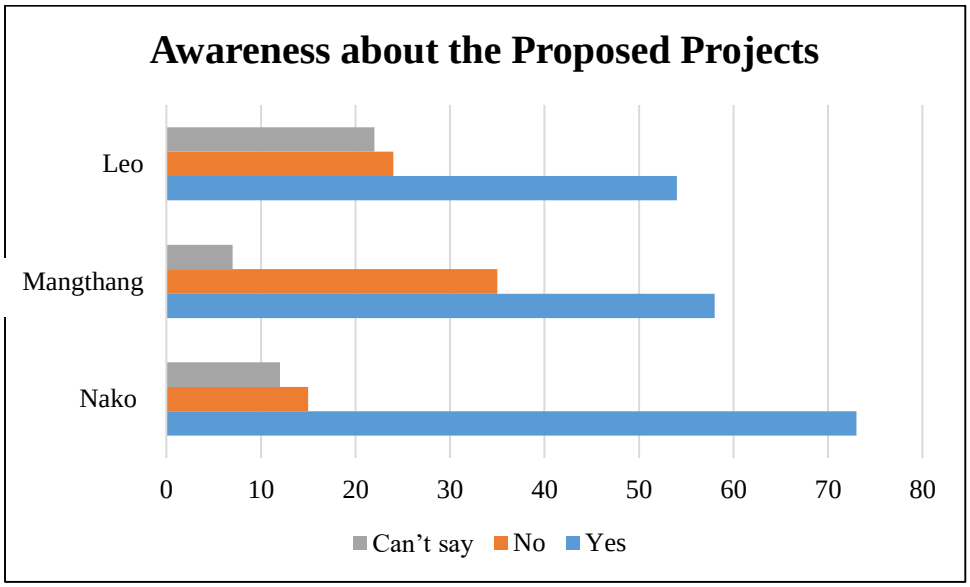

Figure 2: Awareness among People about HEPs

Hydro Power Generation and Its impact

Dams are a primary example of a large infrastructure project that presents opportunity for economic development, while also engendering environmental changes that consequentially feedback to social and economic values of communities downstream. Dams have the potential to produce a variety of positive and negative impacts on the surrounding people and environment. In order to maximize the benefits of a dam, the valuable relationship between communities and their river networks must be accounted for. With highly valued ecosystems and people who closely rely on the land for their livelihoods, it is important to take all possible impacts into account. These HEPs have also altered the land use pattern and economic practices of the region which further intensified the man environment relationship. Figure 3 maps out various installed and proposed HEPs in Kinnaur district. The NE region comprises of Hangrang valley where proposed sites are above 3500 metres (Fig. 3).

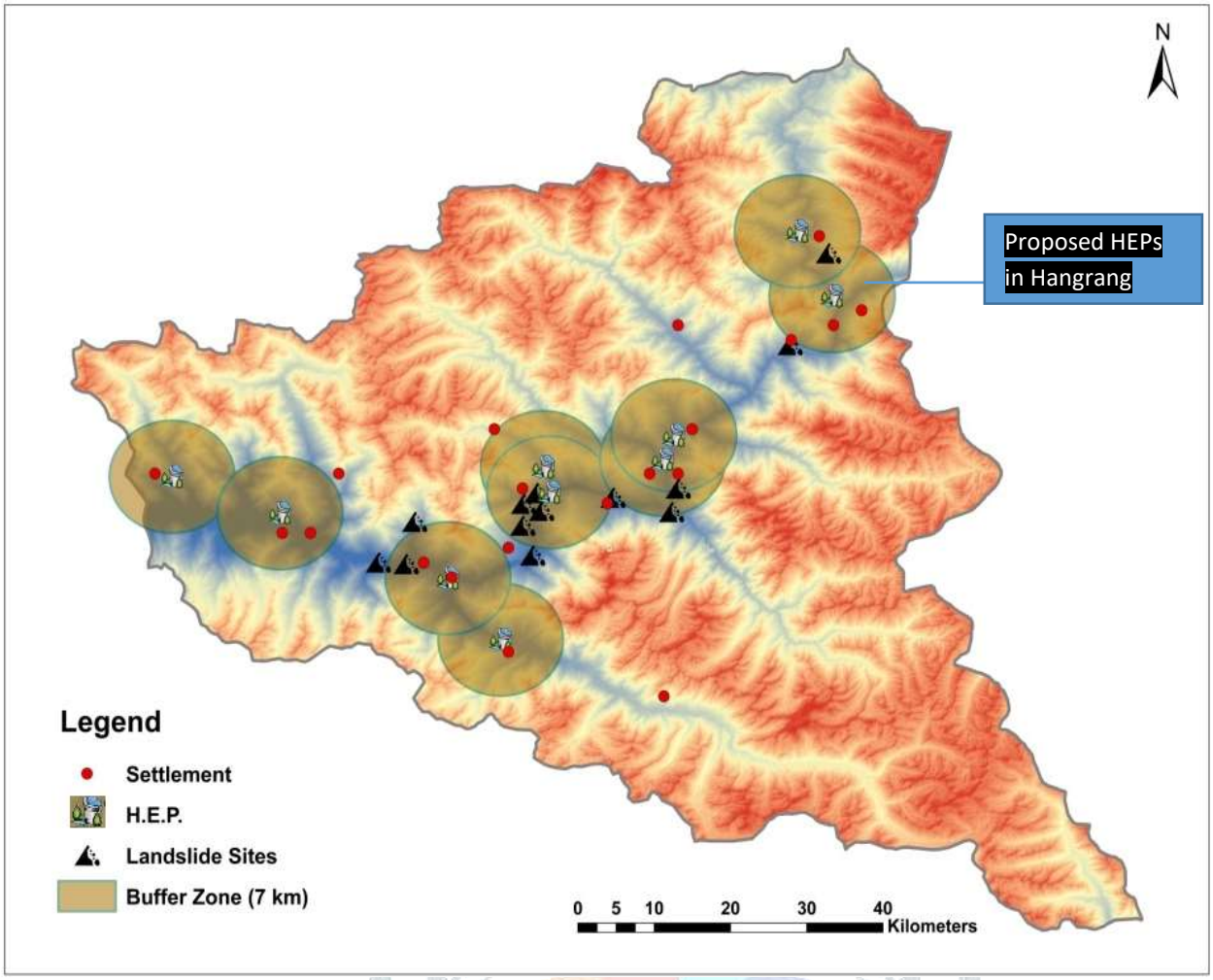

Figure 3: Buffer zonation along major hydropower projects

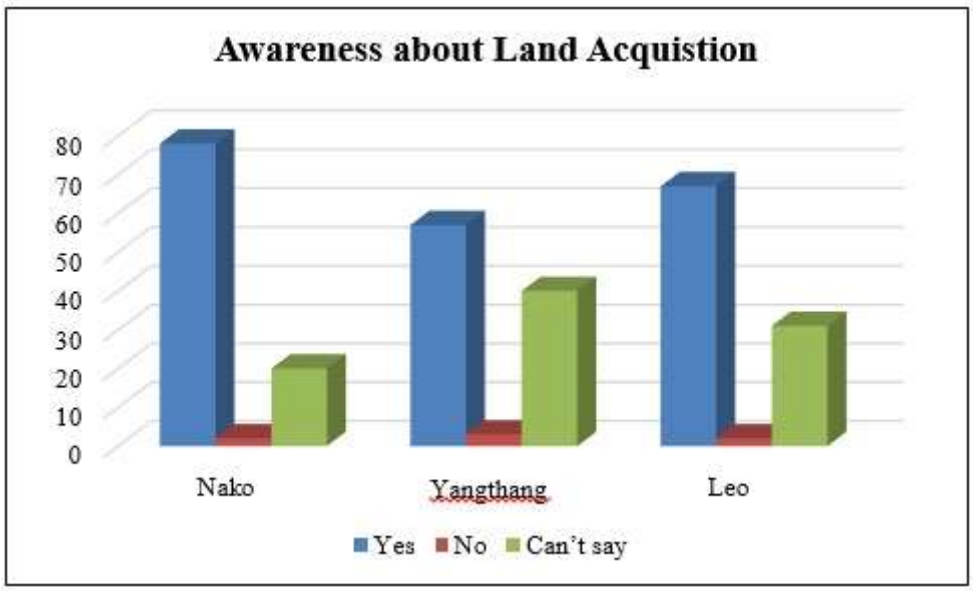

Figure 4: Land acquisition

The land area required for hydropower development are proportional to the size and capacity of the project and majority of the land proposed to be acquired is forest land. Number of projects in the river or tributaries and their impact due to land use changes on protected area in terms of fragmentation (such as fragmentation of land) was considered for assessment. Fig. 4 gives an idea about land acquisition process for proposed projects in Hangrang valley.

Pinus Gerderiana (chilgoza) trees are grown naturally and are harvested as a community resource and it is a rare and endangered species but construction activities and dam building have taken over this rare species space which is endemic in this part of the Himalayas 751 out of 1261 trees allowed for felling for Tidong-I were Chilgoza trees shows the insensitivity of the forest department to recommend such offset and in return the project has done irreparable damage to additional 590 trees which questions the whole design conception of the project. The impacts of hydro-electric projects (HEPs) on soil erosion and sediment transport commence with project construction activities such as construction of barrage, tunnels and approach roads, etc., and may continue up to generation of hydro power. Sediment load is mainly due to natural phenomenon, the construction activity adds to the sediment load during construction and pre commissioning till the mitigation measures for stabilization are undertaken.

Plate 2: Hangrang Valley Topography

Source: Primary Survey, 2017

People's perception regarding HEPs

The local indigenous population is mainly tribal in nature in Hangrang valley. Agitation against proposed HEPs is quite evident in the study area since last 5-6 years. The state government in providing lucrative offers to attract private hydro developers. Whereas the project proponents are flouting the provisions of tribal, environmental, forest and revenue laws in the execution of hydro projects in scheduled areas. The recent events in Uttrakhand and Kinnaur have shown, more than ever, that we need a development strategy for the Himalayas that takes into account the vulnerability of the region and the need for environment protection. In a climate change scenario, fluctuations in rainfall pattern and glacier melting processes extending over a large spatial extent may cause havoc as witnessed in other Himalayan states. The riverbeds of major rivers and tributaries are used as dumping ground and the muck disposal is coming up as a primary cause for environmental degradation in the study area. Less forest cover slopes of study area may trigger high sedimentation load coupled with construction activity and reduced effective channel width. The region receive tourists throughout the year but there was drastic change in previous some years due to deteriorated road infrastructure by heavy machinery, blasting, heavy rainfall aiding

landslides. Even the post construction impacts were seen in 2014 (Chulling nallah) where traffic was diverted from Chulling to Tapri through a risky terrain. Primary survey conducted during field visits to study area provide an insight about people's perception regarding HEPs in the valley (Fig. 5).

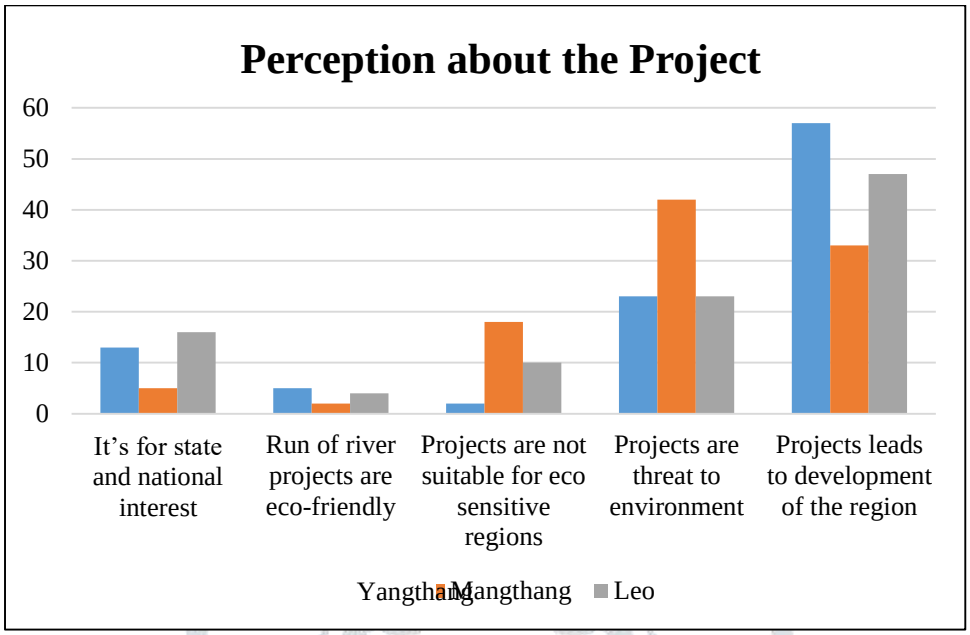

Figure 5: People's Perception for HEPs

These hydroelectric power projects have been a mixed bag for the people of this area. Majority of the peoples thinks that the project has given them a lot of set back as well as convenience also in their opinion the setback means that some people in the project catchment were made to leave their land and were shifted to the entire different place allotted by the project. Maximum number of the households said that they felt discriminated by the project in some way or the other. They did not receive compensation in time. Majority of the respondents got compensation after a year or after many years for other projects located downstream in Kinnaur. This clearly demonstrates that still the issue of compensation is unresolved and is controversial to the local people.

Issues and Challenges

Owing to its remote location and isolation, Hangrang valley is not well connected to major urban towns and centers. But, over the years its geographical characteristics and presence of high flowing Himalayan River have propelled a fuel of development in the region in the name of hydro-power generation. Once the projects are approved or started there are issues like cost over-runs, untimely approvals or delays, protests from the local indigenous community, litigations, apart from the harsh and unfavorable geology(Jodha, 1992). All these associated factors have either led to cancellation of the proposed project or have been stalled midway with only a part of construction being complete.

This is evident that Hangrang valley is devoid of vegetation and have unconsolidated sandy soil and falls under highly vulnerable landslides zones. The proposed projects may not only cause massive loss to life and property downstream, but may also have subsequent impact on the hydrology of the region. Other negative impacts within the project sites are deforestation and diversion of the water from different sources, these impacts further leads

change in the local ecology and eco-system. As per the high-level committee of the Himachal Pradesh high court in 2009, stated "There cannot be a totally environment-friendly hydro project in the Himalayas. The results of blasting, excavation, tunneling, cutting, tree-felling, diverting of rivers--all these are bound to have a severe and damaging effect on the environment and ecology of the area affecting water sources, green cover, wildlife.

Conclusion

Developmental aspects of hydro power generation in Kinnaur seems to be a myth only. The analysis shows that the construction of large-scale hydropower projects in the fragile area have disturbed the flora, fauna, and other negative impacts like displacement of people, landslides, soil erosion and deforestation has been increased after initiation of HEPs. After the construction of hydroelectric projects in the study area the level of income and saving has gone down, whereas the expenditure increased according to some responds who lost their land holding due to introduction of HEPs. Large number of people in the study area has the similar views regarding the hydroelectric projects and resulting environmental implication. According to them hydroelectric projects in the study area have created environmental and socio economic impacts on all fronts and majority of the villagers are against the construction of these large projects in study area.

REFERENCES

Aegerter, Simon, and Paul Messerli. The impact of hydroelectric power plants on a mountainous environment: a technique for assessing environmental impacts. Bern: Bundesamt für Umweltschutz. 1981.

Srivastava, Ankur, Poonam Sharma, and Ajay Kumar, "The Energy Scenario of India: An Assessment", in Sustainable smart cities in India, challenges and future prospective, Sharma Poonam, Swati Rajpoot (eds.) Springer publications, 2017; 321-332, ISBN: 978-3-319-47145-7

Beniston, Martin, and Michel M. Verstraete. Remote Sensing and Climate Modeling: Synergies and Limitations. Dordrecht: Springer Netherlands. doi: 10.1007/0-306-48149-9. 2003.

Energy Statistics. Central statistics office, Ministry of Statistics and Programme Implementation. New Delhi: Govt. of India2015; 22.

Hydropower Projects in the Sutlej River Basin, NW Himalayas, 2014, Environics trust and Himalayan Niti Abiyan, pp49-52.

International Rivers. (n.d.). About dams. International Rivers. Retrieved March 13, 2011. http://www.internationalrivers.org/en/node/287

IPCC, 2012, IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation, Cambridge University Press, Cambridge, UK and NY, p1075.

Jodha, N. S., Sustainability issues in the mountain context: Emerging scenario. Paper presented in the workshop on Approaches to Sustainable Development of the Indian Himalaya, Manali, Himachal Pradesh, 1–4 August 1992

Nepal, Santosh, Flügel, Wolfgang-Albert, and Shrestha, Arun. Upstream-downstream linkages of hydrological processes in the Himalayan region. BioMed Central Ltd. BioMed 2014; Central Ltd. www.ecologicalprocesses.com/content/3/1/19

Rai, S.C & Srivastava, A. Small hydro projects & community participation, in Livelihood security of Northwestern Himalaya: Case studies from changing socio-economic environments in Himachal Pradesh, Singh RB, Hietala R (eds.) Springer publications2014;

Singh A. Power sector reform in India: current issues and prospectus. Energy Policy 2006; 34:2480–90.

Singh P, Bengtsson L: Hydrological sensitivity of a large Himalayan basin to climate change. Hydrol Process 2004, 18(13):2363–2385. 10.1002/hyp.1468 International Rivers. (n.d.). About dams. International Rivers. Retrieved March 13, 2011. http://www.internationalrivers.org/en/node/287

IPCC, 2012, IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation, Cambridge University Press, Cambridge, UK and NY, p1075.