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Socio-Economic Impact Analysis of Hydropower Projects in Chamba District, Himachal Pradesh, India

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Abstract - **In this paper, an attempt has been made to analyze the Socio-Economic Impacts of hydropower projects on inhabitants of Project Affected Zone in District Chamba of Himachal Pradesh. The study is based on primary data collected from six major hydropower projects of district Chamba (three NHPC and three private sector projects). A sample size of 250 respondents collected from affected families through convenience sampling. The indicators under consideration were the impact of hydropower projects on, a) local economy with seven variables, b) infrastructural development with its eight sub variables and c) impact on service sector with twelve variables. Data collected through questionnaire was analyzed by using descriptive statistics and Chi-square test. As per the findings it has been observed that hydropower projects helped to change the lifestyle of general public with positive impact on infrastructural development and have large impact on services sector of the area. It has developed the tourism industry in the area, establish market base and enhanced the market and infrastructural development.**
Keywords: **Infrastructural Development, Economic Impact, Services Sector, Hydropower**

I. INTRODUCTION

Hydropower is a renewable source of energy with ecological benefits and low greenhouse gas emissions. In the modern phase of developed and developing economies the demand for energy is increasing at a rapid rate due to the expansion of industrialization and service sector. Every economy needs to develop its energy sources with a strategy which protects its environment up to a great extent from degradation. Thus, hydropower development is gaining key focus by these economies. In the present stage of enhancing energy in the developing countries tapping the unutilized hydropower potential is the highest priority. Most of the countries have emphasized run of the river mode of hydropower generation.

Hydropower projects can be expected to have important effects because they involve considerable construction expenditures and electrical power generation. Hydropower development has socio-economic and environmental impacts; and these impacts are reflected in both economies and diseconomies. Hydropower development featured by tradeoffs among sustainability, environmental impacts and economic development, so that it requires a comprehensive evaluation of its negative and positive impacts. The benefits of the hydropower projects are more significant when private foreign investment is attracted to finance these projects. Hydropower projects affect the inhabitants of the project area in every sphere of life. Development of these projects affects the level of income, employment, standard of living, social structure of the area. Construction activities of the hydropower projects have created environmental impacts like deforestation, landslides and displacement of the local peoples. Inception of hydropower projects affects the road connectivity, communication facilities, Education and Health facilities in the area. The social and economic structure of the project area is affected at a large scale.

India has a vast potential of hydropower development in Indian Himalayan Region led by its major rivers. The major river basins in India have this potential and recognizing this potential, Central Government of India proposes to develop several hydropower projects in Himalayan Region under its initiative to develop 50,000 MW power generation. With the development of hydropower projects in Himalayan Region of the country many socio-economic and environmental issues arises in this ecologically sensitive region. The socio-economic impacts of hydropower projects are the need of the hour. Himachal Pradesh being a hilly state situated in the Himalayan region has a large potential of hydropower generation. The rivers in Himachal Pradesh and the physiographic features lead to the hydropower potential and generation to a large extent. Himachal Pradesh has been emerged as the 'Energy State' with the development of hydropower at a rapid rate.

II. REVIEW OF LITERATURE

Eckberg, D. K. (1986) suggests that to comply with National Environmental Policy Act 1969 and thereby eliminate the unnecessary degradation of river recourses, Federal Energy Regulatory Commission (FERC) should assess hydropower development on basin-wise scale considering the cumulative impacts of hydropower permits, licenses, exemptions and non-hydropower activities affecting river resources. Pradhan, G. (1998) examines the macroeconomic impacts of hydropower projects in Nepal using an economy-wide computable general equilibrium model. The study reveals that hydropower projects provide

overall benefits to economic growth along with increase in general price level and decline in traditional exports in short term. These hydropower projects are more beneficial when financed by private foreign investment.

Cernea, M. M. (1999) studies the displacement impacts of hydropower projects and pointed that economic research on displacement and resettlement is indispensable to improving resettlement problems. The author focuses on the constructive alliance between economic and sociological knowledge on resettlement and concluded that in-depth economic knowledge is worth necessary for achieving the goals of resettlement policy i.e., reduced displacement and development of the resettle's livelihoods. Kumar, D. (2006) analyses the environmental and ecological impact of existing inter-basin water transfer projects in Canada and examines the water policy-making procedures, water laws and other decision-making criteria. Jain S. K. (2012) analyzed that water resource management became more challenging with growing scarcity of water and deteriorating quality of water. He elaborates the likely impacts of water sector and the actions that India required to manage these impacts.

Baker, J. M. (2014) examined the implementation of Himachal Pradesh's small hydropower policy and highlight the social and environmental impacts of hydropower development and conclude that majority of hydropower projects have generated unmitigated negative effects, employment generation and uncompensated deaths from construction activities. The study provides the basis for proposing steps to help the small run-of-water hydropower projects. Diduck, A. P. and Sinclair, A. J. (2016) analyzed the impacts of small hydro development in Indian Himalaya region mainly in the states of Himachal Pradesh and Uttarakhand. The study reveals that the legal exemption for small hydropower projects has left an important gap in India's environmental assessment regime. Small hydropower projects need improved project-level assessments, cumulative effect assessments and better local involvement.

III. DATA COLLECTION AND METHODOLOGY

To explore the socio-economic impact of hydropower projects the study is conducted on major hydropower projects in District Chamba of Himachal Pradesh. Project affected families of the hydropower projects are included in the sample for study. The indicators under consideration are Impact on Local economy, Infrastructural development and Service Sector. A self-design questionnaire that is based on dimensions under consideration has been used to collect data. A sample of 300 respondents through convenience sampling has been selected from the project affected families. But 250 respondents fill the questionnaire, so the response rate was 71 percent. Data collected through questionnaire is analyzed by using descriptive statistical tools Mean, Standard Deviation, skewness and Kurtosis. Chi-square test is used to validate the results and draw inferences from the data.

IV. RESULTS AND DISCUSSION

Hydropower projects have different impacts on the local inhabitants as well as on the environment. The socio-impacts of hydropower projects are evaluated under different indicators and dimensions given below.

TABLE I DESCRIPTIVE STATISTICS FOR ECONOMIC IMPACT OF HYDROPOWER PROJECTS ON LOCAL ECONOMY

Economic Impacts of Hydro Power Projects	To Great Extent	To Some Extent	Not at all	Total	Mean	Std. Deviation	Kurtosis Value	Skew-ness Value	Chi-square	d.f.	P-value
Projects have helped to increase the income level	137 (54.8)	112 (44.8)	11 (4.4)	250 (100)	2.46	0.581	-0.653	-0.539	95.52	2	0.000
Helped to increase the employment opportunities	140 (56.0)	96 (38.4)	14 (5.6)	250 (100)	2.50	0.602	-0.349	-0.792	98.14	2	0.000
Helped to change and increase the consumption pattern of inhabitants	151 (60.4)	79 (31.6)	20 (8.0)	250 (100)	2.52	0.641	-0.076	-1.012	103.30	2	0.000
Helped to increase the education level of peoples	154 (61.6)	81 (32.4)	15 (6.0)	250 (100)	2.55	0.606	0.046	-1.031	116.02	2	0.000
Helped to increase the indirect employment also	147 (58.8)	73 (29.2)	30 (12.0)	250 (100)	2.46	0.700	-0.398	-0.945	84.05	2	0.000
Helped to change the lifestyle of general public	162 (64.8)	69 (27.6)	19 (7.6)	250 (100)	2.57	0.631	0.303	-1.192	126.39	2	0.000
Expansion of market access to the public	150 (60.0)	83 (33.2)	17 (6.8)	250 (100)	2.53	0.621	-0.077	-0.981	106.13	2	0.000

Source: Data collected through field survey
Note: Values in the parenthesis ( ) shows percentage

Table I shows the analysis for the economic impacts of hydropower projects on local economy of the project area. The mean score for the opinion, project helped to change the lifestyle of general public is 2.57, which is greater than the average mean score at three point scales. The value of standard deviation is 0.631, which depicts that the opinion

of the respondents is distributed more towards the higher side of the average. The value of skewness -1.192 shows that the distribution is negatively skewed. The calculated value of χ^2 is 126.39 at 2 degrees of freedom. The value of χ^2 is significant as the P-value is 0.000 which is less than 0.05. The analysis in the table reveals that 64% of the respondents are strongly agree that hydropower projects helped to change the lifestyle of general public to a great extent. The mean value in response to the opinion that hydropower projects helped to increase the education level of the peoples is 2.55. The value of standard deviation 0.606 and skewness -1.031 describes that the distribution is negatively skewed with the concentration of values to higher side of the average. The calculated χ^2 value 116.02 at 2 degrees of freedom is significant at 5% level of having P-value as 0.000. It is observed from the analysis that most of respondents are of the opinion that education level of the peoples increased with the inception of hydropower projects in the area.

In case of expansion of market access to the public, mean value is 2.53. The value of standard deviation is 0.621 have the distribution of values to the higher side of average score. The value of skewness and kurtosis is -0.981 and -0.077 respectively. It shows that the distribution is negatively skewed. The calculated χ^2 value 106.13 at 2 degrees of freedom is significant at 2% level of having P-value as 0.000. The data reveals that 60% of the respondents are of the opinion that hydropower projects have expanded the market excess to the public of the project areas. The inception of hydropower projects makes aware about the market access.

The mean score for the opinion that inception of hydropower project helped to change and increase the consumption pattern of inhabitants is 2.52. The value of standard deviation is 0.641. The value of kurtosis and skewness is -0.076 and -1.012 respectively. It shows that the distribution is negatively skewed. The calculated value of χ^2 (103.30) at 2 degrees of freedom gives significant results with P-value 0.000 at 5% level of significance. The analysis reveals that 60% of the respondents believe that inception of hydropower project changed the consumption pattern of inhabitants of the project area.

In case of the opinion that hydropower projects helped to increase the employment opportunities, the mean value is 2.50. The value of standard deviation is 0.602, which shows that the opinions of the respondents are distributed to the higher side of the average. The value of skewness -0.792 shows that the distribution is negatively skewed. The calculated value of χ^2 is 98.14 at 2 degrees of freedom. The value of χ^2 is significant as the P-value is 0.000 which is less than 0.05. The analysis reveals that most of the respondents (56%) are of the opinion that hydropower projects increased the employment opportunities.

The mean value regarding the opinion that hydropower projects increase the indirect employment is 2.46. The standard deviation value 0.700 and skewness value -0.945 depicts that the distribution is negatively skewed with concentration of values towards the higher side of average. The calculated χ^2 value 84.05 at 2 degrees of freedom is significant at 5% level of having P-value as 0.000. The table analysis shows that 64% of the respondents are of the opinion that hydropower project increases the indirect employment also.

In case of the opinion projects have helped to increase the income level, the mean value is 2.46. The value of standard deviation 0.581 shows that the opinion is distributed towards the higher side of the average score. The value of skewness -0.539 presents that the distribution is negatively skewed. The calculated value of χ^2 is 95.52 at 2 degrees of freedom. The value of χ^2 is significant as the P-value is 0.000 which is less than 0.05. The analysis reveals that 54% of the respondents are of the opinion that inception of projects has helped to increase the income level.

Table I concludes that hydropower projects helped to change the lifestyle of general public. The hydropower projects helped to increase the education level and employment opportunities. The inception of hydropower projects changes the consumption pattern of the inhabitants of the project area. The hydropower projects lead to the expansion of market access to the public and helped to increase the indirect employment also.

Table II shows the analysis of the impact of hydropower projects on infrastructural development in the project area. The mean score for communication facilities in the area is 2.72, which is higher than the average score on three-point scales. The standard deviation value 0.561shows the concentration of responses towards the higher side of the average. The value of kurtosis and skewness is 2.566 and -1.894, which shows that the distribution is negatively skewed. The χ^2 value 225.15 at 2 degrees of freedom is significant at 5% level of significance as in the table the P-value is 0.000. The data analysis in the table shows that 77% of the respondents strongly agree that hydropower projects increase communication facilities to a great extent in the project-affected areas, but still, there are some villages in the project periphery in the Chamba district that don't have or very rare communication facilities.

In the case of the impact of hydropower projects on education facilities, the mean score or response is 2.71. The value of the standard deviation is 0.525, which depicts that the opinions of the respondents are distributed towards the higher side of the average. The value of kurtosis 1.980 and skewness -1.689 reveals that the distribution is skewed towards the negative side. The χ^2 value 208.80 at 2 degrees of freedom is significant at 5% level of significance as in the table the P-value is 0.000. The data in the table shows that 75% of the respondents strongly agree with the statement that education facilities increased up to a great extent due to the development of hydropower projects in the study area.

TABLE II DESCRIPTIVE STATISTICS FOR IMPACT OF HYDROPOWER PROJECTS ON INFRASTRUCTURAL DEVELOPMENT

Impact on Infrastructural Changes in the Project Region	To Great Extent	To Some Extent	Not at all	Total	Mean	Std. Deviation	Kurtosis Value	Skew-ness Value	Chi-square	d.f.	P-value
Communication Facilities	194 (77.6)	42 (16.8)	14 (5.6)	250 (100)	2.72	0.561	2.566	-1.894	225.15	2	0.000
Education Facilities	188 (75.2)	53 (21.2)	9 (3.6)	250 (100)	2.71	0.525	1.980	-1.689	208.80	2	0.000
Hospitals/ Health Facilities	158 (63.2)	73 (29.2)	19 (7.6)	250 (100)	2.55	0.632	0.157	-1.123	117.84	2	0.000
Public Transportation	95 (38.0)	129 (51.6)	26 (10.4)	250 (100)	2.27	0.639	-0.686	-0.319	66.104	2	0.000
Bridges	164 (65.6)	73 (29.2)	13 (5.2)	250 (100)	2.60	0.578	0.422	-1.192	138.72	2	0.000
Drainage and sanitation	70 (28.0)	147 (58.8)	33 (13.2)	250 (100)	2.14	0.236	-0.489	-0.110	83.04	2	0.000
Maintenance of Roads and Bridges	148 (59.2)	87 (34.8)	15 (6.0)	250 (100)	2.53	0.608	-0.138	-0.931	106.37	2	0.000
Market facilities	60 (24.0)	182 (72.8)	8 (3.2)	250 (100)	2.20	0.479	0.160	0.517	191.45	2	0.000

Source: Data collected through field survey
Note: Values in the parenthesis ( ) shows percentage

The mean value of the response regarding the impact of hydropower projects on health facilities is 2.55. The value of the standard deviation is 0.632, which depicts the concentration of responses towards the higher side of the mean score. The value of kurtosis and skewness is 0.157 and -1.123 respectively. It shows that the distribution is skewed to the negative side of the average. The calculated χ^2 value 117.84 at 2 degrees of freedom is significant at 5% level of having a P-value as 0.000. The analysis reveals that 63% of the respondents agreed that health facilities increased up to a great extent due to hydropower projects in the study area.

Public transportation is necessary for everyone in society. The mean score for the impact of hydropower development on public transportation is 2.27. The standard deviation value is 0.639. The value of skewness -0.319 and kurtosis -0.686 shows that the distribution is negatively skewed. The value of χ^2 is 66.104 at 2 degrees of freedom. The value of χ^2 is significant at 5% level of significance as the P-value is 0.000 which is less than 0.05. The analysis reveals that 38% of the respondents are of the opinion that hydropower projects increase public transportation up to a great extent and 51% opined that to some extent.

In response to the impact of hydropower on the construction of bridges, the mean value 2.60 is higher than the average mean value on a three-point scale. The value of the standard deviation 0.578 reveals the response distribution towards the higher side of the average. The value of skewness -1.192 presents that distribution is skewed to the negative side. The value of χ^2 is 138.72 at 2 degrees of freedom. The value of χ^2 is significant as the P-value is 0.000 which is less than 0.05. The analysis reveals that 65% of the respondents have the opinion that bridges are constructed due to hydropower projects to a great extent in the project-affected areas.

In the case of maintenance of roads and bridges, the mean value is 2.53. The value of the standard deviation is 0.608. The value of kurtosis and skewness is -0.138 and -0.931 respectively, which shows that distribution is negatively skewed. The calculated χ^2 value 106.37 at 2 degrees of freedom is significant at 5% level of significance having a P-value as 0.000. Table analysis reveals that 59% of the respondents have the opinion that roads and bridges are maintained by hydropower projects in the study area.

Regarding, market facilities with the hydropower project development mean value is 2.20. The value of the standard deviation is 0.479. The value of kurtosis 0.160 and skewness 0.517 shows that the distribution is skewed towards the positive side. The χ^2 value 191.45 at 2 degrees of freedom is significant at 5% level of significance as in the table the P-value is 0.000. The analysis in the table shows that 72% of the respondents are of the opinion that hydropower projects have increased market facilities up to some extent.

In the case of drainage and sanitation facilities, the mean score is 2.14. The value of the standard deviation is 0.236. The value of kurtosis and skewness is -0.489 and -0.110 respectively, which shows that the distribution is skewed towards the negative side of the average. The calculated χ^2 value 117.84 at 2 degrees of freedom is significant at 5% level of having a P-value as 0.000. Data in the table shows that 58% of the respondents believe that hydropower projects have developed drainage and sanitation facilities up to some extent.

Finally, table II concludes that hydropower projects have a positive impact on the infrastructural development of the area. The hydropower project increases the communication facilities and education facilities and also enhanced the

health facilities in the project area. Public transportation increased with the development of hydropower projects. Construction and maintenance of roads and bridges are essential parts of hydropower project development. It has developed the market facilities in the area and also develops the system of drainage and sanitation in the project-affected area up to some extent.

TABLE III DESCRIPTIVE STATISTICS FOR IMPACT ON SERVICE SECTOR DUE TO HYDROPOWER PROJECTS

Impact on Services Sector of the Project Region	To Great Extent	To Some Extent	Not at all	Total	Mean	Std. Deviation	Kurtosis Value	Skewness Value	Chi-square	d.f.	P-value
The Tourism Industry	129 (51.6)	93 (37.2)	28 (11.2)	250 (100)	2.42	0.673	-0.566	-0.740	67.83	2	0.000
Internet facilities	161 (64.4)	76 (30.4)	13 (5.2)	250 (100)	2.59	0.589	0.289	-1.135	132.39	2	0.000
Marketing Facilities	82 (32.8)	129 (51.6)	39 (15.6)	250 (100)	2.17	0.675	-0.818	-0.222	48.63	2	0.000
Market Base	91 (36.4)	126 (50.4)	33 (13.2)	250 (100)	2.23	0.666	-0.781	-0.302	52.95	2	0.000
Other Business Activities	92 (36.8)	112 (44.8)	46 (18.4)	250 (100)	2.18	0.721	-1.040	-0.292	27.48	2	0.000
Aqua Culture	48 (19.2)	165 (66.0)	37 (14.8)	250 (100)	2.05	0.602	-0.230	-0.021	104.07	2	0.000
Environmental protection	79 (31.6)	139 (55.6)	32 (12.8)	250 (100)	2.18	0.640	-0.635	-0.189	69.03	2	0.000
Rehabilitation of Land ouster	97 (38.8)	137 (54.8)	16 (6.4)	250 (100)	2.32	0.590	-0.633	-0.233	91.20	2	0.000
Herbal Park	63 (25.2)	107 (42.8)	80 (32.0)	250 (100)	1.93	0.754	-1.232	0.113	11.81	2	0.003
Nature Club	69 (27.6)	98 (39.2)	83 (33.2)	250 (100)	1.94	0.779	-1.344	0.098	5.04	2	0.080
Gym/Yoga /Sports Centres	80 (32.0)	97 (38.8)	73 (29.2)	250 (100)	2.02	0.783	-1.366	-0.049	3.65	2	0.161
Spiritual Centre	141 (56.4)	84 (33.6)	25 (10.0)	250 (100)	2.46	0.671	-0.375	-0.886	82.13	2	0.000

Source: Data collected through field survey
Note: Values in the parenthesis ( ) shows percentage

Table III presents analysis for impact of hydropower projects development on service sector in the project affected area. The mean value of responses to the opinion that impact of hydropower projects on the tourism industry is 2.42. The value of standard deviation is 0.673, which shows that the opinions of the respondents are distributed more to the higher side of the average. The value of skewness -0.740, shows that the distribution is negatively skewed. The calculated χ^2 value 67.83 at 2 degrees of freedom is significant at 5% level of significance having P-value as 0.000. The analysis shows that 51% of the respondents are of the opinion that hydropower projects have developed the tourism industry in the project area to a great extent.

In case of internet facilities, the mean value is 2.59, which is greater than the average mean value at three point scale. The value of standard deviation is 0.589. The value of kurtosis and skewness is 0.289 and -1.135 respectively. It describes that distribution is skewed to the negative side. The χ^2 value 132.39 at 2 degrees of freedom is significant at 5% level of significance having P-value as 0.000. The table data reveals that 64% of the respondents have opinion that hydropower projects increased the internet facilities in the study area.

The mean score for the opinion that hydropower project provided market base is 2.23. The value of standard deviation is 0.666. The value of skewness and kurtosis is -0.302 and -0.781 respectively. It shows that the distribution is negatively skewed. The calculated χ^2 value 52.95 at 2 degrees of freedom is significant at 5% level of having P-value as 0.000. The analysis reveals that most of the respondents i.e., 86% are agree with the opinion that hydropower projects have provided market base to the local traders of the affected area.

In response to the marketing facilities with the development of hydropower projects mean score is 2.17. The value of standard deviation 0.675 shows that responses are distributed more towards the higher side of the average score. The value of skewness -0.222 depicts that the distribution is negatively skewed. The value of χ^2 is 48.63 at 2 degrees of freedom. The value of χ^2 is significant as the P-value is 0.000 which is less than 0.05. The table analysis describes that 83% of the respondents are of the opinion that market facilities increased up to some extent in the project affected area.

The mean value for the opinion that rehabilitation of land ouster by the hydropower projects is 2.32. The value of standard deviation 0.590 and skewness -0.233 reveals that the distribution is negatively skewed, and values are distributed more towards the higher side of the average. The calculated χ^2 value 91.20 at 2 degrees of freedom is significant at 2% level of having P-value as 0.000. Analysis in the table reveals that most of the respondents are agree with the opinion that rehabilitation of the land ouster is accomplished by the hydropower projects up to some extent.

In case of other business activities through hydropower projects development, the mean score is 2.18. The value f standard deviation 0.721 shows concentration of values to the higher side of the average. The value of skewness -0.292 depicts that the distribution is skewed to the negative side. The χ^2 value 27.48 at 2 degrees of freedom is significant at 5% level of significance having P-value as 0.000. As per the analysis 36% percent of respondents believe that hydropower projects have increased other business activities to a great extent.

The mean score for the environmental protection measures by hydropower projects is 2.18. The value of standard deviation is 0.640. The value of skewness and kurtosis is -0.189 and -0.635 respectively; which shows that the distribution is negatively skewed. The calculated χ^2 value 69.03 at 2 degrees of freedom is significant at 2% level of having P-value as 0.000. The table data reveals that 55% respondents have the opinion that hydropower projects developed measures for environmental protection up to some extent.

In case of the opinion regarding aqua culture, the mean value is 2.05. The standard deviation value 0.602 and skewness value -0.021 reveals that the distribution is skewed to the negative side with concentration of values to the higher side of mean value. The calculated value of χ^2 is 104.07 at 2 degrees of freedom. The value of χ^2 is significant as the P-value is 0.000 which is less than 0.05. It is revealed from the table that hydropower projects have affected the aqua culture to a great extent.

In case of the impact of hydropower projects on Herbal Park, the mean score is 1.93. The value of standard deviation is 0.754, which shows that the opinion of the respondents is distributed more towards the higher side of the average. The value of skewness 0.113 shows that the distribution is negatively skewed. The calculated χ^2 value 11.81 at 2 degrees of freedom is significant at 5% level of having P-value as 0.000. The analysis describes that most of the respondents have opinion that hydropower projects adversely affected the Herbal Park in the project area.

The mean value for Nature Club by hydropower project is 1.94. The value of standard deviation is 0.779 and skewness 0.098 shows that the distribution is positively skewed, and values are distributed more towards the higher side of the average. The calculated χ^2 value 5.04 at 2 degrees of freedom is significant at 5% level of having P-value as 0.000. It is observed from the analysis that hydropower projects have minor impact on nature club have impact on the nature club.

The mean score in respect of Gym/Yoga/Sports Centers facilities provided by the hydropower projects is 2.02. The value of standard deviation is 0.779, shows concentration of values to the higher side of the average. The value of skewness -0.049 reveals that the distribution is negatively skewed. The calculated value of χ^2 is 3.65 at 2 degrees of freedom. The value of χ^2 is significant as the P-value is 0.000 which is less than 0.05. The analysis shows that 38% of the respondents are of the opinion that hydropower project authorities have provided Gym/Yoga/Sports Centers facilities in the project affected area.

In case of the spiritual centre developed by hydropower projects, mean value is 2.46. The value of standard deviation 0.671 and skewness -0.886 describes that the distribution is negatively skewed and distributed more towards the higher side of the average. The calculated χ^2 value 82.13 at 2 degrees of freedom is significant at 5% level of having P-value as 0.000. The analysis in the table reveals that 56% of respondents are agreeing with the opinion that hydropower projects have developed the spiritual centers of area.

Table III concludes that hydropower projects have large impact on the services sector of the project area. It has developed the tourism industry in the area, establish market base and enhanced the market and internet facilities in the project area. Hydropower projects also led to development of other business activities in the area. It has partially affected the aqua culture, Herbal Park. The environmental protection activities increased with the inception of hydropower projects. Hydropower projects made provision to the rehabilitation of land ouster and developed the spiritual centers in the affected area. NHPC has also provided facilities of Gym/Yoga/Sports Centers in the project affected areas.

V. CONCLUSION AND IMPLICATIONS

The above analysis reveals that hydropower projects helped to change the lifestyle of general public. The hydropower projects helped to increase the education level and employment opportunities. The inception of hydropower projects changes the consumption pattern and leads to the expansion of market access to the inhabitants of the project area. In case of Infrastructural facilities, the hydropower projects increase the communication facilities and education facilities and also enhanced the health facilities in the project area. Public transportation increased with the development of hydropower projects. Construction and maintenance of roads and bridges are essential parts of hydropower project development. Hydropower projects have large impact on the services sector of the project area.

It has developed the tourism industry in the area, establish market base and enhanced the market and internet facilities in the project area. Hydropower projects also led to development of other business activities in the area. The environmental protection activities increased with the inception of hydropower projects. Hydropower projects made provision to the rehabilitation of land ouster and developed the spiritual centers in the affected area. NHPC has also provided facilities of Gym/Yoga/Sports Centers in the project affected areas.

REFERENCES

[1] D. K. Eckberg, "Cumulative Impacts of Hydropower Development under NEPA," *Environmental Law*, Vol. 16 No. 3 pp. 673-703, 1986.

[2] D. Shripad, "Hydropower from Sardar Sarovar: Need, Justification and Viability," *Economic and Political Weekly*, Vol. 28, No. 48, pp. 2584-2588, 1993.

[3] G. Pradhan, "Exploiting Nepal's Hydropower Potential: Some Prospects," *Asian Perspective*, Vol. 22*,* No. 1, pp. 171-185, 1998.

[4] M. M. Cernea, "Why Economic Analysis Is Essential to Resettlement: A Sociologist's View," Economic *and Political Weekly*, Vol. 34, No. 31, pp. 2149-2158, 1999.

[5] D. Kumar, "Environmental Impact of Inter-Basin Water Transfer Projects: Some Evidence from Canada," *Economic and Political Weekly*, Vol. 41, No. 17, pp. 1703-1707, 2006.

[6] K. Zhou, "Himalayan Hydropower: Alternative Energy in Nepal," *Harvard International Review*, Vol. 33 No. 1, pp. 8-9, 2011.

[7] S. K. Jain, "Sustainable water management in India considering likely climate and other changes," *Current Science*, Vol. 102, No. 2, pp. 177-188, 2012.

[8] D. C. Sharma, "Himalayan floods spark debate about hydropower' *Frontiers in Ecology and the Environment*, Vol. 11, No. 6, pp. 286-286, 2013.

[9] R. Singh and C. S. Vaidya, "Social Impact Evaluation of Implementation of Rehabilitation & Resettlement Plan and Community Development Activities under Nathpa Jhakri Hydro Power Station (Himachal Pradesh)," *Research Report, Agro-Economic Research Centre,* Shimla, 2014.

[10] J. M. Baker, "Small Hydropower Development in Himachal Pradesh: An Analysis of Socio ecological Effects," *Economic and Political Weekly*, Vol. 49, No. 21, pp. 77-86, 2014.

[11] K. H. Sharma and K. P. Rana, "Assessing the Impact of Hydroelectric Project construction on the Rivers of District Chamba of Himachal Pradesh in the Northwest Himalaya, India," *International Research Journal of Social Sciences,* Vol. 3, No. 2, pp. 21-25, 2014.

[12] S. K. Jain, "Assessment of environmental flow requirements for hydropower projects in India," *Current Science*, Vol. 108, No. 10, pp. 1815-1825, 2015.

[13] A. P. Diduck, and A. J. Sinclair, "Small Hydro Development in the Indian Himalaya: Implications for Environmental Assessment Reform," *Journal of Environmental Assessment Policy and Management*, Vol. 18, No. 2, pp. 1-24, 2016.

[14] A. Van Cleef, "Hydropower Development and Involuntary Displacement: Toward a Global Solution," *Indiana Journal of Global Legal Studies*, Vol. 23, No. 1, pp. 349-376, 2016.

[15] Jumani, *et al.,* "Big concerns with small projects: Evaluating the socio-ecological impacts of small hydropower projects in India," Ambio, Vol. 46, No. 4, pp. 500-511, 2017.

[16] M. Raj and C. P. Singh, "Socio-economic Study of Hydro Power Project-affected Tribal Communities in Kinnaur District of Himachal Pradesh," *International Review of Social Science and Humanities*, Vol. 9, No. 7, pp. 293-303, 2019.

[17] P. K. Attri, R. Sood, D. Kumari and A. Kumar, "Hydroelectric power project and its impact on the livelihood of tribes: A Case Study of Holi Tehsil of District Chamba, Himachal Pradesh, India," *International Journal of Social Science and Humanities,* Vol. 2, No. 2, pp. 58-64, 2020.

[18] Economic Survey of Himachal Pradesh different issues.

[19] [Online]. Available: www.nhpcindia.com.

[20] [Online]. Available: http://.himurja.hp.gov.in.

[21] [Online]. Available: www.himachal.nic.in.