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Teesta Hydro-Electricity Projects and Livelihood Security in the Sikkim Himalaya: Issues and Challenges

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ABSTRACT

Energy is crucial for any nation's economic growth and development, as well as poverty eradication and livelihood security. However, hydropower projects require significant expanses of land for construction and also affects people's lives and social structures. Sikkim is a growing economy that is pursuing modernization through economic growth. In Sikkim, the forest department administers 82.31% of the land, while agricultural accounts for 11.1% of the overall geographical area, with agriculture employing 65% of the population. People's livelihoods are adversely affected when agricultural and forest land is diverted for project-related activities. This paper studies the post-project livelihood situations of the affected people of Teesta hydro power project. Field study has been carried out in six affected villages. Total of 334 sample household has been surveyed through pre-structured questionnaire. To assess the levels of various livelihood capital assets, all the five capitals i.e., natural, physical, financial, human and social capitals has been studied at household level by grouping the calculated data into three class intervals (i.e., high, medium and low). Index has been prepared to evaluate livelihood security and the livelihood diversification (Simpson Diversification Index) of the affected villages.

Keywords- Development, Livelihood, Livelihood Security, Hydro-Power Project, Sikkim Himalaya.

I. INTRODUCTION

The term "development" refers to a positive value notion in regional development that attempts to upgrade peoples' well-being and general human welfare characteristics in a region. Hydropower plants have spread throughout India's Himalayan state of Sikkim, with a slew of new ones planned along River Teesta in Sikkim. Hundreds and millions of people around the world rely on rivers for their livelihoods and well-being, yet dams have devastated them. Dam construction accelerated from the 1950s, particularly in developing countries, and by the end of the century, over 45,000 dams had been built in over 150 countries (WCD, 2000). The loss of people's livelihoods is the most prevalent and dangerous result of changes in the flow regime. Hydropower as a green energy source has commonly become a risk in the Eastern Himalayas. The waterscape has been irreparably transformed, despite the fact that water is renewable. Relying on clean development and climate change to support hydropower development risks obfuscating many of the project's environmental and social repercussions. When one considers that the number of displaced persons regularly increases over time as a result of project-related damage to private land and property that was not included or expected in the first EIA Report, the actual impact on local communities and their livelihoods is even greater.

Sikkim's development strategy has largely centered on eradicating poverty, revenue production possibilities through educational and marketable skills, and infrastructural development since it merged to India in 1975. The Sikkim government is pushing the state's much-needed socioeconomic development in conjunction with the business sector. As a consequence, the perennial rivers which flowing from the snow-capped mountainous regions are indeed perfect for hydropower development,

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and both the public and commercial sectors make use of them. The government had initially planned six hydro-electric projects along the Teesta River in Sikkim, two of which (Teesta stage-III and stage-V) have already been constructed and operational. Some of these six proposed projects are scrapped, some are halted, and others are under investigation. People's livelihoods are impacted by the diversion of agricultural and forest land for project-related activities. Regardless of the potential financial rewards, leaving land meant losing not simply a long-term source of income, but also a crucial anchor for a sense of identity and belonging for some landowners who have fully given their land to the project.

II. REVIEW OF LITERATURE

Sustainable rural livelihood is becoming highly significant in discussions discourses about poverty eradication, and ecological balances (Scoones, 1998). "A livelihood module includes of the capabilities, assets (both material and social resources), and activities necessary for survival. A livelihood is sustainable if it can withstand and recover from stresses and shocks, as well as preserve or improve its capabilities and assets in the present and future, without jeopardizing the natural resource base" (Carney, 1998, p-2). The most widely cited definition given by Chambers and Conway, (1992, p-6),

"A livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living. a livelihood is sustainable when it can cope with or recover from stress and shocks, maintain or enhance its capabilities and assets and provide sustainable livelihood opportunities for the next generation and which contribute to net benefits to other livelihood at the local and global levels and in the short and long term."

Apart from the above definition given by Chamber and Conway, Institutions of Developmental Studies also define livelihood as:

"A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base".

In India, dams are mainly installed in locations with fertile soil and forests that are inhabited by economically disadvantaged communities who rely on the natural environment for their livelihood. As a result of the expansion of dams and other related construction operations, many towns lose out on environmental money. Such rhetorical structures resemble a perception-based development agenda that undermines and overlooks socio-environmental challenges associated with major dams (Huber. Et. al., 2015).

The Hydel project along river Teesta in Sikkim covers a large area in a region where agricultural land (11%) is already limited. Secondly, project restricts the production of forest-based cardamom, which is a significant source of income for rural households (Huber, 2012). The rapid development of hydel projects in river Teesta in Sikkim has impacted negatively on the ecosystem and culture (Arora, 2007). People living in adjacent to the construction sites being displaced and rehabilitated, as well as landslides, earthquakes, and tremors caused by excavation for the projects, are some of the key challenges affecting residents' livelihoods. There is also a loss of culture and tradition as a result of these initiatives, which has resulted in protests from the affected people in the immediate area (Rai, 2017).

III. SIGNIFICANCE OF RESEARCH

Sikkim's indigenous inhabitants are highly reliant on their land and forests for survival. People's livelihoods are impacted by the shift of agricultural and forest land for project-related activities. The socio-cultural and economic effects of project implementation, as well as institutional errors and sensitivities may have an effect on the local population's livelihood. Regardless of the potential monetary gains, surrendering land to the project meant losing a significant long-term source of income, sense of identity and belongings. In a separate perspective, it is particularly the lack of development involvement in these places that has resulted in considerable livelihood insecurity, with serious implications for people's long-term well-being. According to prior literature, no precise research of the Teesta Hydro-Electric Power Project's affected people's livelihood security has ever been conducted. The main objective of this paper is to evaluate how hydropower projects affect the livelihoods of people living in the Teesta Hydro-Electric Power Project's adjacent areas along the Teesta River in Sikkim, which are situated in its most ecologically fragile, seismically active, and culturally distinctive regions of the state.

IV. GEOGRAPHICAL BACKGROUND OF THE STUDY AREA

Sikkim is bordered on the north by Tibet, on the south by West Bengal, on the east by the Chumbi Valley of Tibet and Bhutan, and on the west by Nepal. It is located between 27°04'46" and 28°07'48" north latitude and 80°00'58" to 88°55'25" east longitude. North, South, East, and West Sikkim are the four districts that make up the state. Sikkim makes up 0.22 percent of India's total land area (7096 sq km). According to the Census of India's regional divisions, it is one of the four micro regions of the north-eastern Himalaya.

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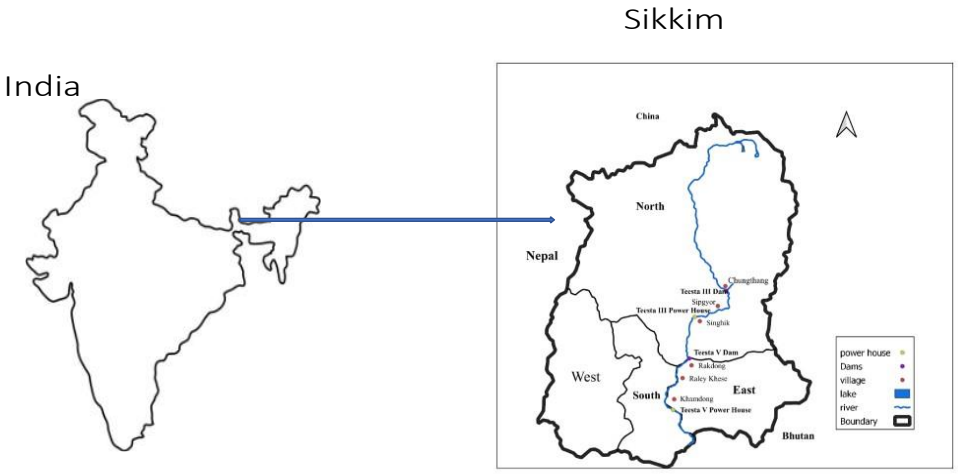

Figure 1: Location of Study Area

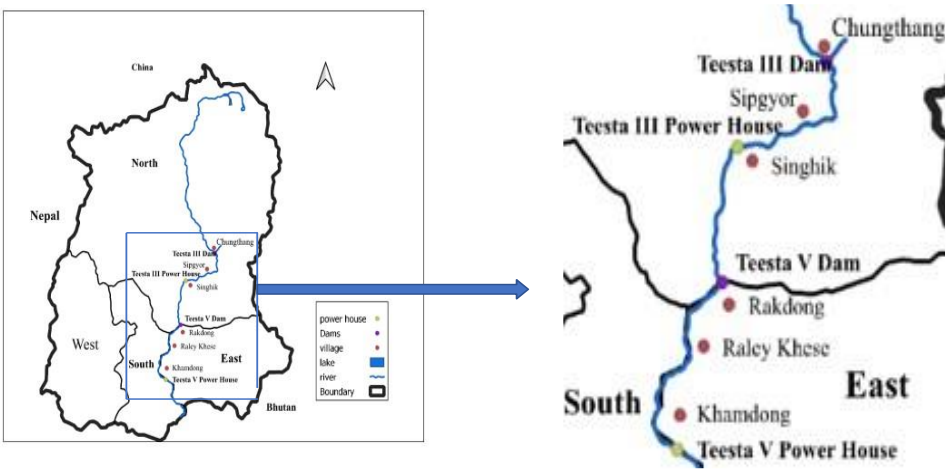

Figure 2: Location of Sample Villages, Dams and Power House

V. OBJECTIVES

This research focusses on one major objective as listed here under:

- To assess the post-project livelihood situation of the affected communities of Teesta Hydro-Electricity Project.

VI. DATA BASE AND METHODOLOGY

Field surveys have been carried out in two stages, in April and May 2021 (1st phase) and September and November 2021 (2nd phase) in order to examine the livelihood pattern of the Teesta Hydro-Electricity Project along the river Teesta. This paper also referred to various secondary sources in addition to primary sources. For sample village selection, all the villages were collected from different project sites (i.e., damsite, downstream and power house site) from two commissioned projects (Teesta stage-III and Teesta stage-V). Using lottery methods one each village from all the points of two project were selected. Altogether, six villages are selected for the study. At the household level, all five-livelihood capital, i.e., natural, physical, financial, human, and social capitals, has been examined. 31 indicators from five domain of livelihood capitals have been selected to study the livelihood pattern of the affected people of the project. To investigate livelihood diversification, the six villages were divided into three categories: high, medium, and low using descriptive statistics. Normalization of data has been done with the same procedure followed by Human Development Report for calculating life expectancy. Livelihood diversification index has been calculated following equal weightage methods. Livelihood diversification is represented by a livelihood diversification index computed on the basis of household income from various sources to analyse the livelihood diversification of the Teesta Hydro-Electricity Project's affected population following Sympson's Diversity Index.

$$SI = 1 - \sum_{i-1}^{n} \left(P_i^2\right)$$

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Where n is the total number of sources of income and Pi is the income proportion of the ith source of income. SI is a scale that ranges from 0 to 1.

VII. SAMPLING

As two major projects commissioned in river Teesta in Sikkim, total of six sample villages has been selected from six different points from damsite, downstream and power house site from both the projects. Altogether, total 334 sample household was surveyed from six sample villages. This study uses the Confidence Interval Approach to determine sample size, with a confidence level of 90% and a margin of error of 5%.

Table 1: Sample Villages

Location	Upper catchment (Teesta -III)		Upper catchment (Teesta -V)	
	Name of the villages	Number of sample household	Name of the villages	Number of sample household
Dam Site	Chungthang	101	Rakdong	61
Downstream	Sipgyer	32	Raley-Khese	47
Power House Site	Singhik	42	Khamdong	51

VIII. RESULTS AND DISCUSSION

VIII.A. Livelihood Status Based on Livelihood Capital Assets

All five livelihood capitals have been examined at the village level to determine the livelihood status of the sample villages.

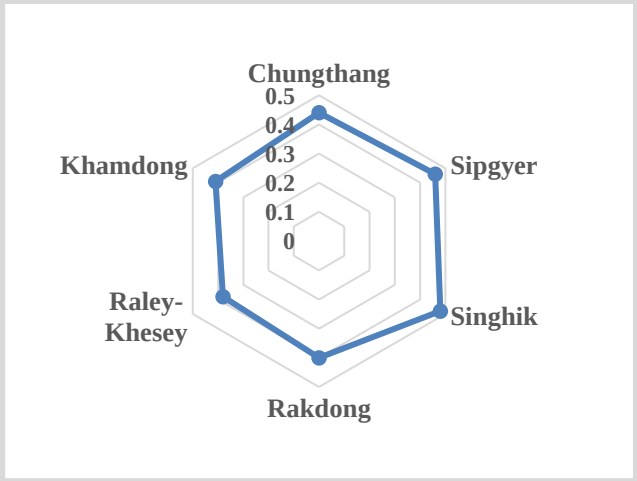

Figure 3: Natural Capital

Figure 4: Physical Capital

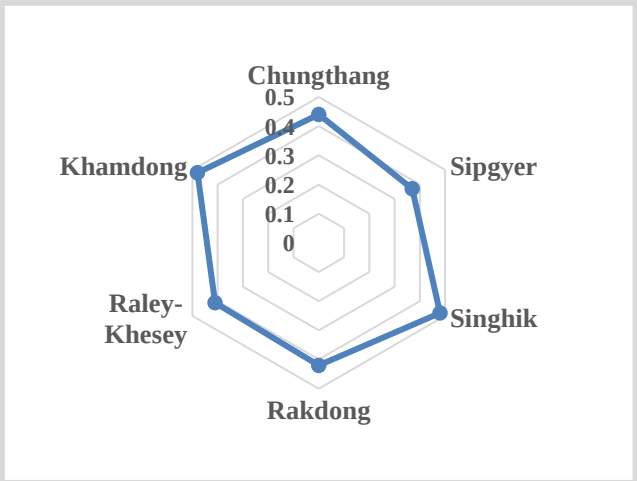

Figure 5: Human Capital

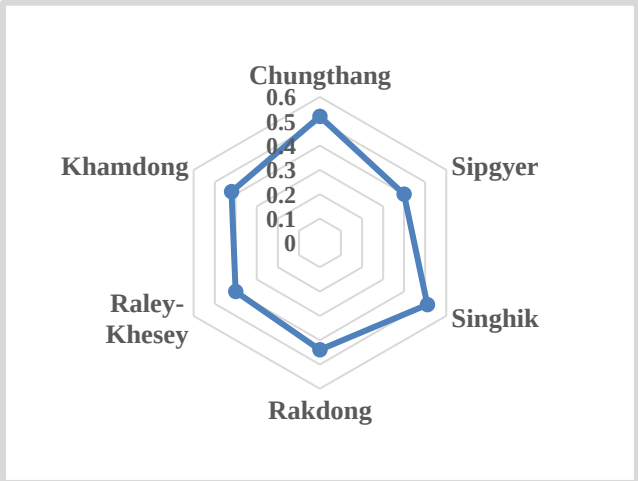

Figure 6: Financial Capital

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Figure 6: Social Capital

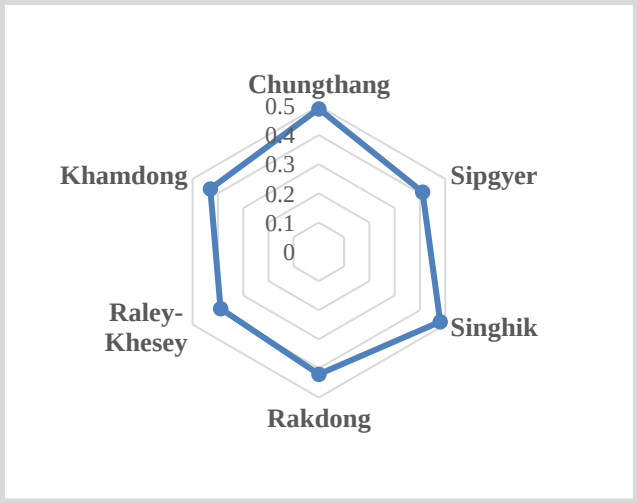

Figure 7: Total Livelihood Capital

In Natural Capital, the value is highest in Singhik village (0.48), followed by Sipgyer (0.46), Chungthang (0.44) and least value is in Raley Khesey (0.38). Singhik village is located in the power house station of Teesta-III (1200MW) and could able to avail maximum benefit given by the project due to its locational advantage being near to the north district headquarter Mangan. The villages situated downstream as Raley-Khesey were so much underprivileged as they neither got any monetary assistants nor employment. However, the head race tunnels that pass through these villages have considerably impacted the spring water, affecting agricultural production. In Physical Capital, Chungthang Village located at the damsite of Teesta-III has the highest value (0.51) and lowest value is in Sipgyer village (0.36) (Downstream of Teesta-III). In Human and Financial Capital, highest value is in Singhik (0.48) and Chungthang (0.52) respectively. Overall livelihood capital values also found highest in Chungthang and lowest in Sipgyer. Chungthang being the gateway to rest of the tourist points like Gurudongmar lake, Lachen, Lachung, Yumthang Valley etc. have the privileged in terms of tourism and allied activities. Chungthang also enjoys various basic amenities like schools, hospital, market etc. Same situation can be seen with Sipgyer village from where head race tunnel passes through. Many landslides can be seen especially in lower Sipgyer. Connectivity is also a major concern as there is only one road to this village which is very narrow, if this road blocked during monsoon, the whole village will remain cut-off from rest part of the district.

VIII.B. Livelihood Status based on Livelihood Security

Households with adequate and long-term access to income and other resources to meet their fundamental needs are said to be in a secure position. Food, clean drinking water, medical facilities, educational opportunities, housing, community participation time, and social integration are all part of the livelihood security.

Table. 2. Levels of Livelihood Security. N=334

Villages	Livelihood Security Index
Chungthang (n=101)	0.52
Sipgyer (n=32)	0.38
Singhik (n=42)	0.49
Rakdong (n=61)	0.42
Raley-Khesey (n=47)	0.45
Khamdong (n=51)	0.47

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Table. 3. Percentage of Livelihood Security in each village. N=334

Villages	Less Secured (<0.32)	Medium Secured (0.32-0.50)	Less Secured (<0.50)
Chungthang (n=101)	24	52	24
Sipgyer (n=32)	25	65	10
Singhik (n=42)	16	68	16
Rakdong (n=61)	18	68	14
Raley-Khesey (n=47)	21	67	12
Khamdong (n=51)	15	70	15

Above table depicts that the livelihood security index value is highest in Chungthang village (Dam site of Teesta-III) followed by Singhik (0.49) and lowest is in Sipgyer (0.38). Again the highest percentage of household lies in highly secured range is in Chungthang and lowest is in Sipgyer village.

VIII.C. Livelihood Status based on Livelihood Diversification

As a result of the rise of the rural nonfarm economy, diversification of the rural economy refers to a shift in rural activities away from farm (agricultural) activities and toward nonfarm (non-agricultural) industries (Loison, 2017; Start, 2001). The process through which rural families build a varied portfolio of activities and social support skills in their struggle for survival and to enhance their living standards is known as livelihood diversification (Bedeke, 2013; Ellis, 1998). Diversification of livelihoods is an important approach for rural people to employ in order to create sustainable livelihoods; it is commonly used in conjunction with other methods to achieve this goal.

Table. 4. Levels of Livelihood Diversification. N=334

Villages	Livelihood Diversification Index
Chungthang (n=101)	0.49
Sipgyer (n=32)	0.35
Singhik (n=42)	0.46
Rakdong (n=61)	0.39
Raley-Khesey (n=47)	0.42
Khamdong (n=51)	0.44

Table. 5. Percentage of Livelihood Diversification in each village. N=334

Villages	Less Diversified (<0.25)	Medium Diversified (0.25-0.44)	Highly Diversified (>0.44)
Chungthang (n=101)	30	48	22
Sipgyer (n=32)	31	61	8
Singhik (n=42)	29	58	13
Rakdong	26	62	12

(n=61)			
Raley-Khesey (n=47)	24	66	10
Khamdong (n=51)	18	68	14

Table-4 shows that the highest value in terms of livelihood diversification is again in the Chungthang village (0.49) and lowest is in Sipgyer village (0.35). in highly diversified range, 22% household lies in Chungthang village and only 8% household in the Sipgyer village.

IX. CONCLUSION

The low levels of income diversification and livelihood security of the impacted population are major difficulties and challenges seen in the study villages. Villages impacted by the project have recently been forced to lose their long-term livelihood opportunities. They are less diversified and more exposed to threats for long run because agriculture makes a large portion of their income. Due to a number of social and environmental risks, including lowering post-project agricultural production in their limited land, Families tries to engage themself for a wide range of activities for income stabilization and risk mitigation though, their livelihood diversification has decreased. Across all livelihood capital assets, projects initiatives have been proven to have both beneficial and adverse effects on the livelihoods of the affected people. Roads were developed as part of the project, which strengthened physical capital, but they also changed the flow volume and velocity of river, negatively damaging many aspects of natural capital. In certain situations, there were benefits for local schools and healthcare institutions, but there were also various health risks associated with the presence and implementation of hydropower plants, which impacted human capital. The social consequences of the project's impacts on the villagers are complex.

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