

Hydropower Development Consequences in Nepal: A Case study of Upper Tamakoshi Hydro Project in Dolakha District Within Province Number 3

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ABSTRACT: *Hydropower is the key project in the context of present world to get a reliable electricity, which is the primary necessity in the present realm. The word power simply means power of water and this water is the key factor in the development world. Hydropower is the major source of renewable energy and beautiful gift to the nature. This paper argues the consequences of Upper Tamakoshi Hydropower Project in Nepal. It also explain that how hydropower development could be one of the major source of Income and development in context of Nepal.*

Descriptive and analytical methods were applied to show the consequences of hydropower in the Upper Tamakoshi area, which is located in the Dolakha district within Province number 3. Estimated 20 HHs data from the Hydropower area, 4 Key Informant Interview, 4 FGD and various literature review and consultation have generated a fact in relation to the hydropower consequences in case of Tamakoshi Project.

The data revealed that the hydropower development helped to get income, infrastructure, electricity, institution and so on in the study area. Various group discussion indicate that the uses of electricity is vital and other benefits are more in highlights in the study area. The study concluded that the electricity is needed in the present development context generating from the own area. Hydropower contributed the income factor and created a positive environment in many cases. In other hand, there are many drawbacks of the hydropower system, which we must not neglect and take on the priority for the policy protocols. Monetary losses and disaster are the common drawbacks in the hydro project; hence, investment and benefit factor must be in detailed to get desirable results for all actor are highly recommended.

Keywords: *-Hydropower, Environment, Energy, Laws and Policy.*

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I. INTRODUCTION

According to a report by World Bank and International Finance Corporation (2016), hydropower contributes about 16 % of worldwide electricity, a share that is expected to grow. Hydro's technical potential is five times the current utilization rate, and huge potential exists in developing countries respectively. Hydropower accounts for around 17 % of global generating capacity, and about 20 % of the energy produced each year. The upgrading of existing hydropower installations is by far the lowest cost renewable energy available in present time (WB and IFC, 2016).

Hydropower, the invaluable gift of nature to the country and the major source of renewable energy, can play very vital role in Nepalese economy by providing cost efficient & environment friendly power supply cum service to improve energy services and by contributing to GDP growth strength through its export. It could be measured as the major economic backbone of the country (Department of Electricity Development, 2017).

A literature review show that in 1882, A.D. that the first hydropower plant was constructed in Wisconsin, USA. This plant made use of a fast flowing river as its source. After, few years later, dams were built to create artificial water storage area at the most convenient locations. These dams also controlled the water flow rate to the power station turbines.

In Nepal, the first hydropower plant was established at Pharping (500-KW) in 1911 A.D., 29 years after the world's first plant was established, during Prime Minister Mr. Chandra Shamsheer Rana's time to meet the energy requirements of the members of the ruling class. Though some 60 % of Nepal's population remains deprived of electricity, while the capital city continues to thirst for drinking water and follows from suffers from regular load shedding even at the present, it is attractive to note that Nepal had such an early start in the hydropower generation.

Adhikari (2005) elaborated that there are two types of hydropower plants based on facility types. (1) Run-of-river type: hydro power plants that utilize the stream flow as it comes, without any storage being

provided and (2) Storage (Reservoir) type: Hydropower plants with storage are supplied with water from large storage reservoir that have been established by constructing dams across rivers. Certain flow for hydropower generation is additional for the storage schemes than the run-of-river schemes. In case of Nepal, the above mentioned both types of hydropower plants are in practiced (Adhikari, 2005, pp. 72-73).

According to Bhatta (2017) reviewed that Nepal Electricity Authority (NEA) has a total installed capacity power of about 746 MW (MOF, 2014) and 26 MW functioning from mini and micro hydropower plants in the hills and mountains of Nepal (NPC, 2013). There is important energy deficit due to the poor economic and instable government to continue the electricity supply (Bhatta, 2017).

According to GON (2018) Global, experiences shows that that inadequate and lack of proactive management of environmental and social issues can have significant and adverse impacts on the cost, quality, security, and schedule of hydropower project planning, construction and operation. An EIA's comprehensiveness and its quality offers the very foundation to facilitate the hydropower project development processes by the number of steps (Identifying and addressing environmental and social risks and impacts, opportunities and management strategies; Focusing on resources and attention where it is required the most; Identifying stakeholders and gaining support and building understanding with stakeholders; Informing decision-makers with the necessary evidence to support further action and many more) reliable in the present context (GON, 2018).

Panthi and Basnet (2017) added that the Upper Tamakoshi Hydroelectric Project (UTHP) is under construction in the Dolkaha district of Nepal, which is the north east of the Kathmandu capital. It will have a gross head of 822 m and installed capacity of 456 MW. This is the highest crown hydro project so far the construction in Nepal and will generate approx. 2300 Gwh/ year. Construction started in 2011 with a time line of target to finish by the end of 2016 but due to mega-earthquake it became delayed (Panthi & Basnet, 2017).

Similarly, 10th annual report of technical section have reviewed the progress of Upper Tamakoshi project among which estimated 8.5 KM road site work with civil work from Lot 1 to Lot 4 lane have successfully done and rest of the work is accelerating now. It was also quoted that many environmental and economic activity have benefited the locals to uplift there social and economic life, income, local Structure, banking Institutes, share investment and number of privileges have been provided to the locals and nations as per the law and regulation prescribed under water and electric act (UTHL, 2016).

According to Shrestha (2016) the history of hydropower in Nepal we can see that the first hydropower project was started in Nepal was commissioned on 22nd May 1911 (By late King PrithviBir Bikram Shah) in Pharping about 10-15 km south of Kathmandu, using water from two spring sources, Satmule and Shikha Narayan3, with installed capacity of 500 kW. Through, till 1991, the power sector was in the public domain solely – under the ownership of Nepal Electricity authority (NEA), a public initiative fully owned by the Government of Nepal (GoN), on August 16, 1985 under the Nepal Electricity Authority Act, 1984; formed through the merger of the then Department of Electricity under the then Ministry of Water Resources (now called Ministry of Energy), Nepal Electricity Corporation, Eastern Electricity Corporation and related Development Boards. IN addition to the review, it was established to arrange for supply of electricity by generating, transmitting and distributing in an efficient, reliable and convenient manner. Various projects with cumulative total installed capacity of 239,330 kilowatt (kW) were built from 1911 through 1991 under the ownership of NEA (Shrestha, 2016).

Gradually many hydropower Project initiated in case of Nepal. Shrestha (2016) reviewed that the following hydropower projects were initiated as per the year which are Sundarijal-1935; Panauti-1965; Trishuli-1967; Sunkoshi-1972; Tinau-1978; Gandak-1979; Baglung, Doti, Phidim-1981; Kulekhani I-1982; Jomsom-1983; Devighat-1984; Seti-1985; Kulekhani II-1986; Terathum-1988, Khandbari, Mrasyangdi and Ramechhap-1989; Surnaigad, Tatopani-1991; Chatara-1995; Pauwakhola-1999; Modi Khola-2000; Kaligandaki-2002; Middle Mrasyangdi-2002 and Gamgadi in 2011 respectively (Shrestha, 2016)

From the review of literature it was found, that hydropower have many benefits such as electricity, Socio-economy, infrastructure, Institutional shares, market and so on.

Based on above literature and fact following objectives were drawn to set a case study mentioned here with:-

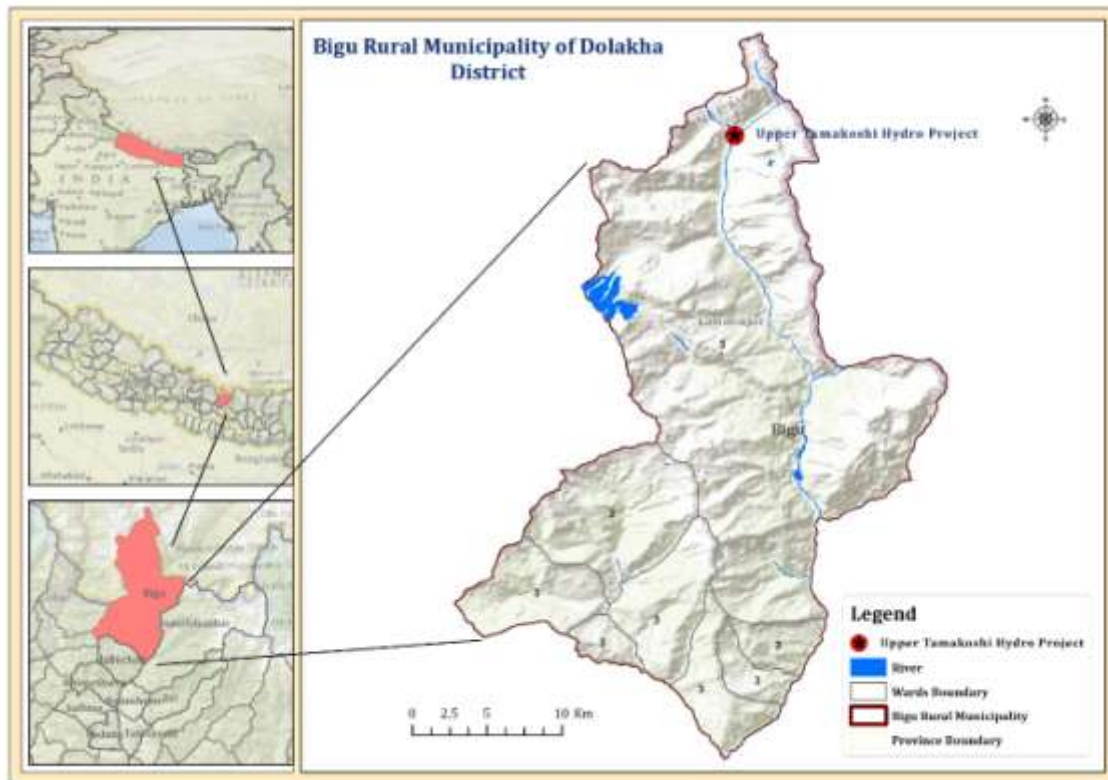
- 1) To analyse the socio economic condition of community near to hydropower project area.
- 2) To analyse the benefits and constrains generate by Upper Tamakoshi hydroelectric Project.

II. MATERIALS AND METHODS

Study Area

Upper Tamakoshi Hydropower area is in the northeast section of Kathmandu, which is in, the Dolkaha district within Province Number 3 in Nepal. Dolakha is the historical district within Nepal it is the mountain part of the Province number 3, the study area comes within the Bigu Rural municipality in Dolkha. The Upper Tamakoshi project area sited near to Tamakoshi River to Sunkoshi River within Nepal Tibet boarder.

(Photo-1, Self-created map using GIS Arc View of the study area)



Respondents Selection

A purposive sampling based on the strata were designed. Purposively because the study was mainly targeted to the Upper Tamakoshi Project. People residing near to the area were the respondents for this study. Estimated, 30 HHs out of 140 HHs were chosen as respondents for this case study. The HHs selection was randomly chosen, the sample were trying to capture representative figure from the community of the Upper Tamakoshi area comes within ward number 1 in Bigu Rural Municipality at Lamabagar catchment.

Data Collection Procedure

The data were collected in between January to February 2018. A pre-test were done in Project nearby area to get an insight of the questionnaire. The feedback generated through the pilot test and final questionnaire were prepared accordingly. Along with HHs, data 4FGD, 4 KII and many consultations with concern agencies were conducted for this case study. Cronbach's alpha value stands for 0.78 using reliability testing.

Data analysis

The Primary collected data were further put into SPSS after setting of relevant variable. IBM SPSS Vol-20 were used to interpret the data and table, further it was analysed through MS excel spreadsheet. Mean Value, SD and many other results were drawn from this case study.

III. RESULTS

In this section, the data obtained from the different sources (Primary HHs data, Secondary HHs data, Observation, KII, FGD and consultative meetings) are try to illustrating here:-

(Table-1, Analysis of Socio economic status of the surveyed community residing in the hydropower area)

Variables	Legends	Frequency	Percentage (%)
Land Size	1-5 ropani	27	90.0
	6-15 ropani	3	10.0
Production	Up to 3 months	4	13.3
	Up to 6 months	26	86.7
Livelihood-1	Off/ On farm wage	20	66.7
	Construction wage	4	13.3
	Tourism	6	20.0
Livelihood-2	Off/ On farm wage	6	20.0
	Tourism	23	76.7
	Forest Resource	1	3.3

Study level	Primary	1	3.3
	Lower Secondary	6	20.0
	Secondary	23	76.7
Loan Access	Yes	22	73.3
	No	8	26.7
Monthly income	Up to NRS 20,000	3	10.0
	Up to NRS 30,000	21	70.0
	Up to NRS 40,000	6	20.0
Monthly Expenditure	Up to NRS 10,000	5	16.7
	Up to NRS 20,000	20	66.7
	Up to NRS 30,000	4	13.3
	Up to NRS 40,000	1	3.3

(Source:- Field visit, 2018)

In case of Socio economic status, the data revealed that land holding is higher value for 1-5 ropani (1Ropani is 0.05087 Hectare) answered by the respondents. It was found that the hydropower project has provided compensation to the people residing in this community who further purchased arable and upland in the nearby area. Overall land size is limited for planting and during interview; it was find that people do farming in own/ relatives land. In a question of production from own area is shown that the majority of respondents (Table-1) have food stock up to 6 months from own, this stock are noting but maize, millet and rice cultivated from the land for feeding family and cattle's both. The major livelihood found, as off / on farm wage and tourism generated through Hydropower project, the daily wage cost is 1000-1500 NRs / Day(1 USD=110 NRS in average) for construction and agriculture wage. Similarly, people do engaged in tourism activity such as pottering, hotels, etc., which also generating income opportunity within the respondents in majority. The education priority is limited to the secondary level education only because the availability of education structure is present but less interest and high priority for the earning can be easily pragmatic from the interaction with the community people. After intervention of hydropower, project number of banks and financial institutes have been increased because of which peoples have good access to the loan facility. The mean value of monthly income stand for 3.10 compare to the mean value of expenditure, which is 2.03. The above phenomena shows that the socio economic status mainly highlighting production and income is good to the people residing in the project area.

The data more validated through a KII interview with Hydropower staff members that:-

“Due to Upper Tamakoshi project, nearby community and Dolakaha district have much benefited in terms of many reason such as electricity, income, infrastructure and so on”.

FGD interview have similar expression that:-

“Local people have plenty of work opportunity due to Upper Tamakoshi hydropower Project, a small family also earning at least 25000 to 30000 per months form the regular discharging of his daily wage”.

(Table-2 Analysis of opinion of surveyed respondents about the benefits and constrains generated through hydropower project in the study area.)

Variables	Legends	Frequency	Percentage (%)
Compensation satisfaction	Fully	3	10.0
	Partially	17	56.7
	Not happy	7	23.3
	No answer	3	10.0
Benefit from hydropower project-1	Electricity	27	90.0
	Institutional shares	3	10.0
Benefit from hydropower project-2	Institutional shares	24	80.0
	Many Privillages	3	10.0
	Market access	3	10.0
Benefit from hydropower project-3	Higher education	3	10.0
	Earning	24	80.0
	Learning	3	10.0
Problem/ Constraints- Opinion 1	Displacement	1	3.3
	Privileges	6	20.0
	Losses of cultures	1	3.3
Problem/ Constraints-Opinion 2	Losses of relation	3	10.0
	monitory losses	19	63.3

	Losses of cultures	1	3.3
	Losses of relation	5	16.7
	Disaster risk	21	70.0
	Environmental losses	3	10.0

(Source: - Field visit, 2018)

The data in relation to the hydropower project benefits (Table-2) revealed that people residing in the Upper Tamakoshi project area get a cash compensation based on the size of land criteria and based on its valuation. It was noticed through data that 56.7 % respondents are partially agreed with a compensation process, the compensation amount is one factor but the displacement of locality and entire culture is another point of view for them. Similarly, in case of privileges provided by the people, data shows that free electricity have a largest majority of Respondents than Institutional share, which are costly share value even in the present market price and third privilege majority is for employment opportunity to the people. The local people of the area get a privilege to do job with the project based on the educational qualification with them. In some cases the people also generated many employment opportunity from the establishment of hydropower project, the major employment was the labour work, pottering, driving, caring, tourism and so on. However, monetary losses and disaster risk are the problems answered by the surveyed respondents. As Table-1 also illustrated that land is valuable and production is important for the farmers. In case of Dolkaha district, social and cultural life of the people is identified with the cultural events of the ethnic residing in a community, Shifting or displacement makes a big sense to either losses of culture or spoil of relations within the family and community also.

A case study of local people (**Ram Bahadur Lama**) also shared the case that he had shifted due to project works, get a good amount of cash and shifted in nearby area but he has losses his culture, ethnics, race and socio economic practices which he also called a monetary value so the respondents meaning and community meaning was same that they have lost their monetary value.

In another reason disaster, risk is more on the area due to Giant River and year after year number of lands swept or cut away due to flood occurred caused by dam activity.

KII from Rural Municipality people have stated the same fact:-

“Dam provided benefits and also brought challenges in the rainy season, which causes heavy disaster some time and difficult to the recovery”.

“FGD interview also stated that there are many drawbacks of the Upper Tamakoshi hydropower Project among, which major is disaster, environmental effect, Climate change and law related conflict in the area, however, it also generate number of benefits to the people and nations both”

IV. CONCLUSION

Based on the above study following conclusion has been draw from this fieldwork mentioned below:-

Socio economic status of nearby community are well due to ongoing construction work of Upper Tamakoshi Hydroelectric project which not only generate employment also provide many privileges to the community people among, which free electricity and compensation is an additional facts.

In addition, it was also notify that hydropower had a multiple benefits among, which electricity, employment, common institutional shares and many physical infrastructure are commonly developed on which local citizen and nations get benefits from its function.

RECOMMENDATION

Following recommendation have drawn based on the case study are here with-

- 1) The cases study is not enough to reflect the whole phenomena of the study area but somehow it is advised to provide all social economical facility to the nearby community people in order to continue their livelihood in proper manners.
- There are number of benefits notified from the construction site but somehow in context of Nepal there are many things, which we can consider such as investment and its benefit, it will be better if the disaster and other natural calamities occurred form the hydropower project should keep on higher priority and mitigate the situation accordingly.
- It would be better to evaluate the laws and regulation in relation to the hydropower should consider, check, and balance for the future production in context of Local production of electricity.

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