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Small Hydro Power in India: Is it a sustainable business?

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HIGHLIGHTS

- SHP industry in India depicts both strengths and weaknesses.
- Numerous obstacles impact the profitability of the SHP projects.
- Alternate funding options and formalized clearance procedures need to be addressed.
- Environmental awareness and technology research investments should be developed.
- Relationships with all stakeholders need to be strengthened.

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ABSTRACT

Small Hydro Power (SHP) is one of the most important renewable energy generation sources. It is a cost-effective technology that is being used for rural electrification in the developing countries including India. The Indian government is providing attractive initiatives to the private investors to promote faster development of SHP. Until now, a lot has been written about assessment, potential, advantages and the technical aspects of the SHP plants. However, the important business sustainability perspective has not been yet subjected to empirical analysis. Sustainable development involves three interconnected dimensions: social, economic and environmental sustainability. This paper attempts to investigate whether SHP business in India is a sustainable business. The study is based on the analysis of qualitative data acquired through 28 in-depth interviews with various actors that are connected to the SHP industry in India which include Independent Power Producers (IPPs), manufacturers, designers, consultants and representatives of various government organizations. The empirical material was collected in four states of India namely New Delhi, Himachal Pradesh, Uttarakhand and Jammu and Kashmir (J&K) in February, 2013. The data was acquired by individual in-depth interviews, group discussions and direct observation of one SHP plant. The results show that all the three dimensions of sustainability are being realized to a certain extent. However, utmost efforts have to be undertaken in order to call this sector completely sustainable. Both benefits and challenges in all these dimensions are highlighted and recommendations towards a sustainable SHP sector are provided. Further, this study also proposes suggestions for the interested investors.

1. Introduction

The Brundtland Commission's definition of sustainable development as the "development that meets the needs of present generations without compromising the ability of future generations to meet their needs" points towards a concern for the natural systems as well as the social welfare [1]. Sustainable development reflects three interrelated dimensions: social equity, economic prosperity and environmental quality [2]. This definition signifies that these three dimensions should be realized as dependent to and in harmony with each other. In order to achieve sustainable development, the role of business sector is very important. Development of the sustainable business or green business is vital for achieving long term sustainability. Green business encompasses the social and economic dimensions alongside environmental protection in order to maintain the sustainability of the business [3]. Green business understands how to address economic, social and environmental challenges holistically in order to create a better world [4].

In this context, the green energy businesses have received a lot of attention as they generate clean renewable energy by taking into account the environmental concerns and minimizing the release of greenhouse gases during the generation process unlike the non-renewable energy sources. These green energy businesses are instrumental in meeting the energy needs of people without

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depleting the resources of the planet. One such green energy generation source is the hydropower—a renewable energy source where power is derived from the energy of water moving from higher to lower elevations [5]. The focus of this study is to investigate the Small Hydro Power (SHP) sector in India where it refers to hydro-electric projects with capacity generation of less than 25 MW. SHP is considered to be one of the most cost-effective energy technologies to be considered for rural electrification in less developed countries [6]. Its importance has been favoured at the sustainable development forums worldwide. SHP is seen as an innovation as compared to the big hydro projects that involve rehabilitation and resettlement problems as well as prolonged installation periods. SHP units are attractive renewable energy generation sources that are economically viable and require a short time for implementation [7].

The Indian government is promoting SHP and offering incentives to private investors for establishing such businesses in order to promote economic growth. Much has been written about the assessment, potential, advantages and the technical aspects of SHP plants in India. However, the important aspect of business sustainability perspective has not been yet subjected to empirical analysis. Therefore, this paper aims at finding out whether SHP in India is a sustainable business. This is done by investigating the SHP business sector by taking into account complex network of stakeholders who share different interests. This research attempts to answer the questions: Is the SHP business in India a sustainable business? Does it realize all the three dimensions of sustainability? It also proposes suggestions for investors.

The main contribution of this research is to show the sustainability perspective of SHP business industry in India. It is also important as it provides suggestions to the investors who plan to invest in the SHP sector within India.

2. Hydropower as a sustainable energy source

Many studies have been conducted so far regarding the potential of hydropower to improve economic viability, preserve ecosystems and enhance social justice. Hydropower projects that are developed and operated in an environmentally sound, economically viable and socially responsible manner represent sustainable development at its best. Such projects can make significant contributions to achieving sustainable development [8]. Hydropower potential has been identified in developing countries as well as countries like Canada, Turkey and Russia. In Western Europe and the US, the additional hydropower potential is limited, not just because of advanced development but also due to environmental and political reasons [9]. Further, the economic and environmental and technical benefits of hydropower makes it an important contributor to the future world energy mix, particularly in the developing countries [10]. SHP projects are sustainable sources of energy as they not only require inexpensive equipment and construction work but the cost of energy generation is also inflation free and these schemes promise quick financial returns. Other benefits include irrigation, water supply, flood prevention, fisheries and tourism which make these projects self-sustainable [11]. SHP can significantly contribute to the well-being and economic health of communities [12]. In spite of these benefits, many barriers remain against SHP development throughout the emerging markets. The governments of these countries have to frame suitable policies in order to promote rapid expansion of the SHP projects [13].

3. SHP development in India

India faces tremendous challenges in meeting its energy needs. India's national average per capita electricity consumption is very low at 778.63 kW h [14]. The government needs to increase its power generation capacity and utilize every available source of power generation. In this context, the development of hydropower is considered to be of high significance. Hydropower is an energy source where power is derived from the energy of water moving from higher to lower elevations. The installed capacity of hydropower by the end of 2012 contributed 16% of worldwide electricity supply [5]. Hydropower projects are categorized into two segments: large hydro and small hydro [7]. In addition to the development of the large hydro power projects in India, the government is also encouraging generation of power through SHP sources. This classification of hydro-electric projects depends upon the installed capacity which is different in every country. There is no worldwide consensus on the classification of hydropower projects on the basis of installed capacity due to varying development policies in different countries [5]. To date there is still no internationally agreed definition of 'small' hydro; the upper limit varies between 2.5 and 25 MW [6]. In India, SHP refers to hydro-electric projects with capacity generation of less than 25 MW. SHP plants can also be classified according to their function and based on source of water, as run-of-river, canal-based and dam toe schemes [15]. The renewed interest in renewable energy sources makes the SHP development a subject of interest worldwide [16]. Among other renewable energy generation sources, SHP has a potential to play a critical role in improving the overall energy scenario of India, especially for the remote and inaccessible areas [14]. SHP is one of the most cost-effective energy technologies to be considered for rural electrification in less developed countries [6].

India has a tremendous hydropower potential that has not been completely harnessed. In India, an estimated potential of 15,384 MW for SHP plants has been established and a capacity of 3300 MW has been installed so far [8]. The government has planned to increase the SHP installed capacity to 8500 MW by the end of 2021 [14].

The Indian government has instructed the states to set preferential tariffs for SHP [17] and offer financial incentives including capital subsidies [14]. Currently, the SHP projects are essentially private investment driven and this sector is handled by the Ministry of New and Renewable Energy [14]. The government is trying to attract investors by providing good incentives for SHP development. Twenty-three states of India have announced policies for setting up the commercial SHP projects through private sector participation.

4. Understanding sustainable business

According to World Council for Economic Development, for any development to be sustainable, the most important issues that need to be addressed are economic efficiency, social equity and environmental accountability. Sustainable development is a grand paradigm based on these three pillars. Balancing these three aspects in order to meet our needs today will have a large impact on our future generations [18].

Today, businesses require a better understanding of all the operational aspects and their interconnectedness to the social and environmental interface in which they operate. They need to make more informed decisions in order to achieve long-term sustainability [19]. A business could be called as sustainable only if it considers the interdependence of the three pillars of sustainability: economic development, social development and environmental conservation.

Sustainable business promotes green technologies, improves the business environment as well as attempts to attain environmental objectives like decreasing carbon intensity, protecting the environment, reducing emissions and preventing loss of bio-diversity [20].

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