



Research Paper

## Health Impact Assessment: A Sociological Analysis of Chamera-I Hydropower Project in Chamba District of Himachal Pradesh\*

Abhishiant Slariya\*\*

Independent Researcher  
Village Chima, Post office Saru  
Tehsil and District Chamba, (HP)

### ABSTRACT

Development is important for the upward movement of society. Hydroelectric Power Development is an imperative to fulfill needs of human survival around the globe. Like other countries and states, hydropower generation has been started many years ago in the state of Himachal Pradesh. It got momentum in 50-60s with the installation of mega power projects like Bharkra, Pong etc. to cater various development requirements and remains pivotal in transforming lives in adjoining states. But on the other such developments are not free of cost and the 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 29 km long reservoir and affected 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.

The conclusion of the study reveals that there is a considerable impact of installation of Chamera-I on the lives of people along with the benefits which are less as compared to cost. Land submergence, displacement of natives, extinction of flora and dislocating of fauna, negative impacts on health, environment, culture and psyche of people etc. are few to count which are affecting overall health of the people.

**KEYWORDS:** Environment, Health, Hydroelectric Power Project, Flora and Fauna

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\*\* Independent Researcher, Village Chima, Post office Saru, Tehsil and District Chamba HP

### I. 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 needs water for their survival. Water gained more importance when it used for generation of electricity, which is sine-quo of development and being used at every walk of life in modern times. This electricity generation is not free of complications; it has huge effect on the interactive relationship of living organism and environment.

Man has a basic right to live in such 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 sustainable manner. 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 hydroelectric development has disturbed man, land, water and ecology to a greater extend. Ecology means interactive relationship between man, land, water, flora and fauna. The fact cannot be denied that because of such types of development, ecology, health as well as physical environment of the native villages/areas affected to greater extend.

India offers great sources of hydropower with well-defined regions, which are topographically favorable for the run-of-the-river hydro development. As per Central Electricity Authority (CEA), the hydro power potential of the country has been assessed as 84044 MW (at 60% plant load factor) which corresponds to an installed capacity of 150000 MW. However, the total hydro installed capacity as on 30.09.2012 is only 39291 MW, being 26% of the capacity identified. The scenario of the impact is same round the globe. Any hydro based developmental project, anywhere in the world is considerably affecting the lives of natives, organism and also affecting physical environment to the greater extent.

Speaking specifically about India and Indian Himalayan Region (IHR), water is abundantly available for hydropower generation and have been targeted by the policy makers in the planned development era after 1950s. The projects which were started 50-60 years ago are now can be assessed from cost and benefit perspectives. Such developmental initiatives have been initiated in western Himalayan state; Himachal Pradesh in 1950 onwards and presently the state is proceeding toward “Electricity State” of the country. Because of five perennial rivers of the state, presently more than 400 power projects which are in different stage of installation had affected and are affecting health of the flora as well as fauna keeping the recommendations of EIA aside.

Satluj, Beas and Ravi are the worse affected basins of the state and contributing more than 70 percent and it is evident from many studies conducted by many scholars that environment impact assessment have not been implemented properly in power projects. To see the impact of the Chamera-I which is second power project of NHPC and first mega project (540 MW) in Ravi basin after Baira Suil on the lives of people as well as on environment, researcher has chosen villages situated on both sides of 29 KM reservoir. The paper is a humble attempt of the researcher to document the impacts of this power project on the health of the people who are still living in the vicinity of the reservoir and also to assess environment impact assessment done by the executing agency and implementation of the provisions and recommendations of the EIA.

### Hydro Power Development in Himachal Pradesh

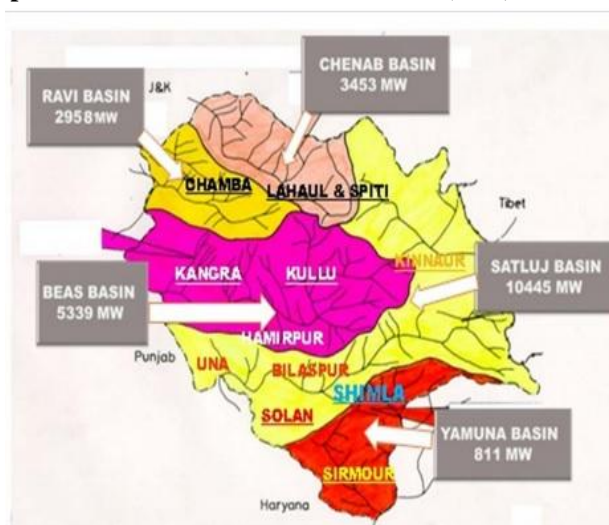
Himachal Pradesh is one of the ten States that makes up the Indian Himalayan Region (IHR). Himachal Pradesh, located in Northern India, share its border with Jammu and Kashmir in North, Punjab in West and South West, Uttar Pradesh in the South East, Tibet in the East, and Haryana in the South and is 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 power generation potential of the state is approximately 23000 MW, which is about 27% of the total hydel potential of the country, out of which only about 6728 MW stands harnessed so far and 6200 MW is presently under execution. The balance potential, if harnessed expeditiously in a judicious manner, can provide adequate resources to the state to promote its developmental activities. The total power potential of the state and the basin wise power potential available and status indicating their operation, constructional and allotment status is given in Table and Figure-1.

**Table/Figure 1: Showing Basin-Wise Hydropower Potential in Himachal Pradesh (MW)**

Sr. No.	Name of Basin	Identified Potential (MW)
1.	Satluj	10445
2.	Beas	05339
3.	Ravi	02958
4.	Chenab	03453
5.	Yamuna	00811
	<b>Total</b>	<b>23000</b>

Source: Department of Energy, Himachal Pradesh



Source: Directorate of Energy, Government of Himachal Pradesh, 2012

### Power Projects in Ravi Basin

As shown in the figure:1 above, the total identified potential from Ravi basin has been assessed as 2958 MW against which, 1286.45 MW has been developed, 136 MW is under execution and the remaining 1164.45 MW is under clearance /investigation.

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 its hydroelectricity resources. 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.

**Table 2: Showing Hydropower Projects in Different Stages in Himachal Pradesh**

Sr. No.	Description of the Project/ Scheme	River/Nallah	Installed Capacity (MW)	Being Executed by
<b>A Under Operation</b>				
1.	Baira Suil	Bhaira, Suil and Bhaled N	198.00	NHPC
2.	Chamera-I	Ravi	540	NHPC*
3.	Chamera-II	Ravi	300	NHPC
4.	Chamera-III	Ravi	231	NHPC
5.	Sal Stage - II	Sal	2.00	HPSEB
6.	Upper Joiner	Joiner	12.00	IPP Scheme
7.	Holi	Holi	3.00	HPSEB
8.	Bhuri Singh P/H	Sal	0.45	HPSEB
		<b>Total</b>	<b>1286.45</b>	
<b>B Under Construction</b>				
1.	Chanju - I	Chanju N	36.00	IPP Scheme
2.	Budhil	Budhil N	100	IPP Scheme
		<b>Total</b>	<b>136.00</b>	
<b>C Obtaining Clearances</b>				
1.	Bharmour	Budhil N	45.00	IPP Scheme
2.	Sal-Kothi	Baira N	15.00	IPP Scheme
3.	Harsar	Budhil N	70.00	IPP Scheme
4.	Chirchind – II	Chirchind N	09.90	IPP Scheme
5.	Bajoli- Holi	Ravi	180.00	HPSEB
6.	Choned	Chhowed	15.00	IPP Scheme
7.	Holi – II	Holi N	07.00	IPP Scheme
8.	Kutehr	Ravi	240	IPP Scheme
9.	Surgani Sundla	Bhaira, Suil and Bhaled N	48.00	HPPCL
10.	Upper Joiner - II	Joiner	8.00	IPP Scheme
		<b>Total</b>	<b>637.90</b>	
<b>D Under Investigation</b>				
1.	Chanju – II	Diyothal Chanju N	17.00	IPP Scheme
2.	Sal – I	Sal	6.50	IPP Scheme
3.	Bara Bhangal	Ravi	200.00	IPP Scheme
4.	Chanju - III	Chanju N	48.00	HPPCL
5.	Diyothal Chanju	Diyothal Chanju N	33.00	HPPCL
6.	Cho Tunda	Tunda N	9.00	IPP Scheme
7.	Dhancho	Dhancho	12.00	IPP Scheme
8.	Suil	Suil	13.00	IPP Scheme
9.	Tanger- Chanju	Chanju	9.00	IPP Scheme
		<b>Total</b>	<b>347.50</b>	
<b>E To be allotted</b>				
			<b>199.00</b>	
G	Himurja Projects (Including Commissioned, Under Construction, obtaining clearances, under investigation & to be allotted)		<b>351.15</b>	
		<b>Grand Total</b>	<b>2958.00</b>	

\*taken for study

(Source: Directorate of Energy, 2013)

#### Abbreviation used:

NHPC- National Hydroelectric Power Corporation Pvt. Ptd  
 HPSEB- Himachal Pradesh State Electricity Board  
 HPPCL- Himachal Pradesh Power Corporation Limited  
 IPP- Independent Power Producer

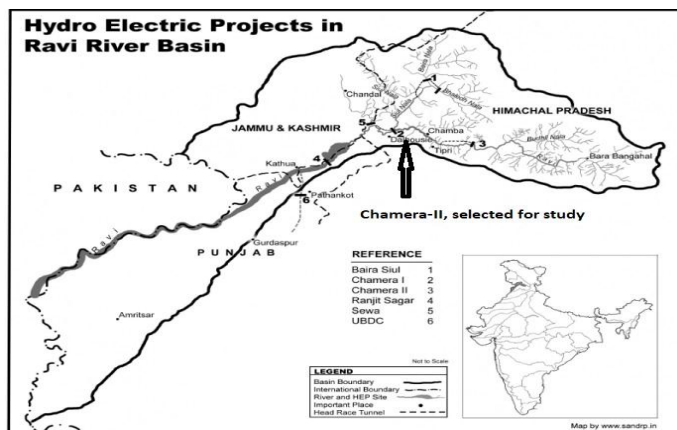
As depicted in above table:2, whole power projects/ potential can be divided in four major categories i. e. large or major power projects which are also known as multipurpose projects are there in form of Bhakra dam and Pong dam in the state since 1960s. And the second category is of small power projects, which gained more importance after sixth five years plan when state plan to be the power state. Then small projects which are recently introduced in the hyrdo policy of the state and being taken care of by the HPSEB and IPP and the last category is micro/meso which are also not being taken by big players but the small, like IPP or state govt. also offered such projects to the unemployed youth of the 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. This project has following features:

**Table 3: Showing the Technical Features of Chamera-I**

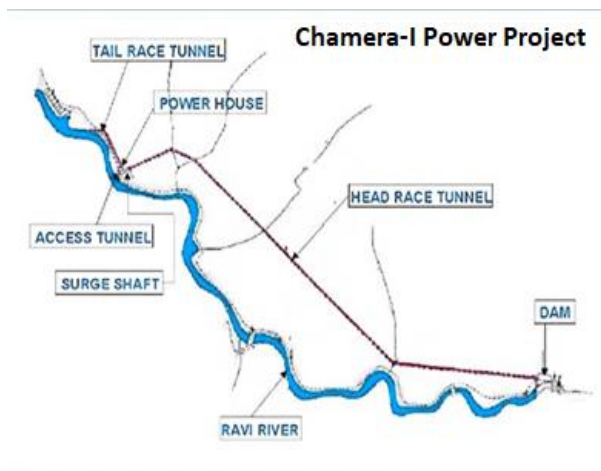
Location	Distt. Chamba (Himachal Pradesh)
Approach	Nearest railhead - Pathankot (100 Km) Nearest Airport - Jammu (200 Km)
Capacity	540 MW (3 x 180 MW)
Design Energy	1664.56 MU (90% dependable year)
Beneficiary States/UTs	Uttarakhand, UP, Delhi, HP, Haryana, J&K, Punjab, Rajasthan and Chandigarh
Date of Commercial Operation (COD)	Unit # 1 - 01.05.1994 Unit # 2 - 01.05.1994 Unit # 3 – 01.05.1994
<b>Technical Features</b>	
<b>Dam</b>	
Type	Concrete gravity arch dam
Height	121 m
Length	295 m
<b>Head Race Tunnel</b>	
Shape	Horse shoe
Diameter	9.5 m
Length	6.414 Km
<b>Power House</b>	
Type	Underground
Capacity	540 MW (consisting 3 units of 180 MW each)
<b>Turbine</b>	
Type	Francis
Speed	214.3 RPM
Discharge/unit	117 m <sup>3</sup> /sec
No of Guide Vane	24
Rated Head	185 m
<b>Generator</b>	
Rated continuous output	200 MVA
Rated Voltage	13.8 kV
No of Poles	28
<b>Generator Step up Transformer: (GSU)</b>	
Type	Single Phase
LV	13.8 KV±5%
HV	400/√(3) kV
MVA	75 MVA
Type of cooling	OFWF
<b>GIS (Gas Insulated Switchgear)</b>	400 kV GIS
<b>TRT</b>	
Shape	Horse- shoe
Diameter	9.5 m
Length	2.447 Km
<b>Evacuation of Power</b>	03 lines
	L1- (Chamera- I – Jalandhar)
	L2- (Chamera- I – Jalandhar)
	L3- (Chamera- I - Chamera-II)

Source: <http://www.nhpcindia.com/Default.aspx?id=186&lg=eng&CatId=1&ProjectId=11>



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](http://www.nhpc.com)). The detailed features of Chamera-I are as follows:

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.



## II. RESEARCH METHODOLOGY

Keeping in view prime objective of the study, exploratory research design has been used. This research design, mainly based on primary and secondary data. Secondary data means any data collected which is already published and available in any form; may be in form of on-line published, books, new papers, research article or paper whereas the primary data means, data being collected for the first time and is not published one. For this study both types of data have been used. The secondary data was used to identify the variables of study and on the basis of identified variables, research plan for the collection of primary data have been planned and executed as per the requirement of the study undertaken. 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 who have witnessed this hydro power development and face negative and enjoy the positive aspects of this developmental initiative. Though respondents of other age group have also interviewed to know about their viewpoint and also respondents with different social, economic, political and other background have been included in the study sample.

### 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.

Keeping in view the objective of this paper, applying suitable research methodology and statistical tools,

following is the description of the results and conclusions drawn from the study:

### III. RESULTS AND DISCUSSIONS

Overall study emphasises that as far as the deprivations received by the displaced as well as the people who are living in the vicinity of the reservoir are concerned, people living on the both side of the dam have received a considerable amount of trauma after the installation of this project which is more as compare to the benefit they have. The benefit may be for the executing agencies and other people who are living far away from the places where this project has been installed.

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* (PAP), 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* (Non-PAP). 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. They are the real sufferer and paying the cost only not taking any benefit and presently their health condition is not so good to enjoy the benefits of the project.

However, the first category (PAP) has also received a considerable amount of impact on their socio-cultural milieu but the second category (Non-PAP) affected comparatively more as compare to 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 (Non-PAP) 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 water. Along with 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*.

To elaborate these impacts on the health of the people (Non-PAP), 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: 4 Showing Change in Floral Diversity due to HEP**

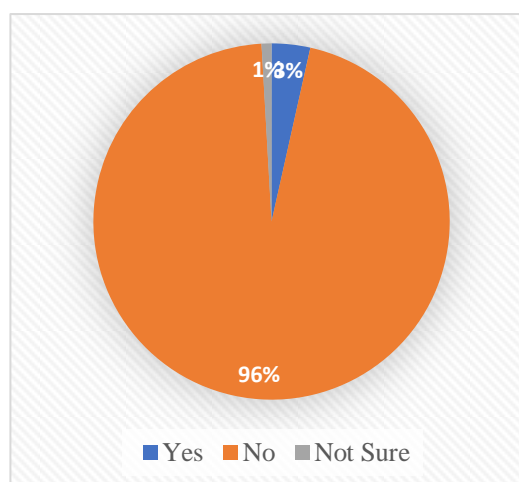
Change in Flora	No. of Responses	Percentage
Yes	113	100.00
No	000	000.00
Not Sure	000	000.00
<b>Total</b>	<b>113</b>	<b>100.00</b>

Before the installation of Chamera-I whole area was rich in biodiversity which was a great source for health well beingness and rendering health services to the people of the area. But with coming-up of the project, trees like; deodar, pine, sal etc. have been cut down and whole area submerged in the reservoir. These trees were of great importance to the native people because they provide them firewood, fodder, timber and moreover ecosystem services of great value because of which everyone was well. These forests were also shelter to various wild animals and birds. But now it is a history only and affecting the lives of people to great extent. As a result of which a very diverse flora diversity was lost. Now people don't have place to get firewood, forest produces and ecosystem services as well as the cool breeze which used to be a good source of good health.

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 and they are of the view that it is costing health wise them a lot. Because earlier they were use to go down to the river bed for walk as well as for morning routine and felt fresh for the whole day after having a some kilometres walks on the river bed and which was very good for their health but now they cannot go even outside of their houses. A 70-year-old resident and retired officer named Sh. Amar Singh from Ghadi village told that he used to have daily morning walk on the river bed and had never any illness but after the installation of this project, he cannot go even outside of his house as his house is situated on immediate water-line of 29 km long reservoir.

**Table: 5 Showing Change in Faunal Diversity due to Chamera-I**

Change in Fauna	No. of Responses	Percentage
Yes	004	03.50
No	108	95.60
Not Sure	001	00.90
<b>Total</b>	<b>113</b>	<b>100.00</b>



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 water-line of the reservoir is very near and only water is there not vegetation and presently there is only fishes which can be used for food only.

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: 6 Showing Improvement in Health Services due to Hydro Power Project Development**

Improvement in Health	No. of Responses	Percentage
Yes	000	000.00
No	113	100.00
Not Sure	000	000.00
<b>Total</b>	<b>113</b>	<b>100.00</b>

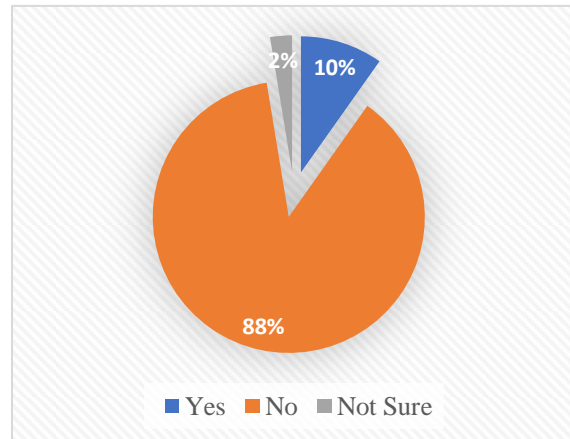
Health services are the basic and essential services/facilities and mandatory on the part of any welfare government to ensure that all such facilities are being provided to its citizen. In the whole catchment area, it was observed that there are few health centres provided by the state government and those are also without basic facilities and people are compelled to go to Chamba for routine medical check-ups and in case of emergency they have to either go to Pathankot or Tanda Medical College at Kangra.

In view of this even this condition, no medical facility was provided in the catchment area of the project. As the scope of the study was confined to the people living in the vicinity of dam, it was noticed that there is no medical facility in form of health centre has been provided by the executor of this power project. The available health facilities are not so good and not capable to address critical or emergency services. 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. In other parts of the catchment area there are only four primary health centres owned by the state government in which also doctor visit occasionally and no any arrangement has been made for the people of whole catchment area of the reservoir by NHPC, though there should be atleast one health centre with basic medical facility and a psychological treatment centre to mitigate post- development psychological trauma to the elderly people who lost everything and see with their eyes.

Every respondent has responded 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: 7**  
**Showing Health Complications on Respondent’s Family due to Installation of Hydropower Project**

Health Complications	No. of Responses	Percentage
Yes	011	09.80
No	099	87.60
Not Sure	003	02.60
<b>Total</b>	<b>113</b>	<b>100.00</b>

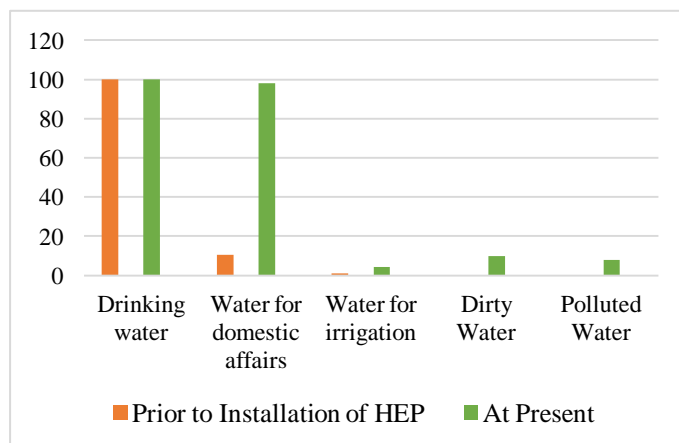


The main concern with the installation of power project is stagnated water which has created because of the formation of artificial lake of 29 kms. Water is still in the reservoir, which can lead to various water-borne diseases. The frequency of mosquitoes has increased after the installation of power project. The main affected villages are those which are situated in the immediate vicinity of the dam, like; Rajnagar, Thari, Ghari, Lower Bhanota, Kiani, Lower Palie etc. The concentration of mosquitoes is very high and leading to diseases like; *fever, malaria, urinary and intestinal schistosomiasis, diarrhoea and dysentery etc.*

87.6% of respondents said that their family haven’t faced any health complications due to installation of power project but they admitted during the discussion with researcher that they are facing normal to acute health problems and may be unknowingly they are saying these problems are not because of dam construction, so it would be useful and important to investigate the causes of these problems at micro level to know the real causes. 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. So, it is recommended that the health literacy campaign should be launch in the catchment area to document all health problem and an intensive research should be initiated to know the real cause of such problems.

**Table:8**  
**Showing Type of Water Available**

Type of water	Prior to Installation of HEP		At Present	
	No. of Responses	Percentage	No of Responses	Percentage
Drinking water	113	100.00	113	100.0
Water for domestic affairs	012	010.60	111	098.2
Water for irrigation	001	000.90	005	004.4
Dirty Water	000	000.00	011	009.7
Polluted Water	000	000.0	009	007.9



Water is an essential requirement of survival of any organism including human being and it has multiple use in household as well as in other realm of life including agriculture. Access to drinking water and water for domestic use was available to people since time immemorial (specifically prior to the installation of Chamera-I) in form of *natural bouris or stream*. But now almost all sources of natural and pure water have been submerged and people are compelled to have water being provided by the state irrigation and public health department (now Jal Sakshti Department). Irrigation facilities was not available before the installation of project and

not available even today. People were totally dependent on nature and rain for irrigation. The main problem

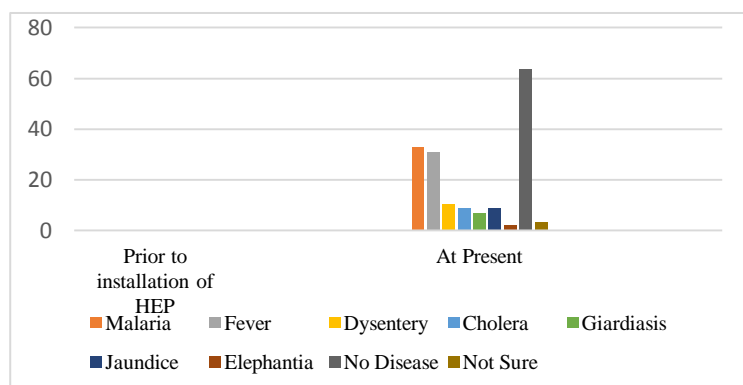


regarding water can be seen in Rajnagar and Thari. In these villages, all garbage which is dumped by Chamba town gathered and settled in the immediate proximity of the villages situated proximate to the dam. Sometimes dead bodies also come to the area. Due to this dumped garbage, sting foul and also responsible to create many health problems to the people who are living there.

Every respondent has drinking water before and after the installation of power project. Water available for domestic use 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. Replacement of water natural water with the water being provided by the state irrigation and health department has render bad results to the lives of people and responsible to create health problems. The problem of stone, indigestion, ulcer are common and for the treatment of such diseases people have to pay huge cost.

**Table: 9**  
**Showing Number of Cases of Diseases Increased with the Coming up of Chamera-I**

Diseases	Prior to installation of HEP		At Present	
	No. of Responses	Percentage	No. of Responses	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 under study, the people of the area were fully dependent on their farms for food, vegetables, fruits and for other essentialities of survival. Plenty of grass was available for cattles, because of which they get good quality milk and milk products and people were hale and healthy and were 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

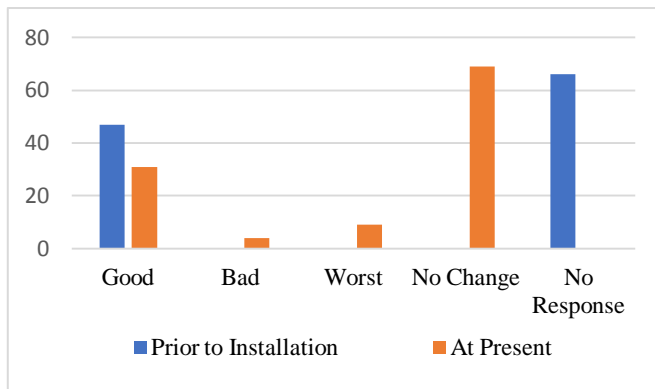
stagnated water the problem of mosquitoes has arrived. Due to all these factors people are now experiencing various diseases.

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. Perhaps this aspect of hydropower generation has been ignored in EIA as well as in the feasibility report of the project which is essentially required before the execution of the project. This may also be the reason that no medical facility in form of primary health centre was opened in the catchment area.

It is also worth of mentioning here that health centre with all medical facilities in Chamera-I power project has been opened and working at Khairi (Power house) which should be in the centre of catchment area of the project aiming to treat people who are affected partially or fully. The researcher observed that the health centre at Khairi is meant for the staff of NHPC not for the people of catchment area and same is the case with chamera-II and III in the upstream of Chamera-I. This is the irresponsible attitude of authorities and people are compelled to go to other health centres and spend huge amount of money on the treatment of their loved ones.

**Table: 10**  
**Showing Improvement in Sanitary Conditions in Locality**

Sanitary Conditions	Prior to installation of HEP		At Present	
	No. of Responses	Percentage	No. of Responses	Percentage
Good	047	41.6	031	27.40
Bad	000	00.0	004	03.50
Worst	000	00.0	009	07.90
No Change	000	00.0	069	61.20
No Response	066	58.40	000	00.00
<b>Total</b>	<b>113</b>	<b>100.00</b>	<b>113</b>	<b>100.00</b>

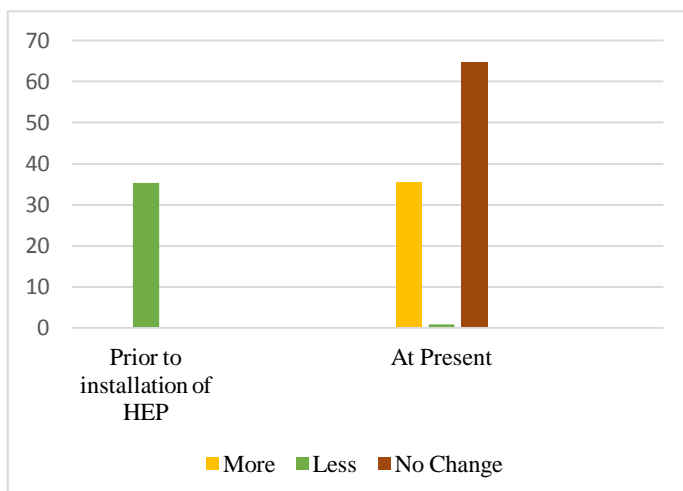


Cleanliness is both right and duty. Before the installation of this power project, the sanitary conditions of the area were very good. There was no sign of pollution. But with installation of power project the sanitary conditions of the area have decreased. The main cause to this is garbage dumping coming from upstream. 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. The sanitary conditions is also responsible for many health problems. As it is evident from the table, that prior to the installation of the project, the condition of the area was very good and after the installation of this power project the condition has deteriorated to great extent and responsible for many new emerged health problems to the people of area particular Non-PAP and other people in general. People who are living in the immediate proximity of the reservoir are the worse affected and bearing the cost of this development initiative, which was planned and executed for the vital welfare of the people. But what type of welfare and whose welfare, this project is doing, is a question which require answer from the policy makers as well as from the executors.

**Table: 11**  
**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 Chamera-I, the expenditure of respondents on medical treatment was very less. As explained above respondents had not any disease and they were leading a healthy life. Prior to the construction of this project, the expenditure on health treatment was zero, but with the installation of power project the expenditure on the medical treatment has increased.

The expenditure on medical treatment has increased after the installation of this power project. 35.4% of respondents responded that the expenditure on medical treatment was less before the installation of power project and increased to 35.5% after the installation

of Chamera-I. Overall, it can be stated that prior to the installation of this power project, there was no major disease in the area and respondents have responded that with the coming up of this power project, the number and frequency of diseases have increased and also the cost of treatment which put extra pressure on the income of the people.

#### **IV. CONCLUSION AND RECOMMENDATIONS**

On the basis of above description, it can be stated that data enumerates certain problems have arisen after the installation of Chamera-I. The problem of drinking water in vicinity of Chamera reservoirs, the problem of low voltage in the catchment, reduction of moisture in the soil has caused the dryness in the vegetative cover of the study area, natural sources of water (*bouri*) has been affected very badly, the problem of the survival of wild animal is prominent, soil erosion is at its peak due to blasting, road construction and the ecology of whole area has badly affected, in other words altered. Although, authorities have 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).

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 premo-carboniferous 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 and on the other responsible for many health problems due to increase in temperature and dust. 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 that this is the after effect of this power project.

#### **Recommendations**

On the basis of above description, following are some recommendations which can be considered by the policy makers as well as executors for the forthcoming power projects which are in different stages and are to be executed for the planned development in the state specifically and in whole country and globe in general:

1. It is recommended that before execution of any power project of any potential generation capacity, there should be demonstrative presentation of all possible impacts of the project on every aspect of life of flora as well as fauna including human being.
2. Before giving final nod to any project of any generation capacity, consent of people of whole catchment area should be taken along with the consent from *gramsabha*. The researcher is of the view that members of gram panchayat are few and some instances have been narrated to him that the *gramsabha* has not done justice while giving NoC to the executor.
3. While preparing feasibility report of the project, there should be including of all possible impact on every segment of society as well as of the environment and after the approval of TEFR (Techno-economic Feasibility Report) from all concerned department, actual work should be executed and monitored regularly.
4. Health Impact Assessment must be one of the most important components of the planning and to facilitate all people in the catchment of each project, health center with all health facilities must be opened in between of catchment area not in the premises of executing agency and should be open to all not only to the employee of the executing agency.
5. CSR fund should spend with the consultation of local people of catchment area who have been affected and paying the cost. There is no logic to spend CSR fund out of premises of catchment area and all required facilities should be created out of that fund, so that the trauma/ ill-effects they are facing can be minimized and they can also enjoy the fruits of such developmental initiatives.

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