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Power and Revenue Generation: A study on hydropower project of Himachal Pradesh

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Abstract

The economic growth of a country may get exposed due to a number of different factors. This paper studies the trend and pattern of socio-economic development in the Himalayan state i.e., Himachal Pradesh. The present paper addresses the power and revenue generation issue of hydropower project Chamera II. The study is entirely based on secondary sources of data. I was collected from various government data providing agencies. The study reveals that there have been about 8 times increase in hydropower electricity in the

Chamera hydropower project – II and there is not significant fluctuations in hydropower production between 2004-05 and 2018-19. It is a positive sign indicating the regular supply of energy to the national power grid and to the national economy as one of the most important economic impacts of the project. The total estimated revenue generated from this project is about Rs. 43715 lacs against the total estimated project cost of rupees 148200 lacs.

Keywords: Hydropower, Revenue, Electricity, Distribution

1. Introduction

Hydropower is considered a clean, green, sustainable and cheap source of energy in long run. Amongst the renewable sources of energy, hydropower has been recognized as the most preferred source of energy due to its inherent benefits (Ministry of Power, 2019:8). Hydropower plays an important role in the development of the country as it provides power at a cheaper rate and is considered a perpetual and renewable source of energy (Sharma and Roy, 2017:12). Hydropower projects leave telling and visible impacts, especially on the economic aspects of the project affected area. It increases the lean season flows, provides flood control, irrigation and drinking water supply and helps in maximum utilization of scarce water resources. (Koch, 2002) (Duflo and Pande, 2007 quoted by Faria *et al.*, 2017:533^[3]). Hydropower projects result in many positive economic impacts and strengthen the economy of the area. Himachal Pradesh is one of the leading hydropower producing states in the country. In order to ensure the more effective results of hydropower generation, the state has made remarkable changes in its hydropower policy over the periods of time. Many hydropower plants have been installed in the state and the Chamera Hydropower project stage - (II) is also one of the main projects of the state.

Most of the previous work about the projects was focused on the problems associated with the socio-economic impacts of the hydroelectric power projects (Choy, 2004, Issacman, 2005, Brown and Xu, 2010 quoted by Chandy *et al.*, 2012:117^[6]). There is a variety of positive impacts also given the fact that the Chamera hydropower project area is a rural area where people largely depend upon agriculture. The same holds true for the state which has shown its higher reliance on hydropower and high access to the grid electricity. The present paper deals with the evaluation of power and revenue generation of hydropower project Chamera-II in specific and general in India.

2. Literature review

There is vast literature available on the development issues of hydropower projects in India. From all over the world scientists, geographers, planners and economists have attracted the attention of various scholars on the issue of economic impacts of hydropower projects. A number of studies have been undertaken by various scholars on the subject and reviewed here to identify the gaps and develop recent research approaches on the issue.

Aydin (2010) investigated the economic and environmental impacts of constructing hydropower plants in Turkey during 2004-2020. The study assessed that increasing renewable energy source i.e., hydropower decreases carbon emissions without reducing economic growth. The net effects of this scenario would reduce even further the cost of adopting environment friendly energy policies.

Oyedepo (2012) [2] examined energy and sustainable development in Nigeria. The study analyzed that the opportunities for conserving energy in our various sectors-office building and residential areas, manufacturing industries, transportation, electricity generation and distribution, and electrical equipment and appliances - presented in this work.

Faria *et al.* (2017) [3] examined the local socio-economic impacts of large hydropower plant development in a developing country. The study reveals that the counties that built hydropower plants had greater GDP during the first few years. The study also reveals that social indicators in counties that built hydropower plants did not statistically differ from others. The study suggests developing an effective mechanism for turning local short-term social and economic growth into long-term economic development.

Tian *et al.* (2020) [7] investigated the assessment power generation potential of small hydropower plants using GIS

software. He analyzed that in terms of cost and energy production a selected plan gives better results and are obtained from the GIS software and Digital Elevation Model (DEM) map showed that decreasing watershed elevation and going along the river and outlet of the watershed, the cumulative discharge increases, thus increasing hydroelectric power generation capacity.

2.1 Objectives of the study

The present study aims at realising the following two objectives:

1. To evaluate the economic impacts expressed in terms of revenue generation.
2. To examine the distribution of free power in the project affected area.

2.2 Study area

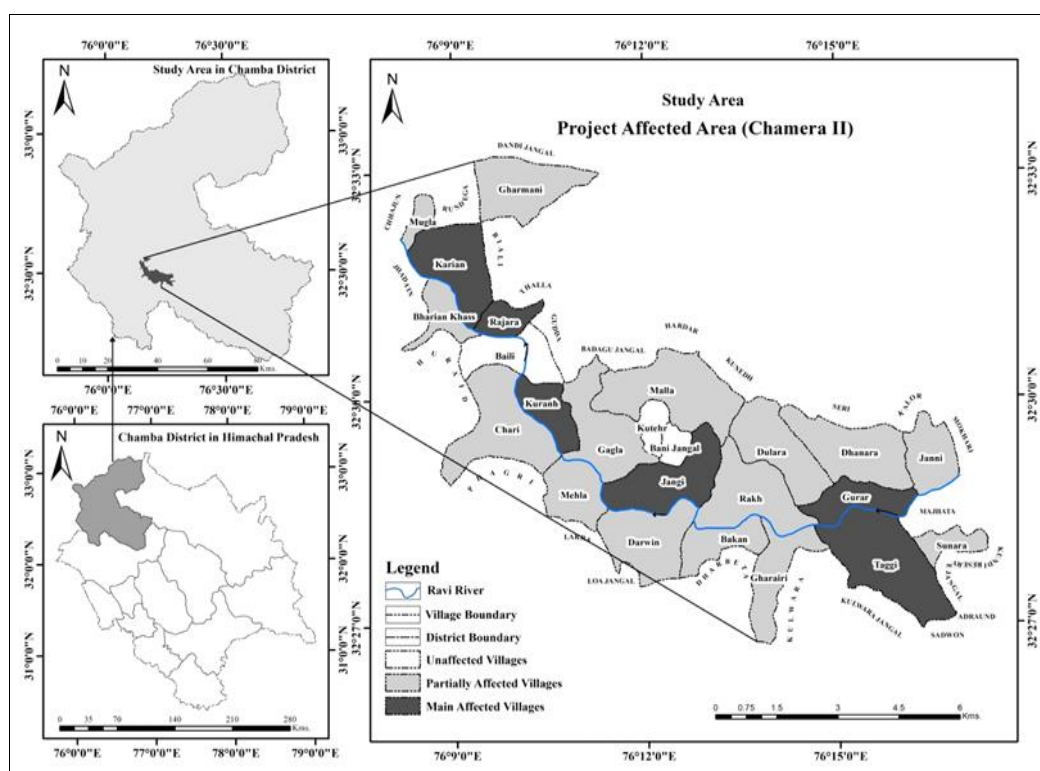


Fig 1: Study area: Project affected area

The study area lies between 32°26'43"N to 32°33'13"N latitude and 76°8'11" E to 76°17'21" E longitude (Fig 1). Sprawling over an area of about 55sq.km, it housed population of about 19,550 persons as per 2011 census. It covers about 0.84% of the total geographical area and about 3.76% of the total population of the Chamba district. In the north, the study area shares the village boundaries with Hardar, Jangal, Gudda, and Thalla. In the east, it shares the boundary with Majhata, Mokhari, Kalor and Seri. In the south, it shares the boundary with Adraund, Sadwon, Kulwara, Dharbeta and Lakra villages and it demarcates the boundary with Phagri, Jhadain and Chhajun villages.

3. Methodology

The current analysis solely relies on secondary data. Data was gathered for the study's purposes from the Chamera-II (NHPC) and NHPC Limited's websites

(<http://www.nhpcindia.com>).

4. Results and discussion

4.1 Project cost of Chamera-II Hyrdo Power Project

Table 1: Study Area: Estimated Cost Spent on Different Sections

Different Sections of work	Estimated Cost (Rs. lacs)
Civil works	655366.46
electrical works	49364.00
Infra-Development and Cost	31300.66
Grand Total Cost	736031.12

Source: DPR Chamera-II, Karian, Chamba

It is evident from the table that the total project cost of Chamera Hydropower project stage-II was estimated to be Rs. 736031.12 lacs. On which a maximum amount of 6,55,366.46 lacs were spent on Civil works while a

handsome amount of 49364.00 was spent on electrical works.

4.2 Hydroelectricity generation and revenue earned

The most straightforward method of computing the economic virtue of investment in a mini-hydro plant is to consider the payback period in years that the net revenue from the plant will take to recover the capital invested (Sarala and Adhau: 2009; 2) [1].

One of the major economic impacts of the hydropower project is the generation of hydroelectricity in the hydropower potential areas. Chamera hydropower project with its total installed capacity of 300 MW has made a

significant contribution in making not only Himachal Pradesh an energy surplus state which helped a lot in making energy-starved countries like India. The present age is the energy age and the whole economy runs on energy. It is against this energy-driven modern life. The Chamera hydropower project has exercised visible and positive impacts on the local as well as the national economy. Table 1.2 reveals the trends in hydropower generation from 2003-04 to 2020-21. It is evident from the table that the Chamera hydropower station produced about 186 million units of hydroelectricity from 2003-04. The total hydro electricity generation increased to about 1508 million units in 2018-19.

Table 2: Study Area: Power and Revenue Generation from Chamera Power Station-II

Years	Hydro Power Generation (Million Units)	Estimated Revenue (Rs. lacs)
2003-04	186.24	372.48
2004-05	1347.56	2695.12
2005-06	1490.47	2980.94
2006-07	1431.55	2863.10
2007-08	1408.09	2816.18
2008-09	1372.43	2744.86
2009-10	1368.50	2737.00
2010-11	1439.49	2878.98
2011-12	1521.82	3043.64
2012-13	1433.48	2866.96
2013-14	1396.00	2792.00
2014-15	1498.64	2997.28
2015-16	1523.99	3047.98
2016-17	1444.02	2888.04
2017-18	1487.06	2974.12
2018-19	1508.4	3016.80
2019-20	1237.20	2474.40
2020-21	684.60	1369.20
Total	23779.55	47559.10

Source: Office of CPS-II Karian, Chamba

The study reveals that there has been about 8 times increase in hydropower electricity in the Chamera hydropower project. The table also reveals that there have not been significant fluctuations in hydropower production between 2004-05 and 2018-19. It is a positive sign indicating the regular supply of energy to the national power grid and to the national economy as one of the most important economic impacts of the project. Table 2 also reveals the trends in estimated revenue generated from the production of the Chamera hydropower project. It is evident from the table that the total revenue generated was Rs. 372 lacs in 2003-04 @ Rs 2 per saleable unit. The total estimated revenue generated increased to Rs 3016.8 lacs during the financial year 2018-19. The study shows that there have been about eight-fold increases in revenue generation between 2003-04 and 2018-19. The total estimated revenue generated from the Chamera hydropower project is about Rs 43715 lacs against the total estimated project cost of rupees 148200 lacs.

Table 3: Study Area: Distribution of Free Power (Million Units)

Years	Free Power
2003-04	DNA
2004-05	DNA
2005-06	DNA
2006-07	DNA
2007-08	DNA
2008-09	DNA

2009-10	DNA
2010-11	DNA
2011-12	DNA
2012-13	1716.32
2013-14	1670.18
2014-15	1792.74
2015-16	1819.46
2016-17	1721.15
2017-18	1337.72
2018-19	1789.96
Total	11847.53

Source: Directorate of Energy, Shimla
DNA: data not available

Directorate of Energy’s physical and financial achievements made during the financial year 2018-19 (upto December 2018) are enumerated as under: Policy Amendments: - In order to overcome the recession in the hydro sector and to encourage investment in hydropower development in the state, the following amendments in the Hydro Power Policy were carried out: -

Deferment of 12% free power share for a critical period of 1st-time band i.e., for initial 12 years and the deferred quantum shall be recovered in the next 28 years in a uniform percentage rate for allotted projects excluding already commissioned projects.

The Free Power Royalty will be charged @ 12% uniformly for the entire agreement period for the projects to be allotted.

Mandatory purchase of power by Distribution Company of India (DISCOM) for projects having capacity upto 25 MW.

The tariff determination will be from the date of achieving commercial operation date CoD instead of the date of signing of the implementation agreement (IA).

Exemption in Open Access Charges for projects having capacity upto 25 MW.

Re-defining of Milestones for stalled projects where 100% equity transfer is involved (Himachal Pradesh Economic Survey 2018-19: 83-84).

5. Conclusion

While evaluating the economic impacts of Chamera hydropower project stage II, it was observed that the total project cost was estimated to be Rs. lacs. The study shows that the Chamera hydropower station produced about 186 million units of hydroelectricity in 2003-04, which increased to about 1508 million units in 2018-19. The study shows that there has been about an eight-fold increase in revenue generation between 2003-04 and 2018-19. The total estimated revenue generated from the Chamera hydropower project is about Rs 43715 lacs against the total estimated project cost of INR 148200 lacs. The rise in both electricity generation and revenue may be taken as the largest contribution to the progress of the nation, promotion of energy supply and employment avenues in the area.

6. References

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