ISSN : 2395-4132

THE EXPRESSION

An International Multidisciplinary e-Journal

Bimonthly Refereed & Indexed Open Access e-Journal

Impact Factor 6.4

Vol. 9 Issue 4 August 2023

Editor-in-Chief : Dr. Bijender Singh

Email : editor@expressionjournal.com

www.expressionjournal.com

The Expression: An International Multidisciplinary e-Journal
(A Peer Reviewed and Indexed Journal with Impact Factor 6.4)
www.expressionjournal.com ISSN: 2395-4132

IMPACT OF CLEAN DEVELOPMENT PROJECTS ON AGRICULTURE: A CASE STUDY OF CHAMBA DISTRICT (HIMACHAL PRADESH)

PRASHANT KUMAR
Department of Geography, Delhi School Of Economics
Delhi University (prashantkumar5063@gmail.com)
DR. MONICA AHLAWAT
Assistant Professor, Dr. Bhim Rao Ambedkar College
Delhi University (monica_ahlawat@yahoo.co.in)

Abstract

Mountain economies are undergoing transformation from traditional agrarian to more industrial` or service oriented economies. Such changes invariably have socioeconomic impacts on nearby communities and lead to fragmentation and rural depopulation. Since 1800 B.C., 45,000 dams are built across the world. Most of the dams were built to provide for irrigation, power generation and controlling of floods but these also altered and diverted the flow of the rivers leading to huge environmental loss and significant impact on agriculture. During the last few years, hydroelectric projects in hilly areas have attracted attention as apart from electricity generation it is also a source of reducing carbon emission such projects are called Clean Development Projects. These CDM projects also help in improving livelihood condition in the area. Construction and operation of dams have always been associated with changes in the social, physical and biological environment. Some of the negative impacts of these projects include loss of vegetations, topographical disturbances, changes in rivers flow patterns, involuntary resettlement, health problems, loss of cultural values and marginalization of local people. Hydropower development adversely affects the productivity of agriculture by degrading or depleting a number of natural resources that constitute vital agricultural inputs. Perhaps the most obvious way hydropower development restricts agricultural productivity is by reducing the supply of agricultural land. A loss of forest land, both as a direct and indirect is result of hydropower development, which further constrains horticulture productivity. Chamba district of Himachal Pradesh has 12 CDM projects. This study examines the community perceptions of the environmental and socioeconomic impacts of these projects in rural areas and considers implications for future sustainable livelihoods. The study is based on the random sampling of 100 respondents at various locations. A semi-structured questionnaire was prepared and interviews from different sections of the community were taken. It was found that many short term benefits such as employment in the projects have accrued to the rural community from these economic development projects but at the same time changes in land use and occupational structure have adverse impacts on agriculture. It is argued that there is a need to support new types of land based economic activities on abandoned agricultural lands, reclaim degraded lands, and introduce new products and production methods, and suggest the local people for better investment options for their sustainable future livelihood options.

Keywords

Livelihoods; Sustainability; Hydroelectricity; Land Use; Agriculture.

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INTRODUCTION

The Clean Development Mechanism (CDM) is an avenue for industrialized countries to undertake carbon abatement projects in developing countries. The mechanism is an element of the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC). Carbon abatement credits occurring from these CDM projects can be used by developed countries to meet their Kyoto emission reduction targets.

The CDM is one out of three 'flexible mechanisms' designed under the Kyoto Protocol to the UNFCCC. It allows developed countries to undertake GHG emission reduction (or emission removal) projects in developing countries to fulfill their own domestic emissions targets. Each CDM project generates Certified Emissions Reduction (CER) units, where one CER is equivalent to one tonne of carbon dioxide (CO2) or its equivalent for the other GHGs. CER units can be exchanged or sold, and finally used by industrialized countries to meet part of their emission reduction targets under the Kyoto Protocol.

Under the Kyoto Protocol, a CDM project must provide real, measurable and long-term benefits relating to the mitigation of climate change. It must produce a reduction in emissions that would not occur in the absence of the particular project undertaken. There are varying views over whether these particular outcomes are being achieved, and any program should be assessed over its declared aims in the first instance. The CDM's declared aims are:

- to accomplish the overarching goals of the UNFCCC – namely to prevent dangerous interference with the climate system;
- to encourage sustainable development in developing nations; and
- to reduce the cost of complying with the provisions of the Kyoto Protocol for developed nations.

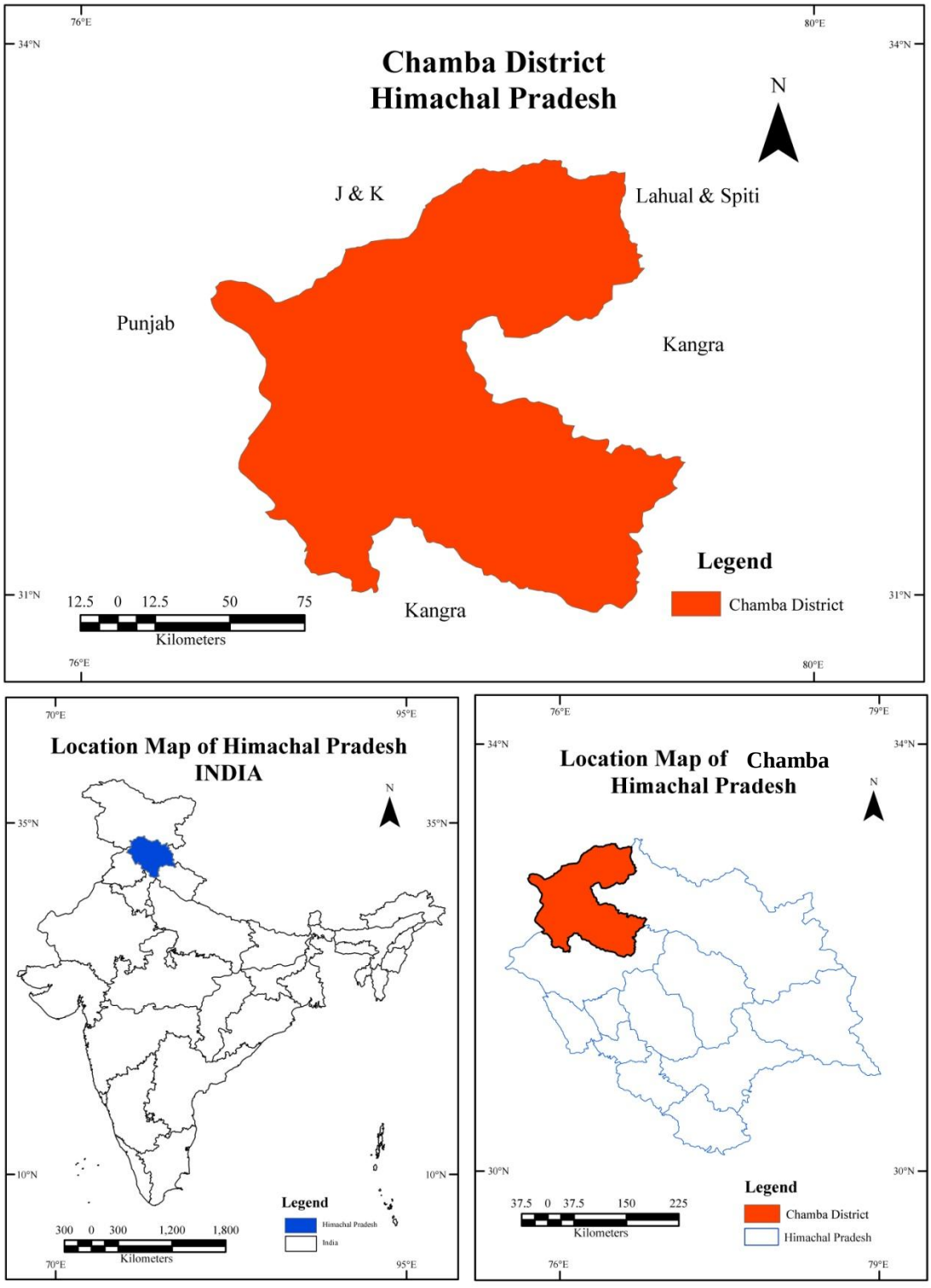
CDM projects (Hydropower) development is occurring on rivers where irrigation, livestock rearing, and other natural resource-based activities are already stretched in their ability to meet local residents' livelihood needs and is affecting the agricultural practices.

Water is the central thread that interweaves energy (e.g., mechanically powered mills, electricity generation), agriculture (irrigated and rain fed crops, fodder for livestock), fishing, and ecosystems (provisioning of water, regulation of micro-climates) a prime example of the water–energy–food nexus. Yet, the integration of hydropower as the newcomer into local and basin-scale resource-use practices poses very significant challenge to agriculture. Purpose of this paper is to identify the impact of CDM projects on agriculture of Chamba district in Himachal Pradesh and suggests methods to overcome this problem.

STUDY AREA

Himachal Pradesh is known to its snow fed rivers and rivulets flowing in almost all parts of the state. The Sutlej, Yamuna, Beas, Ravi and Chenab are the main rivers in the Himachal Pradesh. Himachal Pradesh is called the 'Power state' having high potential to produce electric energy. The emphasis is not just on generating electricity, but to generate clean power with sustainable technology use which is less damaging and more environmental friendly.

Chamba is bounded on north-west by Jammu and Kashmir, on the north-east and east by Ladakh area of Jammu And Kashmir State and Lahaul and Bara-Bangal area of Himachal Pradesh, on the south-east and south by the District Kangra of Himachal Pradesh and Gurdaspur District of the Punjab. The Chamba District is situated between north latitude 32° 11" 30' and 33° 13" 6' and east longitude 75°49" and 77° 3" 30' with an estimated area of 6528 square Kilometers and is surrounded on all sides by lofty hill ranges. The territory is wholly mountainous with altitude ranging from 2,000 to 21,000 feet.


Chamba District
Himachal Pradesh
N
J & K
Lahual & Spiti
Punjab
Kangra
Kangra
Legend
Chamba District
12.5 0 12.5 50 75
Kilometers
Location Map of Himachal Pradesh
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Location Map of Chamba
Himachal Pradesh
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Chamba District
Himachal Pradesh
37.5 0 37.5 150 225
Kilometers

According to the 2011 census Chamba district has a population of 518,844. This gives it a ranking of 544th in India (out of a total of 640). The district has a population density of 80 inhabitants per square kilometer. Its population growth rate over the decade 2001–2011 was 12.58%.Chamba has a sex ratio of 989 females for every 1000 males, and a literacy rate of 73.19 %.**(Economic Survey, 13-14).**

RESULTS AND DISCUSSION

CDM Projects in Chamba: Chamba district is one of 12 districts of Himachal Pradesh. Chamba district has two main rivers The Ravi and The Beas. Like other river basins of the state, hydro-electric power generation in Chamba district has been started way back in 1980s with the installation of first power project owned by NHPC (National Hydroelectric Power Corporation Ltd.). Currently there are 12 CDM hydro power projects of different magnitude and they are in different stage of completion. These hydro power projects serve the purpose of reducing carbon emission but in matters of supporting local population in livelihood security things do not look good. In 2006 the Ministry of Panchayati Raj named Chamba one of the country's 250 most backward districts (out of a total of 640). It is one of the two districts in Himachal Pradesh currently receiving funds from the Backward Regions Grant Fund Programme (BRGF). Area under agriculture and agricultural diversity has also decreased in the district

In other words it can be stated that this district has been heavily targeted for the hydroelectric power generation as well as generation of carbon credit. A large number of CDM projects in Chamba district in Ravi and Chenab basin are either installed or proposed to be installed. The following table is presenting a clear picture of such of developmental activities in Chamba district (table-1).

There are mainly two types of hydropower projects:-

Reservoir Hydro Power Projects: Most commonly, hydropower dams partially block the water flow of a river to create a reservoir with the capacity to store water. Larger reservoirs can cope greater fluctuations and flow over a longer time period to provide both base and peak power generation, while smaller reservoirs typically provide only base power generation because of the impacts of variable discharge rates.

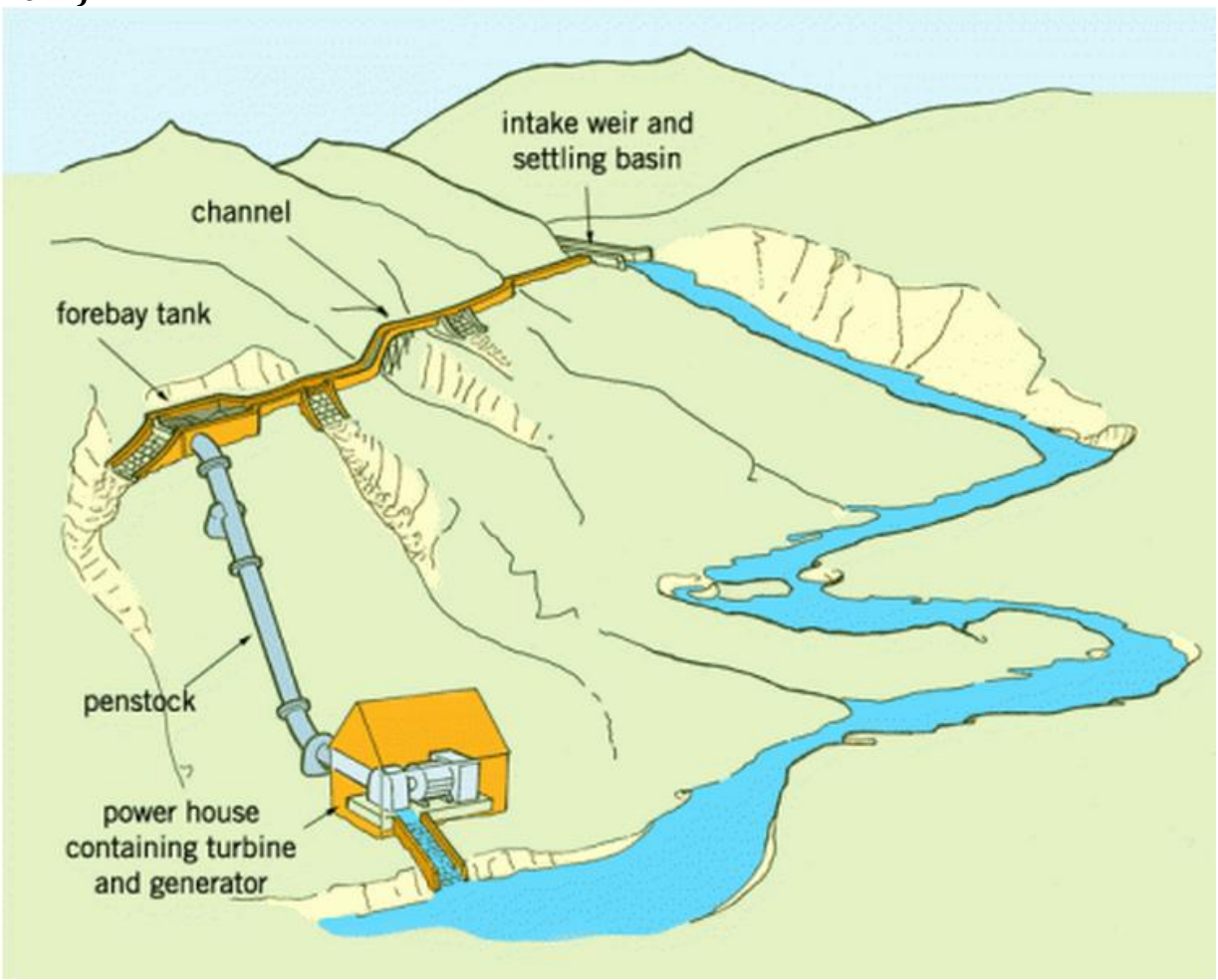
Table 1 - CDM Projects in Chamba District

Name of Power Project	Name of River/ nallah	Classification	Installation Capacity (in MW)
Dunali	Ravi (Baleni ka Nallah)	Small	5
Dhar Grid	Ravi	Small	5
Sahu	Sahu	Small	5
Kalm	Kalm	Small	2
Bundled Hydro power project	Ravi (Belij nallah)	Small	7
Ubhara	Ravi (Ubhara)	Small	2.4
Upper Khauli	Beas (Khauli Khad)	Small	5
Drinidhar	Beas (Brahl khad)	Small	5
Upper Taraila	Ravi (Baira nallah)	Small	5

Taraila II	Ravi (Baira nallah)	Small	5
Hydroelectric Project at Kutehr	Ravi	Medium	240
Chirchind	Ravi (Chirchind)	Small	5

source: cdm.unfccc.int/Reference/Documents

Run-of-river Hydro Projects: Run-of-river dams utilize some or all of a river's flow to produce electricity without impounding any significant amount of water to upstream. As a result, run-of-river facilities have no storage capacity to buffer fluctuations in water flow. These facilities provide only base power generation hence lacks the ability to store water for periods of peak demand. Run of- river hydropower is found most commonly in North America Europe and Asia. Run-of-river systems do not rely on a reservoir. Generation capacity can vary significantly depending on seasonal river flows. Run-of-river schemes can vary in size. **(Gopalakrishnan, M, 2012)**



Picture 1: A sketch of Run-off-River project

Most of the CDM projects in Chamba district are Run-off-river. So there is no storage of water but there is diversion of water as shown here in figure 1. Due to diversion of the water there is generally a stretch of 5 km that has low water in river than normal flow thus affecting the agricultural practices of the people in the nearby area.

IMPACT OF HYDROPOWER PROJECT ON AGRICULTURE

Most of the CDM projects in Chamba district are Run-off-river. What has been overlooked is that these projects are supposed to conserve environment and promote sustainable development but they affect local livelihood of remotely located poor and tribal communities and fragile biodiversity ecosystems in numerous ways. In most of the cases, these rivers and streams support the traditional irrigation channels and watermills. In many villages of the study area the streams are even main source of drinking water to the inhabitants.

Run of the river projects typically involves construction of tunnels through mountainous areas. In this case the mountains happen to be the Himalayas, which are still rising and still very fragile. The tunnel can run for several kilometers diverting the water flow as seeninpicture2.

Picture 2: A tunnel diverting river towards power house

CDM projects involving the construction of tunnels have resulted in immense loss and hardships to the local people on account of natural water sources drying up as seen in picture 3. Once a natural water source dries up, it is difficult to make available the same quantity and quality of water to the local people.

Picture 3: A dried stream

Even if source does not dry up its diversion creates all sorts of problems. If a river stream is diverted the lower villages whose agriculture is completely dependent on the river suffers. They face problems as such reducing crop diversity, reduced livelihood, forced migration etc. as seen in table 2. Hydropower development adversely affects the productivity of agriculture by degrading or depleting a number of natural resources necessary for agricultural production. Perhaps the most obvious way hydropower development restricts agricultural productivity is by reducing the supply of agricultural land. A loss of forest land, both as a direct and indirect is result of hydropower development, which further constrains horticulture productivity.

Deforestation affects horticulture by accentuating flood and drought events and destabilizing soil. Throughout the district people attribute the decrease in crop production, air pollution, decreased precipitation, water percolation and lack of moisture in the soil due to establishment of hydro power projects. People's opinion is that if we have our apple orchard, why are the power projects destroying them and forcing us to take up daily wages jobs like sweeper, gardener or security guards.

TABLE: 2 IMPACTS OF CDM PROJECTS ON AGRICULTURE

ISSUES	INCREASED	DECREASED	NO CHANGE
AGRICULTURAL AREA	0	88	12
IRRIGATION FACILITIES	4	42	54
CROP DIVERSITY	15	74	11

LIVELIHOOD	13	45	42
JOB OPPURTUNITY	26	51	23
MIGRATION	56	8	36

Source: primary survey

Most of 100 correspondent agree here that hydropower projects in their area has led to reduced agricultural area which was mostly caused by land taken away for the project or reduction of water in streams. Villagers also agree that this reduction of agricultural area as well as irrigational facilities have led to less crop diversity. These changes have adverse impact on agriculture and crop diversity has also decreased as villagers now refrain from water intensive crops. So now villagers are only focusing on crops that require less irrigation.

These practices in agriculture have led to reduced livelihood and job opportunity in the area and more and more people are forced to migrate outside in search of better job opportunities. As we can see from table 2 that CDM projects which are supposed to promote sustainable development in the area are causing ecological imbalance in the area and damaging the traditional livelihood and agriculture of the area.

CONCLUSION

Hydroelectric Projects are generally supposed to be good for nature but sometimes it's opposite. Dams on rivers may permanently alter course of river affecting the surrounding land, aquatic life livelihood of people living there. Sometimes it leaves people without home, without any source of livelihood and nowhere to go. So for future considerations the local issues must be taken into consideration. The policies should be framed by accurate examination of local sites so that the proportionate balance between biotic and its components of the environment can be maintained and the potential capacity of rivers can be utilized properly. The nongovernmental organizations should come forward with full time participation to protect the environment and by taking appropriate strategies and to make the local people aware about their rights. Last but not the least suggestion will be to involve villagers in decision making. They should have a larger say in things because it not only affects the environment it affect their livelihood too. CDM projects can go a long way into solving problem of clean energy but it shouldn't happen at the cost of people.

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