SOCIO-ECONOMIC CHANGES AND ITS IMPACT ON QUALITY OF LIFE IN THE ADJOINING AREAS OF TEESTA STAGE V HYDRO-ELECTRIC POWER PROJECT

ABSTRACT

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Introduction

Sikkim a tiny Himalayan state located in North-east India lacks in economic and infrastructural development. The major resources of this state are its picturesque landscape, rich forests and swift flowing rivers of which Teesta is the most significant. These rivers are ideal for hydro-power development. Consequently the government of Sikkim is encouraging hydro-power development under Public-private partnership so as to usher in the much needed socio-economic development along with infrastructural growth. At present there are around 29 (commissioned, under construction and under survey) hydropower projects in the state and the Teesta Stage V hydro-electric power project is an unique project where the river Teesta has not only been diverted but also tunnelled for 17.5 km from the dam near Tangyek in North Sikkim district to the power station at Sherwani located in the border of East and South Sikkim. Thus, this project leaves its immediate impact on the three districts of the State, consequently this thesis makes an attempt to assess the socio-economic changes and its impact on the quality of life on the people living in the adjoining areas of Teesta Stage V hydro-electric power project.

STATEMENT OF THE PROBLEM

The rationale behind this study is to assess the role of hydropower projects in bringing about changes in the socio-economic aspects in hilly and tribal areas of India by taking the case of Teesta Stage V hydro-electric power project located in Sikkim and its impact on quality of life of the people living here.

North, East and South Sikkim districts where this project is situated are mainly inhabited by small tribal communities like Lepchas, Bhutias, Limbus, Sherpas, besides the Nepalese and other plains people. Modernisation is a recent phenomena...
here, and most of the people here live in close proximity to nature where their livelihoods, religious practices and traditions are closely linked to the existing land, water and forest resources. But the TSVHEP project in the name of development has brought changes in landuse, river Teesta has been tunnelled, its natural course has been altered right from the dam located near Dikchu (North Sikkim district) to the power station at Sherwani (East districts). As river Teesta and adjoining landscape holds religious significance especially for the Lepcha community some of them along with the civil society are voicing protest that this project is leading to their cultural erosion besides bringing demographic changes, reducing them to a minority in their own "homeland"(Dzongu- the Lepcha reserve granted by Chogyal and later the Constitution of India). Consequently, this study makes an attempt to assess the demographic and socio-economic changes brought about by this project. Further an attempt has been made to assess the impact of this project on the quality of life of the people living in the vicinity of the project with a view to ascertain whether this development project has been able to realise its goal of enhancing socio-economic development for the maximum number of people living in the surrounding areas of the project thereby improving their quality of life.

Objectives-

The basic objectives this research addresses are mainly -(i)To examine the demographic and socio-economic profile of the people living in the adjoining areas of Teesta Stage-V hydro-electric power project prior to the construction of the project. (11) To assess the demographic, socio-economic changes brought about by the project in the adjoining areas; and (iii) to evaluate the Socio-economic changes and its impact on the quality of life of the people in the adjoining areas of the above mentioned power project.
The Research queries this thesis addresses are

1. Has the project improved the socio-economic condition and infrastructure of the area?

2. The impact on quality of life of the population living in the vicinity of the project is due to TSVHEP project or is it due to other development activities

**Database and methodology**

Both qualitative and quantitative data has been collected from primary and secondary sources in order to assess the socio-economic changes and its impact on the quality of life of the population living in the adjoining area of the TSVHEP project, that stretches over three districts of Sikkim viz. North, East and South Sikkim, the sample design and methods used are as follows:

Sources of secondary date includes:

For locating the project sites and the settlements in the vicinity of the project and the control villages Topographical Maps (Survey of India) has been consulted.

For assessing the demographic composition, socio-economic condition of the population living within the vicinity of the project area, data has been collected from:

i) Published records; gazetteers; census report related to the topic.

ii) Reports from the offices of the Government of Sikkim (Department of Power, Health, Human resource, forest, Directorate of economics, statistics, census board etc.).

iii) Books, articles in journals and unpublished work related to the topic which has been duly acknowledged.

For selecting the settlements around the project
(i) The project sites are first located and marked with the help of topo-
sheets. Accordingly major settlement close to the project are identified
and marked, for field investigation. The three control villages one each
from the three districts over which the project passes are also marked,
which are located away from the project site.

(ii) The district/blocks were these field sites are located are identified in
order to collect the necessary secondary data.

Due to paucity of secondary data for the year 1999, when the project was
initiated the census data of 1991 has been referred to mark the socio-economic
conditions existing before the TSVHEP project came up here. 2001 census data has
been referred to assess the socio-economic conditions during the process of
implementation of the project and 2011 census data has been referred to assess the
prevailing socio-economic conditions after the completion of the project as this
project was commissioned in the year 2009 as secondary data was not available for
this particular year. In order to assess the socio-economic changes in the study area
in general and the selected sites of field investigation in particular, the following
variables with its indicators has been incorporated:

i. Demographic variable consisting of changes in size, growth, density, the age
   sex composition has been examined

ii. Social variable consists of changes in ethnic composition, religious composition,
    literacy and level of education of the population.

iii. Economic variable consists: of type and share of workers to the total population,
    agricultural density, livelihood opportunities, and size of land holdings etc.

iv) Access to basic amenities like housing, source of water including piped water
    supply, sanitation, medical facilities, schools, markets and connectivity networks
has been examined and compared to the conditions prevailing in the control villages in order to assess if the access to amenities are due to the project or other development programmes.

v) Field surveys has been carried out through -
   i) Focused Group Discussions (FGD).
   ii) Household survey through structured schedules.

The primary data has been collected at two levels, (i) Village and (ii) household level.

For household survey, Random sampling technique covering 449 household has been taken representing a sample size of 10 percent of the total household in each selected village and town.

Primary data has been generated through field investigation from five selected settlements which are located in the vicinity of TSVHEP project covering important sites of the project from the three districts, two project displaced settlements and three control villages, one each from the three districts, that is away and not under the direct influence of the TSVHEP project site has been selected for field investigation. Socio-economic changes and its impact on QOL of life for the sites selected close to the project has been compared with the socio-economic changes and QOL of the control villages in order to assess if the changes are due to the TSVHEP project or other development programmes operating here.

The relevant maps for this study has been prepared using GIS software such as Map info and Arc GIS.

An attempt has been made to compute deprivation index (Bhattacharjee and Wang, 2011) in regards to access to basic amenities in the selected sites close by the project which has been compared to the deprivation index score of the three control villages in order to assess if development process is inclusive for the population living
here. This has been further ranked as per their score to access the level of deprivation to basic amenities and services.

The formula for deprivation index (DI) for each field sites has been given as

\[
DI = \frac{\text{Max}(x_{jk}) - x_{jk}}{\text{Max}(x_{ik}) - \text{Min}(x_{jk})}
\]

Where,

\(X_{jk}\) = the percentage of households enjoying the \(k\)th facility in the \(j\)th village/town

\(k = 1, 2, 3, 4\) for the four basic necessities: Safe drinking water \((k = 1)\), Sanitary toilet facility \((k = 2)\), access to health facilities \((k = 3)\) and access to urban centres \((k = 4)\).

Further, \(\text{Max}(x_{...k})\) denotes the percentage of households in a given field sites which has the best coverage of the \(k\)th facility \((k = 1, 2, 3, 4)\) in the all the field sites and \(\text{min}(x_{...k})\) represent the percentage of households in the field sites that has the least coverage of the \(k\)th facility \((k = 1, 2, 3, 4)\) in the all the field sites.

For measuring QOL Index, individual households has been taken as the unit of measurement, as this study is empirical in nature, both facts and opinions of the respondents of the individual households generated through primary survey has been taken for computing the QOL Index. The methodology adopted in the present study to find the quality of life has been improvised as per objectives. Information on each subjective /opinion based indicators has been arranged on a scale ranging from 1-4 for each indicator where 4 represent the best positive response. Both objective and subjective indicators used for evaluating QOL Index represents the physical, social, economic dimensions of life of the people living here(All together 20 indicators has been selected for computing QOL index).
To measure quality of life index the following formula has been used

\[
\text{QOL INDEX} = \sum (P_{f1} + P_{f2} + \cdots + P_{fn}) + \left( P_{o1} + P_{o2} + \cdots + P_{on} \right) \times \frac{Si}{Ni}
\]

(After, Choudary, 2006)

Where,

- Pf1 = Percentage of household scoring particular score in factual indicators
- Po1 = Percentage of household scoring a particular score in opinion based indicators
- Si = Individual score of each factual or opinion based indicators
- Ni = Total maximum possible score in the ith category

ORGANIZATION OF CHAPTER

The thesis has been organised under six chapters. Chapter I introduces the research problem and highlights on survey of literature, choice of the study area the main objectives of the research, research queries, data source and methodology adopted and concludes with the research design.

Chapter II- Deals with the geographical background of the study area where the physical and socio-economic characteristics of the study area are discussed.

Chapter III deals with the demographic and socio economic attributes of the three districts and the selected settlements in the vicinity of the TSVHEP project before the implementation of this project, which has been compared to the socio-economic condition prevailing then in the three control villages.
Chapter IV deals with the demographic and socio-economic changes after the implementation of the TSVHEP in the three districts and the selected settlements located close to the TSVHEP project and this has been compared with the changes experienced in the three control villages.

Chapter V deals with impact of TSVHEP on Quality of Life- where the spatial variation in the impact of TSVHEP on the Quality of life between the population living in the vicinity of the project site and the control villages are discussed, measured and analysed. Consequently, it highlights not only on the socio-economic changes brought by TSVHEP Project on the basis of primary data, but also highlights on access to basic amenities and measures the deprivation level through deprivation index in order to assess whether development is inclusive or not. Further, an attempt is made to measure the quality of life of the people in the selected sites in the vicinity of the project which is compared to the quality of life in the control villages so as to examine whether this project has brought about the socio-economic changes, or is it due to other development activities impacting the quality of life.

Chapter VI summarizes the findings of the study and concludes the thesis.

**Major findings**

The demographic and socio economic changes before and after the completion of the TSVHEP project based on secondary data has been assessed with the help of suitable indicators.

Before the implementation of the project Tangyek village located in the vicinity of the TSVHEP project had a population size of 357 (1991census) which reported a decadal growth rate of 111 Percent by 2001 census i.e. During the implementation of the project in comparison to the control village of Lingthem, which reported a decadal population growth rate of only 28 percent during this period. This
is suggestive of the fact that large number of migrant workers came to Tangyek to work in the project. However, after the completion of the project in 2008 most of the migrant workers have moved out from Tangyek as the decadal population growth rate here is in the negative (-9 Percent) indicating that out migration is occurring here.

In east district Patuk which is located besides the river Teesta has the decadal population growth rate of 29 percent during the time of construction of the project which increased to 37 percent in the next decade marking the completion of the project. Sherwani village where the power plant is located reports the decadal growth rate of 6 percent at the time of implementation of TSVHEP Project, which further increased to 54 percent in the next decade marking the completion of the project, this suggests that this village became more populous after the completion of project. However, during field investigation it has been also observed that Sherwani village being located in the periphery of Singtam town is slowly developing urban characteristics. Whereas control village of Martam in East Sikkim has decadal growth rate of only 5 percent during the decade when the project came up, and in the next decade marking the completion of the project the decadal growth rate of population was as high as 47 Percent (this higher growth rate here may be attributed to Martam’s location in the outskirt of Gangtok the state capital and due to lack of space in Gangtok proper the urban growth in the periphery, where Martam village is located).

In South District, Doring village where the project colony is located reported 28 percent decadal growth rate of the population during the process of construction of the project, which increased substantially to 88 percent in the next decade marking the completion of the project, suggesting project staff of TSVHEP project has been accommodated here as the TYSVHEP project colony and office is located here. Contrary to this, the control village of Temi in South district experienced higher
decadal growth rate during the decade when the project was being constructed. In the next decade marking the completion of the project Temi experienced fall in population growth rate, thus this confirms that the gain in population of Doring village marking the completion of the project is mainly due to settling of the project officials here along with natural growth rate.

Two rehabilitated sites Samdong and Khamdong both located in East district has reported very high decadal growth rate of population in during the implementation of the project which is attributed to the fact that most of the project displaced population were settled in this two village. But by 2011 census marking the completion of the project both the villages report negative population growth rate suggesting out-migration (this could be because people settled in this area at the time of implementation and out-migrated due to less socio-economic facilities).

As regards sex ratio it is observed that in Tangyek village (North district) the sex ratio has marginally increased from 869 females/1000 males to 885 females/1000 males during the implementation of the project, this has further increased to 922/1000 males after the completion of the project. Lingthem, the control village has better sex ratio compared to Tangyek before, during and after the completion of the project. The reason for this change in sex ratio needs further investigation.

In Sherwani and Patuk villages of East district sex ratio has fallen during the decade when the TSVHEP project was constructed, whereas an upward trend in sex ratio can be observed in most of the other field sites located in East district. In Martam the control village the sex ratio has is similar to the sites located in the vicinity of the project therefore it can be stated that TSVHEP project has marginal impact on the sex ratio of the population living in the field sites located near the
project. Sex ratio in the South district as whole along with Doring village and the control village of Temi reports a better sex ratio above 930 in each case when compared to East and North district.

As regards to the density of population it is observed that North district having high altitude with steep Himalayan ridges are not much habitable and records the lowest density of population before, during and after the completion of the TSVHEP project. It is interesting to note that before the implementation of the project (1991 census), density of population in Tangyek village was as low as 79 persons per square kilometres. This got more than doubled in the next decade (2001) marking the construction of the project i.e. 168 persons per square kilometres as against the control village of Lingthem whose density increased from 95 to 121 persons per square kilometres (from 1991 census to 2001 census). This is suggestive of the fact that in-migration of population took place during the construction period of the project in Tangyek village. But in the next decade (2011 census year) marking the completion of the project Tangyek village experienced negative change in density of population ( -10 %) This suggests out- migration of population signifying that economic opportunities here are limited. It was only during the construction of the dam that the village experienced rise in density of population. This may be attributed to the fact that with development, aspiration level of the population especially the youth here is high which cannot be met here in this small village, consequently even the local youth here are migrating out, thus the economic opportunities brought about by the TSVHEP project here was temporal in nature and not sustainable in the long run.

The density of population in East district has increased slightly before and after the completion of the TSVHEP project in fact East District always recorded the
highest density in the state, which may be attributed to the fact that Gangtok the capital city of the state is located here. Sherwani where the Power Plant is located, density of population increased slightly between 1991 and 2001. But in the next decade (2011), density of population/sq.kms increased considerably by 54 persons per sq. kms. Marking the completion of the project. This may be attributed to the fact that the power plant is located here where various skilled and semi-skilled labour force are employed. Singtam town had extremely high population density of more than 21 thousand persons per square kilometres in the decade before the implementation of TSVHEP project which has increased to around thirty thousand persons per square kilometres during the implementation of the project indicating a rise of 40 percent. The density of population has further increased to around 32 thousand persons/sq.km in 2011 that is the decade when the project was completed. In the two resettlement village located in East district, viz. Khamdong and Samdong, the geographical density of population has increased substantially from 225 and 257 persons per sq.kms respectively to 644 and 449 persons per sq. kms respectively between 1991 and 2001 as the project affected population have been resettled here. But after the completion of the project in 2009 the density of population is decreasing, suggesting outmigration due to lack of socio-economic opportunities.

As geographical density is in continuous rise in Martam village, it has been observed from field investigation, that this village located at a close distance to the capital town of Gangtok, is growing fast as a peripheral residential area of Gangtok town, due to space constrains in the capital city more people are building their residences here.

Secondary data suggests that TSVHEP project is impacting the geographical density of Doring village where the offices and the colony of the project are located.
Here people are migrating in, adding to the density of population which has increased from 296 persons per sq.kms (1991) to 380 persons/sq.kms (2001) to 714 persons per sq.kms (2011) against the control village of Temi which has a different scenario of only 14 percent change in density from initiation of the project to the period after the completion of the project.

From the field investigation, it has been found that Tangyek village (North) has the more than a quarter of its population as children adolescent (37%) and about 8 percent as old population, while the working population is only 55 percent, consequently the dependency ratio is 0.8. Lingthem the control village in North district presents a similar picture.

Patuk (East district) has high children and adolescent population (38%) while Sherwani has the highest number of population in the working age group of 16 to 59 years (84%) this indicates that the working age group of population is high here as the power plant is located here, where besides jobs in the power plant other economic opportunities are emerging here. The control village of Martam has also dominance of working age group (68%) but it is lower than Sherwani village. The only urban centre here, Singtam has 70 percent share of working age population while the two resettlement sites here also have higher proportion of working age group. Doring village (South district) has higher proportion of working age group population (62%). The control village Temi presents a similar picture with 67% of the total population belonging to the working age group which can be attributed to the presence of a Tea garden here which is labour intensive. Consequently it can be stated that the TSVHEP project is not having any direct impact on age composition of the surveyed population in the selected settlements except Sherwani village where the power plant is located.
In state of Sikkim, Schedule tribes population has decreased from 22.36 percent in 1991 to 20.6 percent in 2001 but it has increased substantially to 33.8 percent by the next census of 2011 (this is due to addition of Subba and Tamang communities under STs category of population by the amendment act of the Indian constitution). North Sikkim has the highest concentration of Schedule Tribe population. From the field investigation it has been found that maximum households from the North district are belonging to Lepcha community both in Tangyek village located close to the TSVHEP project and the control village of Lingthem. The sites surveyed in East district and South district are mixed settlements having dominance of Nepali and Bhutia speaking communities.

Literacy rate has increased in all parts of the study area (Doring has shown the best results). In most of the control villages the literacy rates has shown a steady increase which is similar to the sites selected near the TSVHEP project. The two rehabilitated villages i.e. Samdong and Khamdong have also shown positive results in literacy rate. This is suggestive of the fact that literacy rate has improved in the study area irrespective of the TSVHEP project and can be attributed to the various literacy related programmes introduced by the government. However, on field investigation it has been observed that one Kendriya Vidyalaya (Senior Secondary) came up in the area near the project plant at Sherwani. A lot of private schools have mushroomed in Singtam town especially after the implementation of the project which has opened avenues for education at the primary and nursery levels for the children as well as provided small job opportunities for the local youths. Further secondary data suggests said that Higher educational institution like colleges and technical institutions are absent in all the selected field sites including the only town of Singtam.
From field investigation it has been found that literacy and educational status of the family member of controlled villages is slightly better than the field sites located in the vicinity of the project. It suggests that TSVHEP project has not played any significant role in educational attainment of the people living within its vicinity.

Proportion of agricultural fallow and amount of agricultural land has increased in the study area, while forest area has decreased during the implementation of the project. There is decrease in the proportion of cultivators after the completion of project in spite of the fact that the area under agricultural land has increased in the project area by about 19 sq.km. This suggests that with the coming up of the project here some people have become marginalized agricultural labourers.

Field investigation suggests that higher number of households own farm land in each control villages than the sites located in the vicinity of the project suggesting that the TSVHEP project has adversely impacted the local population creating landlessness for the population living within its vicinity.

It has been found during the field investigation that almost all families rear livestock which consists mainly of cow, yak, sheep and goat along with piggery and poultry in order to sustain themselves and sell a small surplus helping in increase of their family income and nutrition level. Field data suggests that the households located near the project site owns less number of livestock especially cow, sheep, goat and yak in comparison to the three control villages.

Field investigation suggests that agriculture is the most dominant source of income in almost all the field sites area except Singtam town, where business is the main source of income. It is interesting to note that 27 percent of the households in Tangyek village derive their main income from jobs and other related economic
activities associated with the TSVHEP project. Similarly, in Sherwani village little less than a quarter of the surveyed households (23%) reports that their main source of income is from the project or other related economic activities. In Doring village only 8 percent of the local surveyed households report that their main source of income is from the project or project related economic activities. (It must be mentioned here that the Project colony is located here which was not under the purview of the survey as here all the households derive their income from the Project). In the resettlement villages Khamdong and Samdong 11 percent and 18 percent of the households respectively derive their main income from the project or project related economic activities. Consequently. It can be ascertained that this project has helped in providing livelihood and employment opportunities to a section of the local population living within its vicinity thereby improving their individual household income. In the three control villages of Lingthem, Martam and Temi none are deriving their major income from the project.

Field investigation suggests, Tangyek village and the control village of Lingthem in the North District are old villages as the respondents from surveyed households are residing here for more than 20 years. Sherwani village where the power plant is located has 76 percent of households who settled here in recent time (less than 20 years). The town of Singtam has also high proportion of respondents (23 %) living in the present dwelling for less than five years. Khamdong village (rehabilitated site) has 56 percent of households living for more than 20 years. It is interesting to note that in Khamdong the re-settlers prefer to stay away from the land/house provided by the project officials/government because of severe water crisis and security reasons. Thus, the project has negatively impacted mainly the project displaced population here as
they have not only lost their ancestral land, house and village but at present suffer from security threat as well as face water crises in their new place of residence.

As per the building material of the settlements of surveyed households which is suggestive of the economic conditions of the households, field data suggests that in the North district, the control village of Lingthem and Tangyek village located close by the project have similar building material, suggesting similar economic condition of the respondents living in the vicinity of the dam and in the control village, consequently it can be ascertained that project has had negligible impact on the economic conditions of the local population. In East District, Sherwani village followed by Singtam town has high proportion of the respondents (53% and 48% respectively) living in RCC structured houses suggesting better economic condition. In Sherwani and Singtam, RCC houses are coming in large numbers as it helps in the generation of income through rent. In the control village Martam also has higher percentage share of respondents (94%) living in Pucca (with tin roof) and RCC houses suggesting that the project has had negligible impact on the economic condition of the people living in its vicinity, except in Sherwani village and Singtam town.

Number of rooms of the individual households which is an essential indicator for determining the economic status of the surveyed households, field data suggests that in East and South districts the respondents are living in larger houses in the vicinity of the project in comparison to the control villages, thus some people living close by the project prefers to stay in spacious houses either due to their specific culture and terrain characteristics or due to better purchasing power they can afford to stay in spacious houses in comparison to the control villages.
Health care services are in the rise during the construction of the project, in the selected field sites located close by the project. Singtam town has the maximum number of health centers as it is the only urban settlement in the vicinity of the project. Primary Health Centre or Primary Health Sub Centre are available in each field site. TSVHEP project has not helped much in the development of health infrastructure. However, during field investigation it has been noted that in Khamdong village a dispensary has been established by NHPC. Here the TSVHEP project officials organise either annually or bi-annually health camps where the local population from the nearby settlement can come to take free medical check-up and aids.

There is not much change in the domestic water supply. In almost all the field sites piped water supply exists where the local spring sources are being tapped. It has been noticed from the field investigation that treatment of water has been initiated by the government in few villages and town in the study area but the selected field investigation sites, treatment of water is absent. Majority of the respondents of the surveyed households especially from East and South districts living near the project sites, are of the opinion that quantity of water has deteriorated with the completion of the project as water has become scarce commodity especially in the dry seasons due to drying up of some of the spring sources. In the case of resettled villages more than 65 percent of the respondents are of the opinion that some spring sources have dried up here, with coming up of the project resulting to water scarcity. Contrasting to this viewpoint in the three control villages most of respondents do not face any water shortage throughout the year. Thus, in the name of development the population living close to the project faces water shortage consequently one of their basic need i.e. water has been reduced.
Secondary data suggests not much improvement in regards to the transportation linkages while field investigation suggests that number of private cars, and frequency of commercial vehicles have improved both in the sites located by the project as well as the control villages suggesting that increase in transportation is irrespective of the TSVHEP project.

Field data suggests that accessibility to sanitary toilet has recently come up in a big way here. The State government is also contributing for the construction of sanitary toilets in the villages and towns. With regard to the construction of the toilets no initiative has come from the project officials. It has been found from the field investigation that sanitary toilets are either located inside or outside the house.

The town of Singtam has further developed after the completion of the project as it caters to the need of the people working in this project. Sherwani and Tangyek villages are changing and a market has come up in Tangyek village while Sherwani located close to Singtam town is developing urban characteristics. TSVHEP project has helped in developing the linkage to markets for the population living within its vicinity thereby improving the economy at the micro/local level.

It has been observed from field investigation that respondents are of the opinion that irrigation to their farmland has deteriorated after the implementation of the project. All the sites located in the vicinity of the project (except Tangyek) have significant section of respondents stating that the irrigation has deteriorated significantly with coming up of the project.

Maximum respondents (more than 70%) from the field sites located in the vicinity of TSVHEP from all the three district of Sikkim are of the opinion that the quality of land has either deteriorated slightly or significantly after the coming up of the project.

It has been found out from focus group discussion during the field investigation that
land has been degraded during the process of construction of the project mainly due to muck deposition. Further from focus group discussion it has been noted that the dust produced during the construction has led to the decline in cultivation of cash crop in the field sites located in the vicinity of the project. Cardamom production has fallen drastically.

Maximum (above 80%) respondents living near the project sites as compared to the three control villages, are of the opinion that health conditions has deteriorated during the construction of project. It has been noted that number of asthma and other types of diseases creating breathing distress are on the rise. Around 60-70 percent of the respondents are of the opinion that the rise in lung diseases including asthma are related to the dust being generated during the construction and blasting activities.

In sites located in the vicinity of the project maximum (more than 50% each) respondents are of the opinion that women and children are safe in their respective villages and town. This figure was high in Tangyek (69%) in North District and Patuk (58%) in East district. While 25 percent of the respondents from Sherwani (location of power plant) and Singtam town felt that women and children are not safe especially at night in their respective settlements as crimes against women and children are being reported with the coming up of the project here. It can be concluded that TSVHEP project is slowly changing the social scenario of the area where slowly crime rates are also increasing especially in Sherwani village where the power station is located and Singtam town, but this needs further research.

It has been observed from the field investigation that 22 percentage of the respondents in Singtam town followed by Sherwani (19%) feel that petty crimes like theft, molestation, eve teasing, robbery etc. are on the rise as compared to the control villages of three district which is insignificant (8 percent of the respondent).
With coming up of the TSVHEP project, field data suggests that, in Tangyek 97 percent of the respondents followed by Sherwani village where 95 percent of the respondents are of the opinion that drinking joints has increased significantly in their respective villages. A significant proportion of respondents from the resettled villages are also of the same opinion that drinking joints have increased in their respective villages which may be attributed to better purchasing power among the local population as they find better employment opportunities within the project, or have more livelihood practices closely associated with the project e.g. tea vendors, food stalls etc. which increases their income at the individual household level and some of them have surplus income to be wasted on drinks etc. Consequently it can be concluded that after coming up of the TSVHEP project, drinking joints are on the rise in some of the surveyed settlements located close to the project. And resettled sites in comparison to the control villages which are also showing a rising trend in drinking joints.

It has been observed that in Tangyek village (North district) maximum share (70%) of the respondents believe in nature worship and their rituals are connected with the surrounding rivers and mountains, they are of the opinion that TSVHEP project has restricted their rituals and traditional cultural practices both during sowing and harvesting seasons, as the river Teesta has been modified into a drain or even disappeared in a stretch of 17 km in the name of development. River Teesta is an integral part of Lepcha rituals and religious practices, which has been taken away from the Lepchas, consequently the elite section of the Lepcha community are resenting the mega dam construction in North district related to TSVHEP project as well as other similar projects resulting to their cultural erosion, this in turn has made them unite together along with a section of the civil society under Active Citizen of
Teesta (ACT). This organization is spearheading the movement against such hydro-power development projects here including TSVHEP project which has already been commissioned.

As per the opinion of the respondents towards river Teesta 18 percent of the respondents from Tangyek village in North district and 39 percent of respondents from Sherwani village in the East district are of the view that the river Teesta is an important source of livelihood which supports both fishing and quarrying activities. 41 percent of the respondents (mainly Lepcha community) in Tangyek village are of the view that river Teesta is of great religious significance for their community and regards this river as the holy river where much of their rituals are being practiced, consequently their cultural identity is closely related to this river. Majority of the respondents from the control village of Lingthem (North district) also are of the opinion that river Teesta is associated with their religious practices and their cultural identity is closely associated with this river. Consequently taming of river Teesta and tunnelling it for generation of hydro power has not gone well with a section of the local population.

In Tangyek village 46 percent of the respondents are of the view that quality of life has improved with the completion of the project. In Singtam town, 44 percent of the respondents are of the same view. However, in Sherwani village where the power station is located 26 percent of the respondents are of the view that quality of life has deteriorated in the last 20 years. In the resettled villages of Samdong and Khamdong 24 percent and 36 percent of the respondents states that their quality of life has deteriorated in the last two decades.

The Deprivation index score suggests that Tangyek village located near the dam in North district is least deprived of the basic facilities where maximum households
enjoy the basic amenities as deprivation score of this village is 0.1575 (least score within a scale of 0-1). While Patuk village, located in the East district is the most deprived village in regards to access to basic amenities as the deprivation index score here is maximum - 0.6375 suggesting access to amenities are restricted to few households only. It is interesting to note that except Patuk and Doring villages rest of the sites located near the project has lower deprivation Index score when compared to the three control villages, this is suggestive of the fact that the development here has been more inclusive.

It is interesting to note that QOL in the control villages is slightly better in comparison to the sites located near the project with the only exception of Singtam town which has the highest QOL Index score in East district, this can be attributed to the fact that this urban centre has better socio-economic development in comparison to the other sites located here which are mainly villages, hence the QOL index score of Singtam is irrespective of the project.

**Conclusion**

To conclude, it is observed that the TSVHEP project has basically benefited the state of Sikkim as a whole as it earns good revenue (12% of the total electricity produced) from it, but contrary to this the local people living in the vicinity of the project has not benefitted much. Both secondary data and primary findings suggests that the demographic and socio-economic changes undergoing here are credited to other developmental activities rather than the project since the pattern of change in selected settlements located in the adjoining areas of TSVHEP project is similar to that of the control villages of the three districts located away from the project site.
Setting up of Kendriya Vidyalaya in Sherwani village by NHPC is remarkable project induced benefit in the field of educational infrastructure as local children from the surrounding area can avail the opportunity. In regards to access to health infrastructure the TSVHEP project has led to the setting up of a dispensary in Khamdong (Resettlement site) and organizing medical camps yearly or bi-yearly by the NHPC doctors and staff. With lieu to the development of transportation infrastructure, project has not directly played a major role however, the plying of number of commercial vehicles has been witnessed within the vicinity as well as the control villages irrespective of the project. Economic upliftment had been one of the major target aspired by the state government and NHPC, however, this has been achieved to some extent as some local population got their jobs in this project while indirect income has been improved from economic activities associated with project.

On the other hand there is a relative increase in drinking joints, crime rate etc. which shows that project has not been able to fulfill its aim of enhancement of social development since, crime and insecurity has emerged with the completion of the TSVHEP project here. Dissatisfaction has been noted while countering the rehabilitated population with regard to the rehabilitation and the compensation policies of the NHPC. As observed from the field, this project has also not kept its promise of providing free electricity within the radius of 5 km till date.

Accordingly, it can be concluded that TSVHEP project initiated by the National Hydro-power Corporation under the aegis of the state government of Sikkim with a rationale to bring about development of not only infrastructure (as associated with hydro-power project) but also of the people living here, targeting the much needed socio-economic development for the population residing especially in the adjoining areas of TSVHEP project, thereby ushering in a better QOL for the people
here has yet to realize its objectives. Both secondary and primary data suggests that development associated with this project is yet to translate at the local grass-root level bringing about inclusive development as suggested by the deprivation index score. The selected settlements (except Patuk) in East district have benefited more from the project in comparison to the selected villages of North and South districts as indicated by the QOL index score. Both primary and secondary data suggests that development associated with this project is yet to translate to local grass-root levels bringing about inclusive development which has been further suggested by the deprivation and QOL index score values.