



ROLE OF HYDRO POWER PROJECTS IN EMPLOYMENT GENERATION WITH SPECIAL TO KINNAUR DISTRICT OF HIMACHAL PRADESH.

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Abstract : Energy is one of the significant inputs for economic development. Electricity energy is essential for human life and sustainable development. The growth projects, primarily hydroelectric power projects, are measured possible renewable energy sources and supply to supporting the economy at large. The present paper explains the hydropower projects and socio-economic impact due to hydropower projects in Kinnaur district. This paper has been mainly focused on socio economic and employment generation in Kinnaur district of Himachal Pradesh. This study has been based on secondary and primary data. Finally the study concludes that the construction and operation of hydro power projects develop employment opportunities and socio-economic development in Himachal Pradesh.

Key Words: Employment generation, Socio-economic development.

I. INTRODUCTION

Introduction

Hydro Power is one of the most significant inputs for economic development. In addition to its comprehensively popular role as a mechanism to economic movement in different sectors of economy, the power sector marks a straight and broad contribution to economy in terms of income generation, employment opportunities and enhancing the quality of life. The increasing global demand for energy combined with the uncompleted mission for clean, renewable energy has been a topic of perceived interest amongst countries of developing position worldwide. Some renewable energy sources like hydroelectric, wind, solar, and biomass can be used for generation of electricity and for meeting our daily energy demands. Hydroelectric energy is necessary for a sustainable energy future, and it is a renewable energy source depending on the natural water. It has been one of the sources of energy harnessed for centuries in different parts of the world. India has accomplished unexpected progress in the field of power development since independence in 1947.

As the country shifts towards cleaner energy sources and energy demand rises, hydropower, especially pumped storage, is gaining significant traction, particularly for enhancing system flexibility. Hydropower plays different roles such as peak load management, regulation, frequency response and reserve support. Recent policy initiatives, including the waiver of inter-state transmission system (ISTS) charges for hydroelectric plants (HEPs) and the central government's guidelines for pumped storage plants (PSPs), are expected to strengthen the sector in the next few years.

Hydropower Generation in India

Hydroelectric power has always played a significant role in the energy landscape of the country, providing necessary peaking support to the electricity grid, thus enhancing the dependability and flexibility of the power system.

Energy is the greatest essential sector for the progress of a nation. It is predictable for continued existence and necessary for developmental activities to promote education, health, transportation and infrastructure for achieving a reasonable standard of living and is also a critical factor for economic development. With a population of well over billion people a fast growing economy, India electricity demand is likely to dual over the next decade. India currently has 5th rank in the world for potential hydropower capacity, 197 hydropower plants above 25 MW and 9 Pumped storage stations. Around 4800 large dams have been constructed in the country. Hydro generating unit sizes has increased from 22 MW (from the independence) to 250 MW till today. At the time of independence the installed capacity of hydroelectric power was only 508MW and then the number of units operating were only 51. Indian government invests in large amount for the development of hydroelectric power. Building of hydroelectric plant and its commissioning take near about 8-10 years. Thus building a hydro plant need pre planning. Soon after the independence in the year 1948 the construction of Bhakra and Hirakund dam started. The construction of Bhakra dam completed in 1963 and the construction of Hirakud dam completed in 1957. In 1955 the construction of Nagarjuna dam started on the river Krishna and the construction was completed in 1967. Another large scale dam is Indira sagar dam on Narmada River. The construction of the dam was started in 1984 and it was commissioned in 2005. With the passage of time many large dams are built across the nation. Hydroelectric power stations are built across these dams and thus they help in production of large hydroelectric power.

Hydropower Generation in Himachal Pradesh

The Himachal Pradesh has a huge number hydro electricity resources, about twenty five percent of the national potential. About 27,436 MW of hydroelectric power can be generated in the state by the construction of various hydroelectric projects on the five perennial river basins. Out of total hydroelectric potential of the state, 10,519 MW is harnessed so far, out of which 7.6 percent is under the control of Himachal Pradesh Government while the rest is oppressed by the Central Government. The state government has been giving the highest priority for its development, since hydroelectric generation can meet the growing need of power for industry, agriculture and rural electrification. It is also the largest source of income to the state as it provides electricity to other states. Although Himachal has sufficient resources to generate surplus power, in winter less flow of water in rivers and increase in lighting and

heating load can result in power shortages that overshoot ten lakh units per day. Due to bigger industrialization and rural electrification this figure is expected to rise even further.

Review of literature

Sharma et. al (2014) highlighted the social and environmental impact which arisen from hydroelectric power projects. The dam's construction and operation have always been associated with the changes in the social, physical and biological environment. The author has pointed out some negative impacts of hydroelectric projects which includes loss of vegetation, topographical disturbances, and changes in rivers flow patterns, involuntary resettlement, health problems, loss of cultural values and marginalization of local people. The study has covered the surrounding area of hydropower plants. Authors have revealed that the non-governmental organizations (NGO) should come forward with full-time participation to protect the environment by framing appropriate strategies and to make the local people aware of their rights and environment. The study suggested that a state-level interdisciplinary committee on hydropower be constituted with eminent experts like basin planners, botanists, hydrologists, environmentalists, ecologists and socio-economic experts. **Agarwal and Kansal (2017)** analysed the issues and challenges of hydropower projects above 25 MW in the Uttarakhand state of Indian Himalayan. They studied that the existing installed capacity of hydropower occupies about three fourth of the total installed capacity in Uttarakhand state. Further, the study has described the issues and specific problems during the construction of three hydropower projects in Uttarakhand. Finally, they have discussed the overcoming issues and challenges in the Uttarakhand state of the Indian Himalayan region due to hydropower projects. **Miguel et. al (2019)** investigated the supply and requirement of electricity for a rural area in Mozambique. They have studied the nexus approach to improve water, energy and food safety initiated at the local level. The study is based on case study area related to a mini-grid hydropower system and produced energy for 80–200 households. The results show that the villagers have an actual payment ability of between 8 and 19 USD per megawatt-hour of generated hydropower. It is concluded that electricity contributes to uplift the living conditions, provides improved security, sustainable growth for healthcare and small-scale production development. **Ramadoni and Indah (2020)** examined the planning of hybrid micro-hydropower and solar photovoltaic systems for rural areas of Central Java in Indonesia. The Indonesian government has paid much attention to the development of renewable energy sources, especially solar power and hydropower. Data has been collected through field survey to determine the ideal capacity of solar power and micro hydropower hybrid power plants. They have analyzed the electricity load and optimal design of hybrid power plants. The potential of micro-hydropower plants has been obtained by direct measurement on the AncolBligo irrigation channel located at Bligo village in Indonesia. The study concludes that hybrid power plants were able to meet the needs of electrical energy in the villages around the power plant and that excess energy could be sold to national electricity providers. **Sharma (2022)** advocates that Hydropower is an important renewable energy resource and one of the most efficient power generation systems on the planet. Despite all of the benefits of hydropower plants, there may be some drawbacks. However, its growth is accompanied by

negative environmental consequences. Hydropower dams are still being constructed at a rapid pace in the developing world and are causing disturbances to river ecology, deforestation, loss of biodiversity, increased greenhouse gases emissions, as well as displacing thousands of people and affecting their food system, water sources, and agriculture. While environmentalists around the country reject massive projects with large reservoirs, locals in Himachal Pradesh consider modest projects as a scourge as well. The steady deterioration in environmental parameters in the hills has serious connotations for sustainable development, not only for the hill areas, but for the country as a whole. The goal of this research is to look at the environmental effects of hydropower and possible mitigating strategies. In short, our aim has been to study how damming has had ecological impacts on the dislocated people, to assess their reaction, receptivity, and outlook towards the projects. The interview method was adopted for collecting data. Survey has been conducted with the help of a well designed interview schedule. **Zhao et al. (2023)** used the Sino TERM model to assess the regional and national economic impacts of a large hydropower development project. This Sino TERM model is dynamic through labor and capital year-by-year adjustments and accumulation. This paper uses Sino TERM, a dynamic multi-regional computable general equilibrium model (CGE) of the Chinese economy, to analyze the economic impact of large hydropower development projects. The model features regional labor market dynamics and an electricity subdivision module with substitutability between various types of electricity generation. The results suggest that hydropower development will boost economic growth in the project region. Most sectors in the project region will benefit from the hydropower development such as other services, health, and education, while some sectors will suffer a loss in output because of the substantial increase in real wages. For the national, every 10,000 yuan investment can drive the national GDP growth of 1,000 yuan, and the cost is expected to be recovered in ten years. **Sanjeet and Kushal (2024)** focus on the people perceptions regarding the socio-economic impact of Behna Hydroelectric power project. In today's contemporary era, electricity plays a crucial role in a nation's development, by contributing directly and indirectly to its GDP. In this paper researcher analyze the socio economic impacts of hydro power generation. Several hydroelectricity projects have been established worldwide normally give rise to various socio-economic issues such as: displacement of land for local inhabitant, issues of immigration, low compensation for their land and several other consequences. It is essential to the government and project authority to take into consideration these socio-economic impacts and also the perceptions of limited inhabitant of the region regarding the specific issue arise from the execution of hydro power projects. So long term benefits of project can be achieved.

Methodology

The main purpose of this paper was to access the opinion of respondents regarding hydro power projects and employment opportunities provided by projects in affected areas of Himachal Pradesh. The study has been based on Primary as well as secondary sources. Primary data have been collected from the respondents with the help of questionnaire and secondary data have been collected from newspaper, journals reports internet source and other published material. A sample of respondents was taken from Kinnaur District of Himachal Pradesh. Useful responses of respondents were taken for making study more effective and useful.

Objectives of the study

- To analyze the socio-economic impact and employment generation in Kinnaur district of Himachal Pradesh

Analysis and Interpretation

Employment Generation in the Area

The construction and operation of hydro power projects increase employment through creating jobs as it requires diverse workforce.

Table 1: Classified data on the basis of Construction and Operation of Hydro Power Projects Develop Employment Opportunities

Project	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
NJHEPP	3 (9.38)	9 (28.13)	4 (12.50)	6 (18.75)	10 (31.25)	32 (100)
SKPP	3 (9.09)	12 (36.36)	8 (24.24)	4 (12.12)	6 (18.18)	33 (100)
THPP	10 (23.26)	2 (4.65)	15 (34.88)	3 (6.98)	13 (30.23)	43 (100)
KHPP	10 (18.52)	19 (35.19)	14 (25.93)	9 (16.67)	2 (3.70)	54 (100)
SJVP	24 (35.29)	8 (11.76)	11 (16.18)	11 (16.18)	14 (20.59)	68 (100)
KWHPP	4 (3.33)	15 (12.50)	49 (40.83)	37 (30.83)	15 (12.50)	120 (100)
Total	54 (15.43)	65 (18.57)	101 (28.86)	70 (20.00)	60 (17.14)	350 (100)
$\chi^2=98.124;df=20.\chi^2_{crit.}=31.410;p<0.05$						

NJHEPP' denotes NathpaJhakri Hydro Electric Power Project; 'SKPP' denotes ShongtongKarcham Power Project; 'THPP' denotes Tidong Hydropower Project; 'KHPP' denotes Kashang Hydro Power Project; 'SJVP' denotes Sanjay JalVidyutPariyojna; 'KWHPP' denotesKarchamWangtu Hydro Power Project;

Source: Field Survey 2024

Classified data on the basis of Construction and Operation of Hydro Power Projects Develop Employment Opportunities has been shown in the Table no.1. It is estimated from the Table that majority of respondents in KHPP i.e. 54 percent, SJVPP 47 percent and SKPP is 45 percent are either disagreed or strongly disagreed with the statement that hydropower projects provided employment. Whereas the highest percentage of agreed respondents was in KWHPP 43 percent and THPP is 37 percent. Further table shows that 20.00 percent of respondents agreed, 17.14percent strongly agreed, while18.57percent of PAFs disagreed and15.73percent of PAFs strongly disagreed with the statement. The calculated value of chi-square is 98.124, which is higher than the critical value (31.410) at 5 per cent level of significance. It can be concluded that that there is no significant difference in the opinion of sampled PAFs about the statement.

Table 2: Classified data on the basis of the Respondents Opinion towards Employment Generation

Hydro-power Project	Weighted Mean	Concern s- tration of opinion	Std. Deviation	Mean Range	Remarks
NJHEPP	3.344	↑	1.428	2.61-3.40	Neutral
SKPP	2.939	↓	1.273	2.61-3.40	Neutral
THPP	3.163	↑	1.511	2.61-3.40	Neutral
KHPP	2.519	↓	1.094	1.81-2.60	Disagree
SJVP	2.750	↓	1.578	2.61-3.40	Neutral
KWHPP	3.367	↑	0.970	2.61-3.40	Neutral
Total	3.049	↑	1.300	2.61-3.40	Neutral

Note: ↑ denote supper side of the Standard Average Mean Score; ↓ denotes lower side of the Standard Average Mean Score and = denotes equal to the Standard Average Mean Score.

Source: Field Survey, 2024

Classified data on the basis of the Respondents Opinion towards Employment Generation has been shown in Table no.2. Which shows that the majority of the mean value of respondents' opinion in SKPP i.e. 2.939 and followed by KHPP, SJVP are 2.519 and 2.750 is less than the standard average mean score. While the mean value in NJHEPP, THPP and KWHPP, i.e. 3.344, 3.163 and 3.367 is higher than the standard average mean score. The value of standard deviation is very high, which depicts high variability. The mean value of respondents opinion in almost all the projects, except KHPP, falls in the range of 1.81-2.60, indicating neutral opinion. The Table shows that the opinion of respondents is concentrated towards higher side of the mean score. It can be concluded that majority of respondents remained neutral on the statement, but the concentration of opinion gives an impression that hydropower projects resulted in the increase of employment opportunities in the study area.

Conclusion

The present research has been information finding research work conducted on a limited scale. A well-functioning hydro power projects provides employment opportunities and provided infrastructural facilities in the study area. Hydropower development was the main source of economic growth of any Country. Hydro Power is one of the most significant inputs for economic development and employment generation. In addition to its broadly recognized role as a mechanism to economic movement in different sectors of economy, the hydro power sector marks a straight and wide contribution to economy in terms of income generation, employment opportunities. The study concludes that the opinion of the respondents is determined towards higher side of the mean score. It can be concluded that majority of respondents remained neutral on the statement, but the concentration of opinion gives an impression that hydropower projects resulted in the increase of employment opportunities in the area. The Development of Hydro Electric Projects supplies sustainable development by maintaining balance between the quantity of development and quality of environment. From the study it is estimated that more efforts and hard works are required to make sure that the developments do not disturb the reserved equilibrium of the breakable area.

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