DETERMINANTS OF SUCCESS AND FAILURE OF COMMUNITY BASED MICRO HYDRO PROJECT

Abstract

Ladakh Ecological Development Group (LEDeG) has implemented more than 70 community based micro hydro projects in Leh and Kargil Districts of Ladakh ranging from 0.5kW to 30kW. The initial project was implemented to address the lighting needs of project villages. However, for the last five years, micro-hydro projects were utilized to support income generation measures. Though micro-hydro is a simple and proven technology, yet almost one-fourth of the units installed by LEDeG have failed. This study aims to identify the factors that are responsible for the failures and successes of micro hydro project in Ladakh. For the study, 32 micro hydro sites consisting of 16 failure and 16 successful cases were analysed. The study adopted both quantitative and qualitatively methodologies. For the quantitative analysis, data was collected from 90 respondents and the factor analysis method was used for data analysis. Focused group discussions and interviews were conducted with different stakeholders. The study indicated that for its success, 60% of the variances in variables could be explained by two factors (1) proactive villagers (2) good management. While 67% of the variance in the failure factor could be explained by three factors (1) lack of good planning (2) village dynamics (3) inefficient management. The relative weightage and the nature of the factor contributing to both the success and failure were also quite different. Overall, in both success and failure cases, the main factors responsible were social and management reasons, not technical reasons.

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1. Background - Ladakh and Micro Hydro

Ladakh region consist of two administrative districts of Jammu and Kashmir State in India. The region is scattered over an area of 45,000 km² bordering Pakistan to North and Tibet to east. The study area Leh is located at latitude 37◦75'05" to 37◦87'29" North and Longitudes 73◦10'66' to 73◦99'99" East. The region experiences a severely cold winter with minimum temperature as low as -40◦C. Ladakh on average receives an average rainfall of 55 mm per year and the cloud free days range from 250-300 days in a year. The annual average global solar energy on a horizontal plane in the region varies from 5530 to 6360 Whr/m²/day.

Remote villages of Ladakh have for long been deprived of electric power. Government and non-government organizations have introduced various decentralized options for electrification like small diesel generators, solar home lighting systems, and micro-hydro projects to address the electrification problem of remote villages. Among all these options, micro-hydro and solar home lighting system have experienced wide-spread success across different parts of Ladakh. For the success of the micro-hydro, Ladakh Ecological Development Group (LEDeG) has played a key role. LEDeG in collaboration with Bremen Overseas Research and Development Agency (BORDA) has been promoting environment-friendly decentralised basic need services (DBNS) in the Himalayan region for the last two decades. Under this collaboration, with support from various national and international organizations like European Union, Groupe Energies Renouvelables, Environnement et Solidarities (GERES), Ministry of New and Renewable Energy (MNRE) and so on, LEDeG has installed more than 70 units of Community Based Micro Hydro (CBMH) projects in the range of 0.5 kW to 30kW.

2. Context and study Objectives

Although LEDeG has successfully installed more than 70 community-based micro hydro projects in the region, many projects met with failure. Technically, if installed professionally and successfully, there should not be any reason why the micro-hydro should fail in a short-span of time. It is a simple and proven technology, tested for over a century in different parts of the world. From a social and management perspective, for the success of any developmental intervention, the presence of a need and the affordability of the option provided are the key factors for its success. In the case of LEDeG's hydro project villages, the need for electrification was apparent from the fact that there was no electricity service in the villages and it was usually the villagers who requested LEDeG to install the micro hydro. Once installed, the fee collected was either minimal or none at all as in some cases. LEDeG's micro-hydro intervention fulfilled not only the above cited key social and technical factors for success, but many other factors such as proper capacity building, technical support, local ownership etc. However, despite the presence of many favourable conditions for the success of the micro-hydro unit in Ladakh, LEDeG has faced many failures. These failures and their repetition over the years have raised important questions. Why are some hydro-projects successful, while many others meet with failure, especially when the same hydro- technology is applied in almost similar villages or contexts? In the light of such field base experiences, this study was commissioned to understand the determinants of the success and failures of community based micro-hydro projects in Ladakh. More specifically, the objective of the study was (1) what are the factors responsible for success of micro hydro project in Ladakh? (2) What are the factors responsible for the failure of micro hydro projects in Ladakh? By considering Ladakh as a case study, this study also aims to get a deeper insight into reasons for success and failure of community based energy interventions in general.

3. Methodology of the Study

Data collected from primary and secondary sources have been used. The secondary data used was retrieved from LEDeG project documents and database, and reports published by various organizations working for development and promotion of renewable energy in different countries. The primary data had been collected in April 2007 of 32 different cases (16 success and 16 failure cases). The total number of respondent was 90. The respondents were clustered as consumer, Electricity Management Committees (EMC) and operators of hydro power unit.

To quantify the determinants of success and failure cases, the factor analysis method[1] has been adopted. Respondents were questioned as to the degree of impact from 1= very low impact to 5=very high impact. Statistical software SPSS was used for data quantitative data analysis. Various statistical theories were used to group these variables into factors, calculating their weightages and contribution to either success or failure cases.

The quantity method and the result derived were supplemented by detailed case studies of each of the 32 cases. Group discussions and interviews were held with various stakeholders such as villagers, LEDeG staff, technician, decision makers and women groups. Discussions and interviews were held at two stages, in the first stage, potential variables/factors for success and failures were listed and in the second stage, the identified factors through quantitative analysis were discussed and analysed. On the basis of the initial interview and discussion the variables identified for success and failure are presented in Table-1 and Table-2.

1 *To mention just a few steps of the statistical analysis: calculation of mean of impact, test of statistical significance, test of correlation between variables, factors are derived from variables, their percentage of responsibility has been calculated*

4. Results:

Table 1 : Variables for Failure

Serial No.	Variable
1	Unequal Income distribution
2	Village politics / Differences among people
3	Water dispute
4	Untrained Operator
5	Change of Operator
6	Availability of alternate energy sources
7	Inability of unit to meet the village demand
8	Non Existence / Problems among EMC members
9	Natural Calamities
10	Seasonal Changes / Water Shortage
11	Absence of Initiators / Active persons
12	Land Owner Creating Problems
13	Inefficient Monitoring of MHU
14	Misuse by villagers
15	Problems in Tariff Collection
16	Technical problems with equipment
17	No funds for maintenance & repair

Table 2 : Variables for Success

Serial No.	Variable
1	Introduction of income generation schemes
2	Supportive attitude of villagers
3	Proper training facilities for operator
4	Efficient functioning of EMC
5	Proper maintenance of equipment by LEDeG
6	Proper maintenance of equipment by operator
7	Proper maintenance of equipment in off-season
8	Availability of appropriate energy mix
9	Timely collection of Tariff
10	Proper management of funds
11	Availability of Perennial source
12	Initiative by villagers
13	Availability of funding
14	No alternative power source

The above identified variable was analysed further using a statistical method called Factor Analysis. With the help of this method, five main reasons for success and failures were extracted.

The five factors for success explain 95.7% of the variability, while 91.2% of the analysed failures variability is explained by the reported five factors. Table 1 shows the distribution of the 14 reasons for success and the 17 reasons for failure according to the extracted factors. In addition it shows the percentage contribution of each of the five factors to the analysed projects success or failure.

Table 3: Extracted Factors responsible for success (out of 14 reasons) or failure (out of 17 reasons)

Success of MHU

Factor	Variables	Resp
Proactive Villagers	Supportive attitude of villagers Initiative by villagers Introduction of income generation schemes Proper management of funds	33.5%
Effective management	Proper training for operator Efficient functioning of EMC Availability of funding Proper maintenance of equipment in off-season Timely collection of tariffs Proper maintenance of equipment by operator	27.3%
Good planning and support from LEDeG	Proper maintenance of equipment by LEDeG Availability of perennial source	14.5%
Use of appropriate mix of power	Availability of appropriate energy mix	11.7%
No alternative power source	No alternative power source	8.7%
		Total 95,7%

Failure of MHU

Factor	Variables	Resp
Lack of good planning	Technical Problems No funds for repair Water dispute/water shortage Inefficient monitoring of MHU	27.5%
Village Dynamics	Dispute amongst villagers Land owner creating problems Unequal income distribution	21.3%
Inefficient Management	Problems in Tariff collection Absence of initiators/active persons Non existence/ problems among EMC members Misuse by villagers	18.5%
Disinterested villages & improper maintenance	Change of operator Untrained operator Availability of alternative energy sources	12.7%
External Factors	Natural calamities Inability of unit to meet the village demand Seasonal change	11.2%
		Total 91.2%