

HEALTH AND ENVIRONMENT IMPACT ASSESSMENT: A SOCIOLOGICAL ANALYSIS OF DAM AFFECTED PEOPLE IN RAVI BASIN

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Abstract

Development is important for the upward movement of society. Hydroelectric Power Development is imperative to fulfill needs of human survival. For the last more than 50 years Hydropower generation in Himachal catering various needs and remains pivotal in transforming lives in adjoining states also specifically and whole country in general. But such developments are not free of cost and cost of such projects are being worn by the local people who are living in the vicinity of such developmental projects.

This paper is an attempt to document health and environmental benefits and cost worn by the native of NHPC owned Chamera-I power project. 143-meter-high Dam has created 29km long reservoir and affect 55 villages on both sides, having considerable impact on health and environment in the region. This impact has been assessed by using exploratory research method, collecting primary data from more than 100 respondents and by applying suitable statistical tools conclusion have been drawn.

Every developmental project has impact on the environment. And with 29 Km long reservoir of Chamera-I, the impact is significant. Large amount of land has submerged into water destroying Flora and dislocating Fauna. Before the installation of power project people use to take grass for the livestock from forest but now it is impossible. After the construction of Dam, the water has stagnated due to which there is rise in water born diseases. The number of mosquitoes has increased leading to malaria and other diseases. Garbage from up stream of the project gathered in and around reservoir and create smell. Silt in the reservoir creates difficulties for movement of aquatic life.

Keywords: Environment, Health, Hydroelectric Power Project, Flora and Fauna



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Introduction

Water is a critical resource for human survival, economic development and ecological balance in nature. Hardly any other natural resource affects so many areas of human life; its scarcity affects everything—from health to environment, human rights to economy, poverty to prosperity, culture to politics and from conflict to war. Water can mean the difference between life and death, as every living being is made from water. Water gained more importance when it used for generation of electricity, which is being used at every walk of life in today's modern world. This electricity generation is not free of complications; it has large affect on the interactive relationship between living organism and environment. The prime aim of this chapter is to explore this relationship at micro level in the commissioned power projects in Ravi basin.

Man has a basic right to live in that environment in which he can lead a peaceful life with discipline, which stressed to consume and preserve the natural resources by making effective planning in respect of air, water, land, vegetative cover and natural system in such a way so that it may sustain for the present and preserve for the future generations. In search of enhancement of quality of life, man is destroying the life-supporting web in the name of development willingly or unwillingly. Development, particular hydro- electric development has disturbed man, land, water and ecology to a greater extend. By ecology in this chapter the researcher means, interactive relationship between man, land, water, flora and fauna. This chapter primarily aims to understand and analyze one of the basic questions i.e. what is the impact of installation of power projects on ecology and on the physical environment of the villages falling in the vicinity of the power projects situated in the Ravi basin.

In order to see the effects, villages affected in the vicinity of Chamera-I power project spreading over 29 kilometres. Villages named *Chohra, Rajnagar, Palie, Chakloo, Thari, Bhanota, Tipri* have been selected for intensive study. The variables concentrated on interactive relationship between living things and environment particularly focused on general environmental conditions of the area, area/land submerged in the reservoir, forest cover, responsibility of disappearance of forest cover, effect on greenery, effect on natural source of water, status of barren land and wild animals in the area, problem and intensity of soil erosion, future of land, environmental and ecological problems, road and transportation, air pollution etc. In this _____

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chapter, data on above said variables have been collected, codified and then described the factual situation as narrated by the respondents in the study area.

Hydro Power Development in Himachal Pradesh

Himachal Pradesh is one of the ten States that makes up the Indian Himalayan Region (IHR). Himachal Pradesh, located in Northern India, share its border with Jammu and Kashmir in North, Punjab in West and South West, Uttar Pradesh in the South East, Tibet in the East, and Haryana in the South and is located between 30° 22'4" – 33° 12'40" North latitude, 75°47'55" – 79°04'22" East latitude. Although a relatively small state within the Indian Union, it manifests wide ranges in altitude, climate and geology. The altitudes ranges from 350 m to 6975 m above mean sea level the area is 55673 Sq. Kms and can be divided into three broad

zones: The Outer Himalayas or Shiwalik foothills, the inner Himalayas or mid- mountain zone and the greater Himalayas or alpine zone.

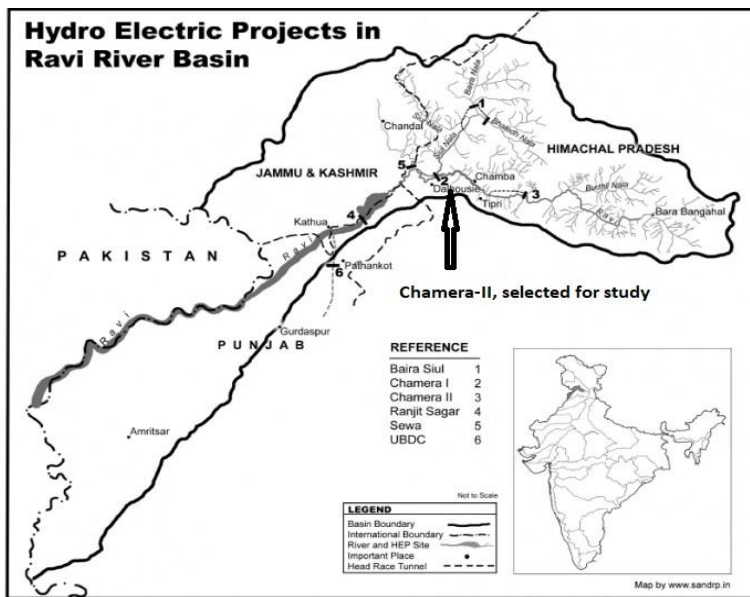
The first hydropower in Himachal Pradesh is in Chamba named as *Bhuri Singh power plant* was built in May 1904. Himachal Pradesh is extremely rich in it's water resources having five perennial rivers and thousands of rivulets. The state is having about twenty-five percent of the national potential in this aspect. It has been estimated that about 27,436 MW of hydel power can be generated in the state by the construction of various hydel projects on the five perennial river basins no matter they are major, medium or small. Out of total hydel potential of the state, 8,418MW is harnessed so far, out of which only 7.6% is under the control of Himachal Pradesh Government while the rest being exploited by the Central Government. Following is the description of status of hydropower generation in state:

Table Showing Hydro-electric Projects in Different Stages in Himachal Pradesh

Sr. No.	Name of Executing Agency	Name of Power Project (s)	Generation Capacity (MW)	Sub-Total (MW)
1.	BBMB (Bhakra-Beas Management Board)	Bhakra Project	1200.00	2550.00
		Beas Satluj Link (Slaper project)	0990.00	
		Pong Dam	0360.00	
2.	PSEB	Shanan	0110.00	110.00
3.	NHPC (National Hydro-electric Power Corporation Ltd)	Baira Siul	190.00	1261.00
		Chamera-I*	540.00	
		Chamera-II	300.00	
		Chamera-III (to be completed very soon)	231.00	
4.	UPSEB	Yamuna Project	237.37	237.37
5.	HPSEB	Giri	060.00	324.01
		Bassi	060.00	
		Sanjay Vidyut Jal Pariyojna	120.00	
		Ganvi	022.50	
		Andhra	016.09	
		Thirot	004.50	
		Binwa	006.00	
		Holi Hydel Project	003.00	
		Killar	000.30	
		Baner	012.00	
		Gaj	010.50	

		Mini/micro HEP (12 No.)	009.12	
6.	SJVNL (Satluj Jal Vikas Nigam Ltd.)	Nathpa Jhakri H.E. Project	1500.00	1500.00
7.	JHPL	Baspa Stage-II	0300.00	0300.00
	Total		6282.38	6282.38
Projects Under Construction				
1.	HPSEB	Bhabha Aug. P/H	0009.00	2792.00
2.	HPSEB	Khauli	0003.00	
3.	HPSEB	Uhl Stage-II	0010.00	
4.	Harza, USA	Dhamwari Sunda Project	0070.00	
5.	NTPC	Kol Dam	0800.00	
6.	NHPC	Parbati	1900.00	
		Total	2792.00	
		Grand total		9074.38

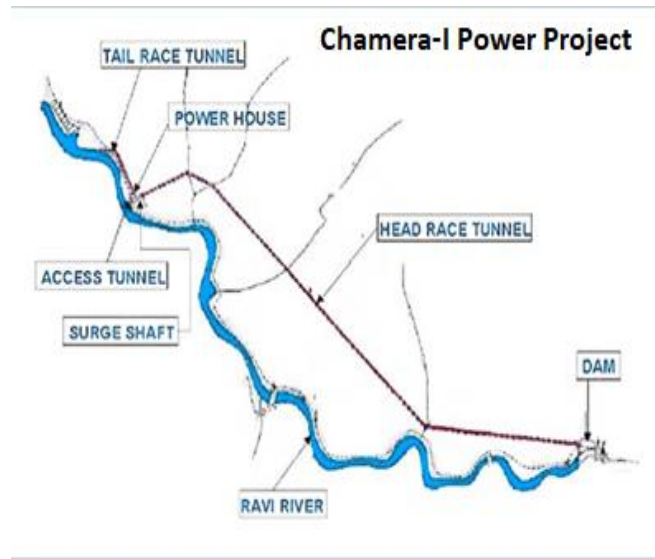
*taken for study



Whole power potential can be divided in two major categories i.e. large or major power projects which are also known as multipurpose projects are there in form of Bhakhra dam and Pong dam in the state since 1960s. And the second category is of small power projects, which gained more importance after sixth five years plan when state plan to be the power state.

Chamera-I Hydroelectric Power Project:

Chamera-I Power Station of 540 (3 x 180 MW) is a pondage scheme situated on river Ravi located in Chamba district of Himachal Pradesh. The project comprises of a 121 m high, 295 m long concrete arch gravity dam with 9.5 m dia., 6.414 Km long head race tunnel. The underground power house with installed capacity of 540 MW houses 3 units of 180 MW capacity each designed to operate under the net



rated head of 185 m and designed to generate 1664.56 million units in a 90% dependable year with 95% machine availability.

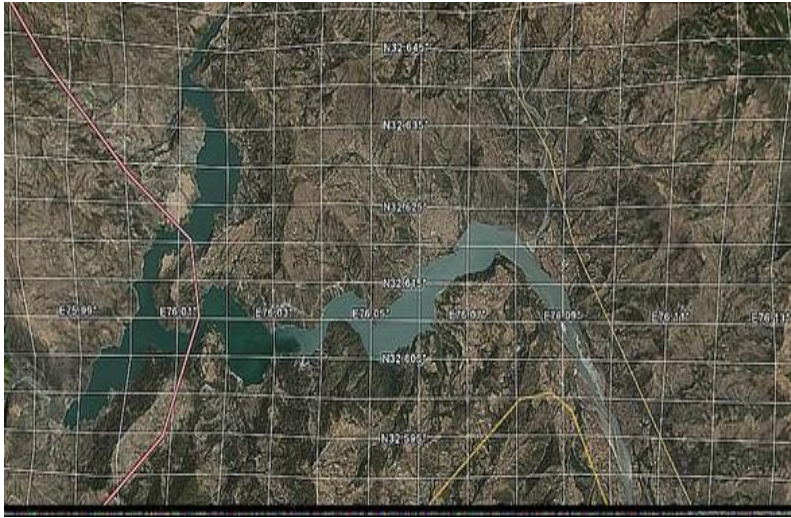
All the three generating units of the power station were commissioned in the month of April-1994. The beneficiary states/UTs of this power station are Uttarakhand, UP, Delhi, HP, Haryana, J&K, Punjab, Rajasthan and Chandigarh. With the construction of the project, the area has also been benefitted by development of infrastructure, education, medical facilities and employment avenues (www.nhpc.com).

This project has created 29 km reservoir and affected the lives of thousands of people living on left and right sides of the reservoir. Some of the people (1554 families) officially have been displaced and reside out the area somewhere in other parts of the district or state who called as PAFs but still today some people (not counted by neither Govt. nor by NHPC) are living the vicinity of this reservoir and facing all sorts of deprivations and they are compelled to live till their last breath or unless they got economic mobility, only then they can leave and move from their original places of residences.

Research Methodology

To collect the data stratified random sampling has been used with non-participatory observation. More preference was given to people who are above 60 years of age.

Study Area and Sample



Study area includes villages along the Chamera-I Hydroelectric Dam in the Chamba Tehsil of Himachal Pradesh. 8 villages have been selected i.e. Tipri, Bhanota, Chhamui, Kiani, Rajnagar, Thari, Chakloo and Palei. As shown in the figure villages of both sides

have been taken for study. From 8 villages, 113 respondents were considered by using probability sampling method. All social and economic segments got proper representation in the study.

Result and Discussions

Deprivations Received Because of Chamera-I

The deprivations received by the displaced as well as the people who are living in the vicinity of the reservoir has received a considerable amount of trauma after the installation of this project. People, whose land has been acquired by the executing agency way back in 1990s, are still waiting for the compensation. The impact on the local people can be divided in two broad categories; one, project affects people, who have got displaced and got compensation, jobs in National Hydro-electric Power Corporation Pvt. Ltd. (NHPC) and resettled somewhere in the part of the district or state. The second category is of those who have not affected as per the revenue/policy document and can be called as Not Project Affected People. But in real sense, they are the people who are facing ill-effects of this developmental activity and at present, they are dying every moment, every hour and every day and their concerns have never listened and never answered.

However, the first category has also received a considerable amount of impact on their socio-cultural milieu but the second category affected comparatively more than the first category. Mental health is most important health parameter. Only with good mental health one can enjoy each and every aspect of life. People who are living in the vicinity of the dam faces considerable amount of trauma. There is fear of living near the reservoir and also fear of cattle and children drowning in the water. Infact some cattle and humans have drowned in

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water. Alongwith these, the study area also becoming dumping sites for the Chamba town, because whatever garbage is thrown in the river is rested nearby the villages and accumulates along lower river basin due to stagnated water and stink foul. There is also threat of rise in water level during rainy season. Water level reach near the houses and water born water creatures like; snake, snail, dead fishes and other.

Data collected from 113 respondents from the villages situated in the vicinity of Chamera-I power project by using semi-structured interview schedule and simple random sampling method to select the respondents from upstream of the dam. The collected data tabulated and interpreted as follows to drive the conclusion:

Table Showing Change in Floral Diversity due to HEP

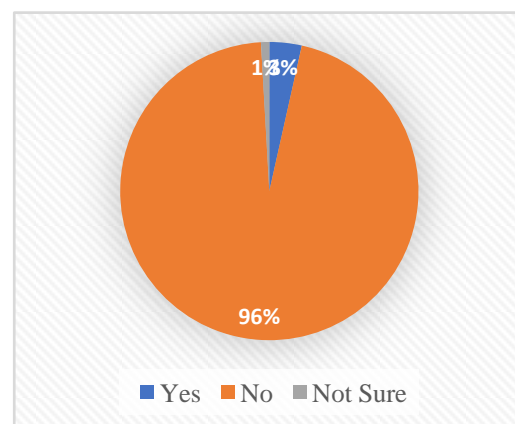
Change in Flora	No. of Responses	Percentage
Yes	113	100.0
No	000	000.0
Not Sure	000	000.0
Total	113	100

Study area is very diverse in flora. Typical mountainous trees like deodar, pine, sal etc were present there. These trees were of great importance to the native people because they provide them firewood and timber. These forests also provide shelter to various animals and birds. But for the installation of project these trees were needed to be cut. As a result of which a very diverse flora diversity was lost. Now people don't have place to get firewood and other forest things.

Every respondent was of the view that power project has changed the flora diversity in the area. The change here is negative. Respondents said that all trees which use to grow on the banks of river ravi are now gone and forest resources also. Not a single respondent was there who has not witnessed this negative change.

Table Showing Change in Faunal diversity due to HEP

Change in Fauna	No. of Responses	Percentage
Yes	004	03.5
No	108	95.6
Not Sure	001	00.9
Total	113	100



The faunal diversity was very less in the study area. The area had bear, jackal etc. There was a threat to people from bear. But with the cutting of trees due to dam, there are no animals left in the area. Only domestic animals can be seen in the area. People are somewhat happy with this situation because there is no threat of bear now. From marine point of view there were only fishes which are used for eating nothing else.

95.6% of respondents were of the view that there is no change in the fauna diversity due to power project. The only change is that the bear is not present in the area. Except bear, all other species are living in the area. Only 3.5% of respondents said that there is a change in the fauna diversity due to power project and 0.9% of respondents was not sure about the change.

Table Showing Improvement in Health Services due to Hydro Power Project Developer

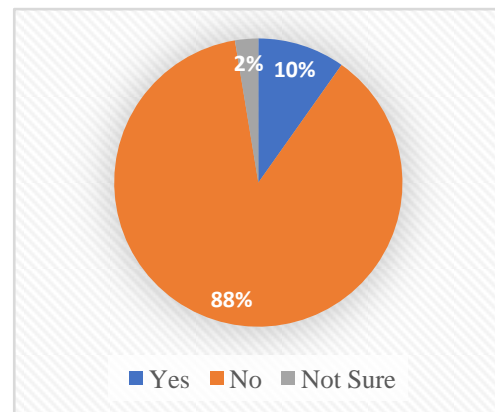
Improvement in Health	No. of Responses	Percentage
Yes	000	000.0
No	113	100.0
Not Sure	000	000.0
Total	113	100.0

Health services comes in the basic facilities which should be provided to the citizens. As the scope of the study was confined to the people living in the vicinity of dam, and that area lies much far away from main road. The health facilities there were not so good. Main centres of population has a Primary Health Centre. In most of places ambulance cannot reach the house. In Palei village people use boat to take patients to Lachori Health centre on the opposite side of river.

Every respondent has said that Chamera-I has not contributed in the improvement of health services in the area. Every health facility available is given by government not by NHPC. People were facing many difficulties in getting health services. Not a single respondent said that NHPC has contributed in the improvement of health services in the area.

Table Showing Health Complications in Respondent’s Family due to Installation of Hydropower Project

Health Complications	No. of Responses	Percentage
Yes	011	09.8
No	099	87.6
Not Sure	003	02.6
Total	113	100

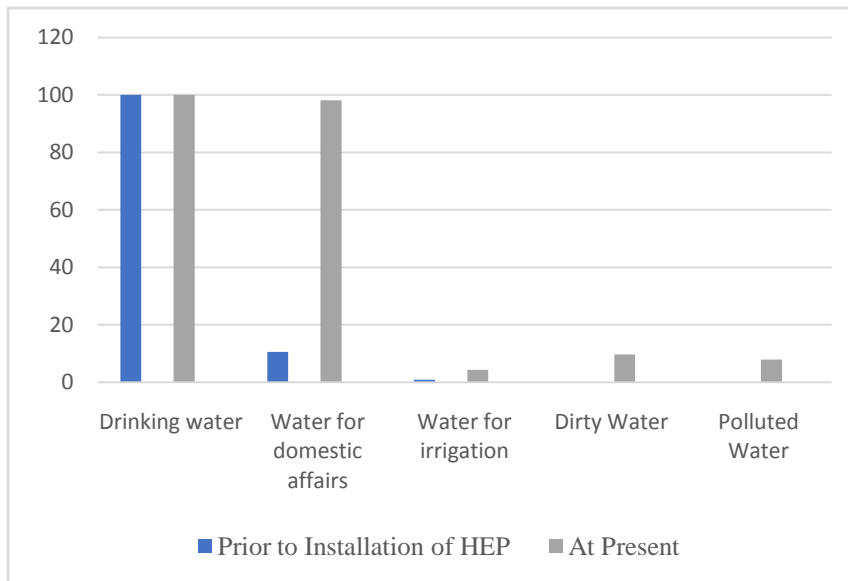


The main concern which came with the installation of power project is stagnated water. Water is still in the reservoir, which can lead to various diseases. The complaint of mosquitoes has increased after the installation of power project. The main affected area with this problem is Rajnagar and Thari. There the concentration of mosquitoes is very high leading to diseases like malaria, dengue etc.

87.6% of respondents said that their family haven’t faced any health complications due to installation of power project. The area around reservoir is clean without swamps due to which there were no health complications. 9.8% of respondents said that their family have faced health complications due to dam. These respondents belong to Rajnagar and Thari. 2.6% of respondents were not sure about the complications.

Table Showing Type of Water Available

Type of water	Prior to Installation of HEP		At Present	
	No. Responses	of Percentage	No Responses	of Percentage
Drinking water	113	100.0	113	100.0
Water for domestic affairs	012	010.6	111	098.2
Water for irrigation	001	000.9	005	004.4
Dirty Water	000	000.0	011	009.7
Polluted Water	000	000.0	009	007.9



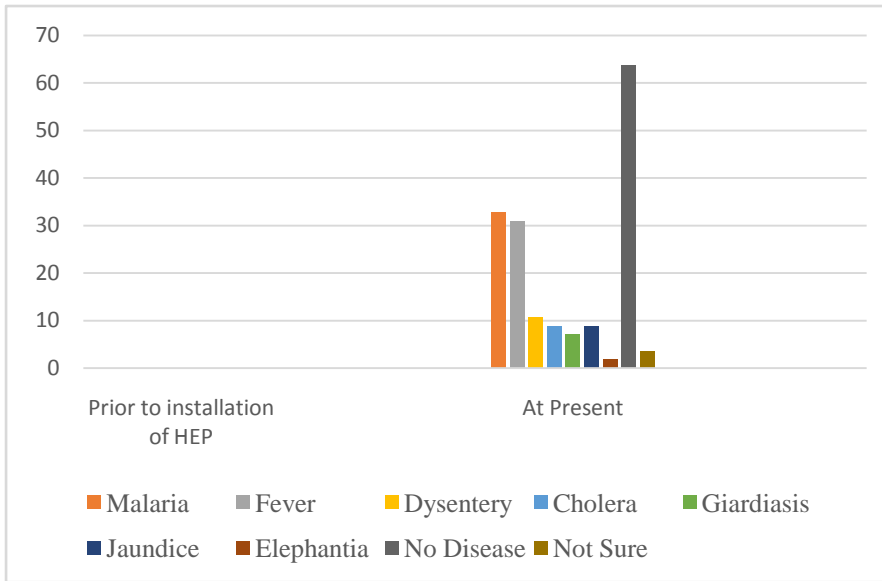
Water has multiple uses in a household and agriculture. Access to drinking water and water for domestic affairs was available to people since time immemorial. Irrigation facilities was not available before the installation of project. People were totally

dependent on rain for irrigation. The main problem regarding water can be seen in Rajnagar and Thari. In these villages, all garbage which is dumped by Chamba town settles. Sometimes dead bodies also come to the area. Due to this dumped garbage, there is bad smell.

Every respondent has drinking water before and after the installation of power project. Water available for domestic affairs has increased from 10.6% to 98.2%. Availability of water of irrigation has seen slight increase from 0.9% to 4.4%. There was no dirty and polluted water before the installation of power project but with construction of dam, its percentage has increased from 0% to 9.7% and 7.9% respectively.

Table Showing Number of Cases of Diseases Increased with the Coming up of Chamera-I

Diseases	Prior to installation of HEP		At Present	
	No. Responses	of Percentage	No. Responses	of Percentage
Malaria	00	00.0	37	32.7
Fever	00	00.0	35	30.9
Dysentery	00	00.0	12	10.6
Cholera	00	00.0	10	08.8
Giardiasis	00	00.0	08	07.0
Jaundice	00	00.0	10	08.8
Elephantia	00	00.0	02	01.8
No Disease	00	00.0	72	63.7
Not Sure	00	00.0	04	03.5

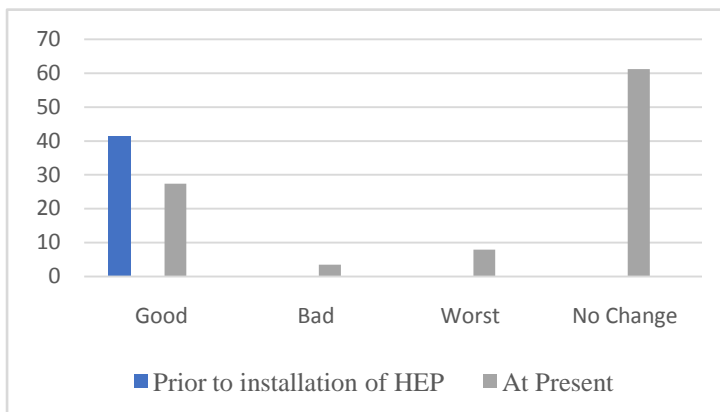


Before installation of power project, the people of the area were fully dependent on their farms for food. They use to grow grains and vegetables. Plenty of grass was available for cattles, because of which they get good quality milk. Due to this people use to live a healthy life without

any disease. But after the installation of power project and loss of land, people were forced to buy grains and vegetables from market. Also due to dirty stagnated water the problem of mosquitoes has arrived. Due to all these factors people are now experiencing various diseases. There was no respondent who had any type of disease before the installation of power project. Respondents suffering from malaria has increased to 32.7%. Respondents suffering from Dysentery, Giardiasis and Elephantia has increased to 10.6%, 7% and 1.8% respectively. Both Cholera and Jaundice has increased to 8.8%. 63.7% of respondents were perfectly fine without any disease and 3.5% of respondents were not sure about the change.

Table Showing Improvement in Sanitary Conditions in Locality

Sanitary Conditions	Prior to installation of HEP		At Present	
	No. Responses	Percentage	No. Responses	Percentage
Good	047	41.6	031	27.4
Bad	000	00.0	004	03.5
Worst	000	00.0	009	07.9
No Change	000	00.0	069	61.2
Total	113		113	100

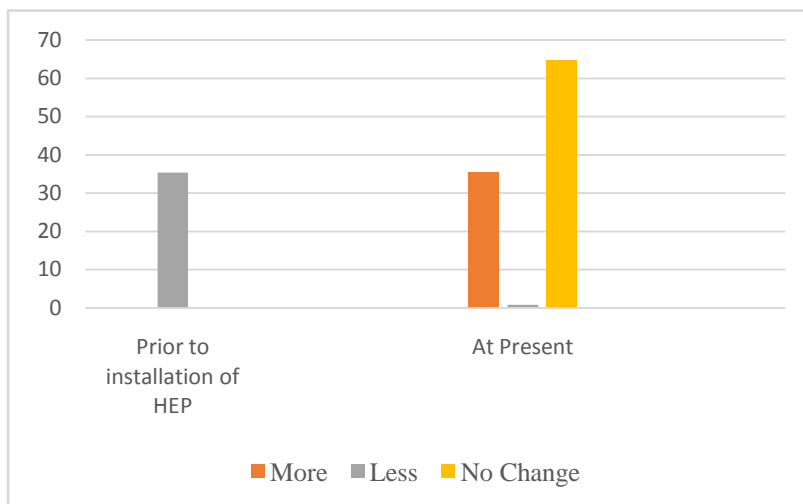


Cleanliness is both right and duty. Before the installation of power project the sanitary conditions of the area was very good. There was not a sign of pollution. But with installation of power project the sanitary conditions of the area has

decreased. The main cause to this is garbage dumping o Chamba town into river. Because of this dumping, all garbage gets accumulated on the river bank near Rajnagar and Thari. The percentage of good sanitary condition has decreased from 41.6% to 27.4%. Rest the Bad and Worst sanitary condition has increased from 0% to 3.5% and 7.9%. 61.2% of respondents were of the view that there is no change in the sanitary condition of the locality.

Table Showing Change in Expenditure on Treatment

Expenditure	Prior to installation of HEP		At Present	
	No. of Responses	Percentage	No. of Responses	Percentage
More	00	00.0	39	35.5
Less	40	35.4	01	00.8
No Change	00	00.0	73	64.6



Before the installation of power project the expenditure of respondents on medical treatment was very less. As explained above respondents didn't had any disease and they were living a healthy life. Due to this the expenditure on health treatment was

zero. But with installation of power project the expenditure on the medical treatment has increased.

The expenditure on medical care was zero before the installation of power project. 35.4% of respondents said that the expenditure on medical treatment was less before the installation of power project and it increased to 35.5% after the installation of power project.

On the basis of above description, it can be stated that data enumerates certain problems. The problem of drinking water in vicinity of Chamera reservoirs, the problem of low voltage over power house of Chamera-II, reduction of moisture in land has caused the dryness in the vegetative cover of the study area, natural sources of water (*bouri*) has been effected very badly, the problem of the survival of wild animal is prominent, soil erosion is at its peak due to blasting, road construction moreover, the ecology has badly been effected. Although, authorities have been made some arrangements in Chamera-I for water supply but these

arrangements are not sufficient. Available water is not pollution free, which leads to so many health problems. Water borne diseases are prominent in the study area. For the treatment, people have to pay a big amount of money, in case of serious health problems.

They have to go to distinct places outside their native places either to *Banikhet*, Chamba, TMC, Kangra, Pathankot, IGMC Shimla, CMC Ludhiana or PGI Chandigarh. However, NHPC project hospitals are available at *Khairi*, *Banikhet* but these hospitals are meant for the employees of NHPC only, because all these hospitals are situated within the campus of NHPC colony under the tight security of Central Industrial Security Force (CISF) and not accessible to the local people and even not for Project Affected People (PAPs).

Majority of respondents have responded that installation of power projects in Ravi basin has led to many environmental problems. Ravi is converted into tunnels and in reservoirs, which have interrupted the natural route of the river having, multifarious affects on aquatic life, in the downstream. At present, people who worked as labourers are without work.

Underground blasting has shaken the rocks of the area on the one hand and reservoirs (29 Km. of Chamera-I, and 6.4 Kms tunnel) have put pressure on the rocks which are of pre-miocene class and are in the early stage of formation. These power projects falls in highly sensitive earthquake prone zone i.e. zone-V and all these activities are quite enough to create environmental havoc at any time. Conversion of Ravi into reservoirs and the tunnels is not environmentally good. Dry Ravi from *Chohra* to *Simlaeu* (15 kms) where flow of Ravi is occasionally visible is engulfing the natural beauty of Ravi basin. On the one hand, the state government is stressing on the development of tourism in Ravi basin while on the other hand Ravi is not even visible in many places. Government is planning to develop eco-friendly tourism but what type of eco-friendly tourism it is?

There is tremendous increase in the temperature particularly in the downstream of Chamera-I in *Sherpur*, *Khairi*, *Chohra*, *Simlaeu* villages and experiencing unprecedented heat and villagers observed (as indicated in the table) that this is the after effect of power projects.

Due to the installation of Chamera-I maximum numbers of respondents have lost their land. NHPC has compensated them in form of money and jobs. It is worth of mentioning here that PAPs have not got anything in easy way. Maximum respondents have received compensation through High Court and some other cases are pending in the High Court of Chamera-I even after the 12 years of its commissioning. Not a single respondent has received land after losing their whole land in these developmental activities. People have been compelled to leave their native places, because in the midnight at *Rajnagar* and *Chakloo*, *Ghari* and *Thari* villages

water entered in their houses, as told by the respondents, they left everything and ran away. Mr. Daljeet Singh of submerged village *Ghari*, resettled at *Folgout* village has told that everything was drowned and submerged in the lake in front of their eyes and nothing could be done by them. All the childhood memories and emotional attachments became history and memories were lost within a few minutes.

Transportation activities have increased after the installation of hydroelectric power projects in the study area, which has caused in the problems of skin, eye soaring, allergic reactions, breathing, etc. Majority of respondents have responded that the number of problems could have been minimized if the environmental norms regarding dam building had been adopted properly and judiciously. The problem of increased temperature would not be so panic if the CAT plan implemented properly by the authorities. As per the website of NHPC (www.nhpcindia.in) more than 2.30 Lac trees were planted in lieu of 1380 affected trees and 172.58, hectare area has been afforested in lieu of affected 78.78, hectare forest area project catchment area but the planted trees and afforested area is physically not visible in the study area, when researcher talked to the authorities in this regards, they responded that an amount of rupees 1072 Lac has been given to the forest department and it is the responsibility of the state government and department concerned to ensure the proper implantation of CAT plan. It is the responsibility of state government and executing agencies to ensure every promised facility before the completion of power project as stated by the respondents during data collection. Had the CAT plan implemented properly, the problem of high temperature in the area would not be there. Above all, the interactive relationship between living organism and environment has badly been disturbed by the installation of power projects in Ravi basin.

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