CHAPTER – I
INTRODUCTION

1.1 Background

Nepal lies in the Himalayan region and is bordered by India to the south, west and east, and by China to the north. The country covers an area of 147,181 sq. km and is bounded by the northern latitudes 26°22' and 30°27' and the eastern longitudes of 80°04' and 88°12'(FRD, 2005). The census (2001) estimated the population of the country was 23.2 million. More than 85% (REDP, 2007) of the population lives in the rural villages depending on agriculture and the natural environment for sustenance livelihoods.

Topographically, the country is divided into three geographical regions. They are Mountains, Hills and Terai. Mountains consist of 35% of total land area and 7.8% of total population. Hills with 42% of total land area and 45.2% of total population, and Plains (Terai) in the south with 23% of the land area and 47% of total population (Rijal, 1998). Administratively, the country is divided into five development regions namely the eastern region; the central region; the western region; the mid western region and the far-western region. These regions are further divided into 14 zones with 75 districts consisting 3913 village development committees and 58 officially recognized municipalities including one metropolitan city of Kathmandu and four sub-metropolitan cities Lalitpur, Pokhara, Birjung and Biratnagar (FRD, 2005).

The total electricity generation in Nepal including big hydro, small and micro hydro and diesel is around 687.38 MW (including middle Marsangdi and 54 MW thermal) has been harnessed (NEA, 2008). Of the total installed capacity, big and medium hydro shares 88% of the total country's capacity where as micro hydro covers only 1 % (REDP, 2007). According to NEA reports, the total electrification of the country is around 40 % and out of which 33% from national grid and 7% from renewable sector. The country is highly potential for hydro power generation. It is estimated that the country's total hydro potential is 83000 MW, and 42000 MW is economically feasible (WECS, 2002). So far, only around 1.63% of the total economical potential has been exploited.

It is estimated that globally more than 1.8 billion people lack access to electricity (2001, World Bank). Majority of such population lives in rural areas of developing countries like Nepal.

Government of Nepal has given high priority for the development of both urban and rural electrification. AEPC, DANIDA and NORAD supported ESAP, WB and UNDP supported REDP, EU supported Institutional PV program, Nepal Electricity Authority, Kaduri AID, King Mahendra Trust, RADC are the main organizations involved for electrification across the country. These organizations were mainly concentrated on energy program to replace expensive kerosene or inefficient lighting wood fuels mostly for lighting and cooking. The governments and public utilities make an effort to extend the power grid to rural areas, either urban consumers/industries or national government subsidizing rural power supply.

The geographical remoteness, harsh climatic conditions, low population density with minimal energy demand and low growth potential, are some of the reasons why rural electrification costs. In Nepal, electrification projects are no longer seen as technical interventions alone. Practitioners and critics conclude that 'electricity if targeted at the poor alone' would not be a realistic approach. This is often because the poor alone cannot risk the heavy financial investments that are required to build and maintain an electrical system. In addition, the lack of proper feasibility studies, quick assessments, and non-participation of the beneficiaries has led to failures in some cases.

Rural development of any developing and underdeveloped countries is depend upon the availability and uses of resources given directly or indirectly by nature. Therefore the present policy of any government is guided by the resources allocation when there is crisis on these components then economic development is distributed (Tiwari, 1995).

In the present condition of Nepal, energy plays the vital role of fulfilment of resources. It is the primary need for all economic and social development. Energy itself is not a sustainable used connect to diverse process such as lighting bulbs charging battery is burning fuels and propelling machines.

Nepalese people are using 300 kg to 900 kg fuel wood per head per year for cooling and heating. Fuel wood consumption that in mountain has been estimated 640

kg/person 1 year while for the Terai it is 479 kg/person per year (Lekhak, H.D., 2003: 205).

So, energy can be generated from falling water through the use of turbine, which can be used as mechanical power. This is known as hydropower. This power can be used directly to run various milling machines or can be converted into electricity by using generator. Electricity generated in this way can be used for lighting, heating and operating machines. Hydro-projects that generated that small amount of mechanical or electrical power up to 100 KW are called micro-hydro power. Generally, these projects are classified on the basis of amount of power produced into large, medium, small and micro-hydro. In Nepal, project up to 100 KW capacities are classified as micro-hydro project, (AEPC, Booklet, 2000: 3).

Nepal is facing enormous challenges in the path of economic development. One of the major-infrastructures required for sustainable development of any nation is power sector, (SHD, 1997: IX). Due to the unique topography with scattered settlements the national grid electricity expansion has difficulties, so the electrification through micro-hydro is suitable. There are more than 6000 rivers and innumerable rivulets crisscrossing the country. So, micro-hydropower has a great potentiality for fulfilling the energy requirements of rural Nepal to a great extent (WECS, 1995: 7).

1.2 Statement of the Problem

Nepal is a diverse feature country. Here are innumerable hills, peaks and mountains. Because of the diverse features of hilly and mountains regions, which are sloppy and many rivers and rivulets flow forcibly from mountains to Terai regions. The hydropower energy is most feasible and alternative energy sources. Nepal is developing country, where 85.80 percent (CBS, 2002) people live in rural area, so the national grids are not suitable due to its high cost and roughed topography. In the context of Nepal and other countries, it is impossible to make the bigger than bigger hydropower it is the most expensive for make large-scale hydropower.

So the micro-hydro is the most, which is cost effective and feasible in many areas in Nepal. Although it is feasible and the input cost is also not high the plant are not extended in satisfactory way. Some are running with low efficiency and some are completely failed during the recent random sample survey conducted on about 10

percent sample of the total plants installed in Nepal, it was learned that around 30 percent of the total MHP are completely failed (Earth Consult, 1997: 23).

Nepalese economy is based on traditional agriculture system. In addition to agriculture other sectors of economy such as industry, trade and commerce transportation, communication and tourism are to developed yet due to their inadequate electric power and financial resources. Hydropower development cannot be achieved more over infrastructures are required for proper exploitation of other available resources in the country. Economic development has not got proper acceleration due to insufficiency of electricity.

The pattern of energy consumption is based on tradition resources particularly fuel wood dung, etc. The over exploitation of forest creates sensitive environmental problems, petroleum product are utilized for transportation, operation of machines and so on. The use of petroleum products creates environmental problems and large amount of foreign currency is needed to import the petroleum products. Nepal has limited sources of foreign currency exchange. As a result Nepal has been facing the problem of debt trap deficit and unfavourable balance of payment.

1.3 Objectives of the Study

The general objective of the study is to evaluate the impact of MHP in rural development on social, economic and environmental aspects and specific objectives of the study are as follows:

1. To study the socio-economic and environmental impact of Manpang-I MHP Plant.
2. To find out the attitude of community toward Manpang-I micro-hydro power project.
3. To study the sustainability of micro-hydro power project in rural area.

1.4 Significance of the Study

In the view of growing scarcity of fuel wood the other non-renewable energy sources and huge investment of commercial energy sources the search for alternative energy sources is prominent. In this context, many projects have been operated but how far the projects are succeeding in terms of end-use-efficiency, how far it effect for the upliftment in the life of rural poor, how far the projects is successding in terms of overall socio-economic upliftment of the rural people in their perception are leading issues that have been tried to access by this study. Moreover there are many studies adopted in MHP sector there are still lack of proper information and show documentation, which has analyzed the ground reality of socio-economic, gender and environment aspect of MHP. Hence this impact study has been rounded on the pivot of rural poor and gender in socio-economic and environmental aspect.

1.5 Limitation of the Study

This research has been conducted for this study is focussed on socio-economic environmental impacts of the micro-hydro power project in the rural development of Nepal.

This is a project work mainly for an academic purpose based on information from secondary data and field survey suffered from certain limitation. The budget, manpower, theoretical and methodological limitation during research has been prevailed for the thesis work carried out by student. This study has been limited only to micro hydropower, which cannot be generalized especially to other types of plant.

The research has been limited in ward No. 5 of Budathum VDC of Dhading district. The impact that occurs by contraction of a MHP is the derivation of numerous social, economical and environmental effects. Thus the study has been limited only social, economical and environmental perspective. Moreover, the social indicators are less factual which had made some difficulties to analyze social impacts and pre-electrification information has been depended on the user groups saying and other secondary information.

1.6 Organization of the Study

The thesis has been divided into six chapters.

The first chapter described about background of the study, statement of the problem, objectives of the study, significances of the study, limitations of the study and organizations of the study.

The second chapter has carried out a review of literature related to the study. Literature related to history of Micro-hydro power, socio-economic and environmental impacts of Micro-hydro power in Global, National and local level.

The third chapter deals with research methods applied to carry out the study. It includes research design, nature and source of data, sampling procedure, data collection and processing procedure.

The fourth chapter deals with the study area and the people, which include physical setting, socio-economic and cultural setting of the study area.

The fifth chapter includes analysis and interpretation of the collected data and information. It describes socio-economic condition, community awareness on Micro-hydro power and observed effects of Micro-hydro power in the study area.

The sixth chapter includes summary, conclusion and recommendation about impacts of Micro-hydro power.

CHAPTER – II
LITERATURE REVIEW

Limited research has been conducted on energy, socio-economic and environmental impacts of micro-hydro power scheme projects. There are many studies in other sector of micro-hydro projects. Generally, the studies on medium and large, small and micro-scale hydropower projects have been conducted to identify various types of impacts created by the rural development of micro-hydropower projects.

East Consult P. Ltd. 1990 socio-economic impact evaluation of the MHP schemes in rural communities of Nepal.

This is the final report prepared by East Consult P. Ltd. under the study sponsorship of ITDG Nepal. This study especially reports to the evaluation of micro-hydro power, its socially acceptance and economic viability. It encompasses many studies areas of micro-hydropower. But it especially focuses to the investigation especially on such questions like who are the real beneficiaries and to what extent do that get benefit. This study is interested to know the constraints prevailed in rural energy. It also keeps the interest to finding the answer of the question who gets the access to the rural lighting and why? This study was conducted in Turture of Tanahun district Karmasingh of Ghorkha, Buling Arkhala of Nawalparasi, Karputar of Lamjung, Arghali of Dolpa and Karnali of Baglung district.

This study has been centred to the socio-economic evaluation of the impact of private and community owned micro-hydro schemes on members of rural communities who are not the owners of micro-hydro schemes. It focuses to the target groups and aims to enhance the knowledge about relationship between nature and MHP scheme. The objectives of the study are to examine the characteristics and perception of those local people who are benefited by micro-hydro. It especially examines the satisfaction/dissatisfaction ratio of micro-hydro power users and tries to recommend for action to maximize the benefit to the rural poor. It also tries to establish the indicators for monitoring the effects of any such actions.

According to the finding of the study, the viability of this technology under the set of technical and social circumstances, which prevails in perceived benefit, accrues to the mill owner as well as the community. It reveals that; in one hand, agro-processing makes positives impact on community saving the drudgery, especially to women and in other hand, it is not effective to the cash starved people.

It says it is not fully beneficial where the time is consumed by the transportation to mill and waiting, although it depends upon the located area of mill from the settlements. The study indicates that only one or two percent of the customers make payment in kind for the service of the mills who cannot afford the cash payment. But about (3 to 8%) of village inhabitants are poorest, of the poor in most of rural areas of Nepal who do not use, the mills even with payment in kind because they do not have such affordability also. But it is naturally that, the payment in kind is anywhere between (50 and 500) higher than the cash down payment depending upon the local prices of agro-production. It further indicates that except the oil processing kol, the traditional agro-processing mills, such as Dhiki and Janto have not been replaced at all because this turbine mills have not yet been able to reduce the risk reliance of the community vis-à-vis traditional sustainable practices.

Dhital R.P. (2003) this is the conference paper presented in international conference on renewable energy technology for rural development (Returned 03) prepared by Dital, Ram Prasad and ET. al. The RETRUD report is published in every four years. It is important information to the energy sector, which combines the present states, past experience and future plan of this energy sector with the view of national and foreign experts. The paper tries to analyze the initial evaluation of investments and optimizes the components to observe on total projects cost. This analysis deals with the approach for financial analysis to calculate the cost where three scenarios that is, with subsidy, without subsidy and with net economic benefit.

HMG/N 2000 – Annual Report of Rural Energy (UNDP, Supported Rural Energy Development Program).

This is the fairly informative report prepared by REDP, which has include the information of rural energy sectors. The principal aims of this report are to give the message to the people about rural energy related areas; to appraise the impacts of

energy and its related components. It tries to demonstrate the development path of rural energy sector, to review on rural energy sector policy and to raise the issues and give the solution of the rural energy sector problems for the sustainable development.

The report mainly focuses on the information of execution of working to increase the level of energy services to poor citizens in the village of Nepal through technological development including micro-hydro, solar, biogas, improved cooking stove etc. This report connotes that the increased population increase the demand of resources that puts further pressure on the forest which is already in determine processes in Nepal. Desertification, ecological instability, loss of biodiversity, drying up of water springs is some of the serious environmental consequences of massive deforestation. So most of the energy needed can be fulfilled by the big hydropower projects but which is focused only one urban areas. This efforts has largely ignored the rural population. This reports raises the majors' issues and focuses on the promotion of rural energy.

This study glimps, the present trend of micro-hydro power, illustrating that most of the MHP schemes have been installed for mechanically driving agro-processing unit like grinder, huller and oil expeller, whereas other end uses are few and far from the low cost application and the local resources utilization through micro-hydro plants. The report concludes that there are inconsistencies in policies support and implementation of micro-hydro, and other, rural energy technology. These inconsistencies are, lack of technical and managerial skills for operation and main finance among the rural population, weak co-operation among the delivery agencies and inadequate information about the technology in rural sector.

Hora (1996), in her thesis "Role of Micro-hydropower in Rural Electrification of Nepal" explains that among the alternative energies more popular and available, continuously renewable, non-polluting, efficient widely distributed and based on simple as well as flexible energy sources is micro-hydropower (MHP) in Nepal. It is technically feasible as well as economically viable and the most appropriate technology for Nepal indeed, micro-hydropower projects are not sufficient to meet the national demand of electricity on one hand, we have no economic resources, technology and skilled manpower to install large-scale hydropower project on the other hand, small scale hydropower projects can play very important role in such

context. This technology provides access to electricity and other mechanical froms of energy for agro processing. Further more, it is also capable of providing rural electrification to a limited scale.

Hilly topography and enough availability of water resources so the huge potential for micro-hydropower in the country. Micro-hydropower help to reduce the alarming deforestation, import of petroleum products thereby playing a vital role to improve the economic condition of the people. Agriculture Development Bank of Nepal (ADB/N) not only providing loan and subsidies but also providing resources survey, feasibility studies, promotion of manufactures involment technical assistance and training has financed over 90 percent of the private MHPs in Nepal. It may not generate electricity in dry season. Likewise the skilled manpower may not be available to get it repaired. Sufficient research has not been carried out yet. These are a few problems involved with MHPs.

UNVN – 2003 – Water contains energy. The energy generated by downward movement, of higher place can be converted into dynamic energy with the help up turbine we can run different machines directly and we can produced electricity by joining the shaft of generator. The project in which small amount of electricity's is produced is called micro-hydro project. Generally MHP includes the project of capacity up to 100 KW.

ESAP Report-Social Mobilization for Micro-Hydro Scheme – 2004, P. 39)

Semi-structured interview are both a separate tool to be used on their own and an important part of other, PRA tools. A part of tools the SSI is the depth discussion and probing to find out the how and why of information produced by the other tools often this comesat the end when the map matrix or calendar has been produced and it the social mobilization needs to understand the how and why without this interviewing the map or matrix or calendar will not give much insight into way community uses energy and sees micro-hydropower.

Energy Trend in Nepal

Modern RE options that are considered technically proven and socially viable in Nepal include micro-hydro, solar photovoltaic systems, improved *ghatta,* biogas

plants, solar thermal units and improved cook stoves. The government, along with bilateral agencies, non-governmental and private organizations is engaged in the promotion of RE through national and regional programs.

Solar Home System

The system of transforming the energy come from sun in to electric, heat and light energy by the help of collector is viable and feasible in the context of Nepal. At preset, there are about 30 manufacturers of solar system and the total installed capacity in the country is estimated at 10,000 sq meters of solar panels. About 14 companies have been involved in the installation and there are 42,500 solar home systems in 74 district except Bhaktapur district. The total installed capacity of solar home system in Nepal is 1,584.5 KW peak power. Among them Eastern Development Region carries 11,761 pants with 467.0 KWp, Central Development Region occupies 6,465 plants having 232.1 KWp and Western Development Region has 16,723 plants with 645.9 KWp. Similarly Mid-Western Development Region has 2,670 plants with 69.11 KWp and 3,470 plants having 116.1 KWp have been installed in Far-Western Region (CADEC, 2004: 18).

Analyzing above data, the trend of installing the solar home system is not dissatisfactory. Solar home system was introduced in 9992 but it had slow growth rate up to 1998, when below 5,000 pants had been cumulatively installed in Nepal at the mid of 1999. Incredibly at the end of 2003 there were 42,500 plants in total, which indicates that the growth rate of solar home system has been highly increased since 1999, (CADEC, 2004: 18). However, due to the high initial investment (required 31,500 – 33,000 per unit of 36 W module), the rural people of low-income level have deprived from it. Thus there are least solar home systems in Far Western Development Region while it is least developed region of Nepal. It is impossible to practice in cooperative way due to scattered settlement pattern and lack of cooperative sense in Nepal. Another system, the solar water heater technology has not yet been proud appropriate for Himalayan regions.

Biogas

Biogas is a by product of *"anaerobic digestions"* of organic wastes such as plants and crops residues, wood and bark residues and human and animal manure. It is

an important and viable energy resources thus have expanded through out the globe in the past two decades. Biogas at first was introduced in Nepal after the demonstration of it as modal in 1955, (Hora P., 1991: 45). Latter on 250 biogas plants were installed during the fiscal year of 1975/76.

With the establishment of Biogas support program (BSP) in 1992 with the financial support from the Netherland Development Organization (SNV/Nepal), the pace of biogas development increased rapidly. Currently 49 biogas construction companies have been recognized for the installation of biogas plants. By the mid July of 2003, a total of 111,395 biogas plants have been installed in 65 districts having total installed capacity 776,146.9 cubic meters. Among them, 21,274 plants have been installed in Eastern Develop Region with 149,968.9 m^3 installed capacity, 32,826 plants have been installed in Central Development Region with 209786.7 m^3 installed capacity and 41,269 plants have been spread in Western Development Region with 283815.1 m^3. Likewise 8,855 plants have been penetrated in Mid-Western Development Region with total 66154.0 m^3-installed capacity and 7,171 plants having 56422.2 m^3 capacities are in Far-Western Develop Region, (CADEC, 2004: 19).

In Nepal 3,318 Biogas plants were installed in 1992/93 and reached the no. 37,354 cumulatively at the end of 1997/98, Then due to the viability of this plant the installation trend was speeded swiftly and at the end of fiscal year 2001/02 the plants were installed in number of 95,055 in total, (CADEC, 2004: 19). It is reported that about 90 percent of the plants installed in Nepal have a provision of toilet connection and more than 50 percent households have already connected toilet to their plants.

Due to the well proven, design and quality control mechanism, recognition of local manufactures/installer, provision of all seasonal subsides, accessibility of masonry and technical work by local people and employment possibility the biogas program has been successfully increased in arithmetic series in Nepal. But biogas plants have not been installed parallel in numbers compared to their effective demands. It is due to less effectiveness of slurry utilization program, inadequate research and development and ineffective and inadequate monitoring and evaluation mechanism. Along these constraints, biogas is not viable in all places of Nepal due to geographically and climatologically uneven regions.

Turbine Mills

The development of hydro electricity turbines was initiated around the middle of 19th century. Its subsequent improvement in efficiency and flexibility of utilization and finally coupling of turbines with electricity generation started enable the waterpower to produce electricity energy. It was famous all over Nepal and is still used widely where there is not accessibly of electricity handled agro-processing mills. It has no environmental impact and, effect on stream ecology is minor. Beneficially hydro electrical turbines system may serve other propose in addition to power such as water supply, flood control, irrigation and recreation.

In Nepal, there are 804 schemes of turbine mills on total and its installed capacity is 7106.9 KW as a whole. Among all, 92 plants with 1013.0 KW installed capacity have been installed in Eastern Development Region, likewise 197 plants have been operated in Central Development Region with 1749.7 KW total installed capacities. Similarly, 301 turbine mills have been installed in Western Development Region with 2573.5 KW installed capacity and Mid Western Development Region has 173 schemes with 1407.25 KW capacities. And Far Western Development Region owes only 36 schemes with 3161.1 KW installed capacity. Likely, 5 plants with 47 KW installed capacity are not region wise know, (CADEC, 2004 30).

Far Western Development Region is in poor status in turbine owing like other technology. Western Development Region is rich in turbine installation which region owes the developed status in Nepal. Though the turbine mills were notably operated in back years, most of them are not sustained ably because they are not used in multipurpose connection.

Improved Ghatta

Ghatta, a spinning device to crossing the cereals and grains using kinetic power of water started to operate from time immemorial. The devices used two hard stone slates knotting with a long modern churning stick are still seen operating at the bank of river mostly. These were operated traditionally and handled by local technology, later on; the technological investigation towards the local indigenous and traditional technology has progressively modernized the devices. In this process these traditional *Ghattas* were changed the figure to improved *Ghatta* joining or fixing iron

churning stick stone/iron devices are fixed with it according to the geographical location of plant installed area and speed and volume of water.

Presently in Nepal, total 872 schemes of improved *Ghattas* have been installed in total. Out of these schemes, 147 plants have bee installed in Eastern Development Region. Similarly, 392 plants have been operated in Central Development Region which comparatively almost 3 times more than the plants of Eastern Development Region. Likewise 80,147 and 103 plants have been installed in Western, Mid-Western and Far-Western Development Region respectively where 3 plants have not regionally known, (CADEC, 2004: 21). These improved *Ghattas* have been used only for grinding purpose so its usefulness is comparatively less than MHP.

CADEC, (October 2003 – July 2004); Monthly E-News

CADEC is an inventory/group which lengthens the micro-hydro sector doing research work and awareness program. The monthly E-New letter on micro-hydro development in Nepal is a vernacular monthly E-News medium, which informs the communicationally facilitated people about updated news on micro-hydro in the context of Nepal. The main objective of this newsletter is to information on activities related to various renewable energy especially to micro-hydro. The primary target readers are the existing and prospective renewable energy, owners users, district based NGOs, CBOs, local government bodies and other rural people. It will be disseminated through direct mailing to interested target readers in rural areas, through development organizations having field based programs, renewable energy network groups and locally based organizations and on sale at special occasions such as training, workshop, seminar, and exhibition as well as at market outlets.

According to the vol. 2, No. 15 of this e-news letter, the failure of MH turbines is due to the turbine buckets to be "poor" manufacturing. Therefore, it is initially will pointed and internal cracks are generally not noticeable, advance tests such as x-rays are required which is not feasible given the cost limitation. This is not to say that construction supervision is not required. Therefore, AEPC/ESAP has introduced the concept of "site inspectors" i.e., pre-qualified techniques who will be making field visits to ensure that the scheme is constructed has designed by the consultant.

This newsletter in discussion part encourages that, Nepali MHP manufactures should get wise to the fact that Nepal is now a member of WTO. The future will not be as easy it is now. If they could not compete in quality and cost with similar products from other countries, they may be out of business.

Shrestha (2006) "Role of Hydro-electricity in economic development" mentions that the development of hydro-electricity is possible due to the enormous water resources as well as favourable topographic and climate condition. Hydro-electricity has tremendous advantages for the people, and its helps to develop energy sector economy. Electricity is one of the infrastructures of upgrading the socio-economic condition of Nation. The proper utilization of electric power accelerates the motion of national development. Our experiences show that the developed countires like Japan, UK, USA, China, France, etc. achieved advancement in time through electric power. At present, the stock of non-renewable resources like petroleum products, coal, natural gas, fuel, wood etc. is decreasing. The hydroelectricity has become economically attractive because it is renewable and environment friendly. He has discussed the role of hydroelectricity in various economic as well as non-economic sectors. Industries, agriculture, transportation social services and other sectors can be promoted by the utilization of electricity. He has also discussed but the development during the plan periods.

Actually micro-hydro plant is very necessary for Nepal as well as rural areas. Where the national projects cannot cover electrification, in such places the small project known as micro-hydropower plant may be very useful. The micro-hydro power project conducted in district head quarter as well as another places cannot cover the whole district. So the micro-hydro project of Lakharkhola must be suitable and usable.

CHAPTER – III
METHODOLOGY

Research methodology is the process of arriving to a solution of the problem through planned and systematic dealing with the collection, analysis and interpretation of fact and figure. Research is a systematic method of finding out solution to a problem whereas research methodology refers to the various sequential steps adopted by researcher in studying a problem with certain objectives in view. The Advanced Learners Dictionary of Current English defines research methodology as- "A careful investigation or inquiry especially through search for new facts in any branch of knowledge."

3.1 Research Design

Research Design is the plan, structure and strategy of investigation to obtain answer to research questions. A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure (Selltiz and others, 1959). Research design is the conceptual structure within which research is conducted.

The research study follows both descriptive as well as analytical research design.

3.2 Nature and Sources of Data

Both the primary and secondary data have been collected.

A. Primary Data

The researcher has been collected the primary data from the respondents by conducting structure and unstructured interviews at household level; informal discussion and simple field observation are the major methods for data collection. It is important as it allows greater flexibility in the form of interview.

B. Secondary Data

Secondary data and information have been collected from the sources mentioned below:

- Human Development Report.

- Statistical Year book of Nepal, Central Bureau of Statistics.
- Various Plans, National Planning Commision.
- Department of Alternative Energy Promotion Centre.
- Department of Water and Irrigation.
- District Development Committee Profile.
- Department of Agriculture.
- Village Development Committee Profile..

3.3 Sampling Procedure

The present study is carried out in Budhathum VDC of Mangpang-I Micro Hydro Power users are taken as the unnerves of the study which is 200 households. Out of them, 56 household were selected by random sampling method. For this purpose 200 household were numbering from 1 to 200 household, and kept in to a basket or cap. Then picked up the number i.e. 56 and data were collected. The respondents of this study were indigenous people, professional, students, businessmen, male, female and all necessary.

3.4 Method of Data Collection

For this study data were collected through direct personal interview with help of structured questionnaire random sampling method lighting household. Data were collected from 2066-7-20 to 2066-7-30.

3.4.1 Questionnaire Survey and schedule

For the collection of information about socio-economic and environmental impact of Manpang-I Micro-Hydropower plant. The questionnaire was designed with the help of respected supervisor of Central Department of Rural Development.

The questionnaire consisted open-ended as well as closed ended questions. The questionnaire is divided into three sections. First section of questionnaire covers socio-economic impact, second section covers environmental impact, third sustainability of MHP.

3.4.2 Key Informant Survey

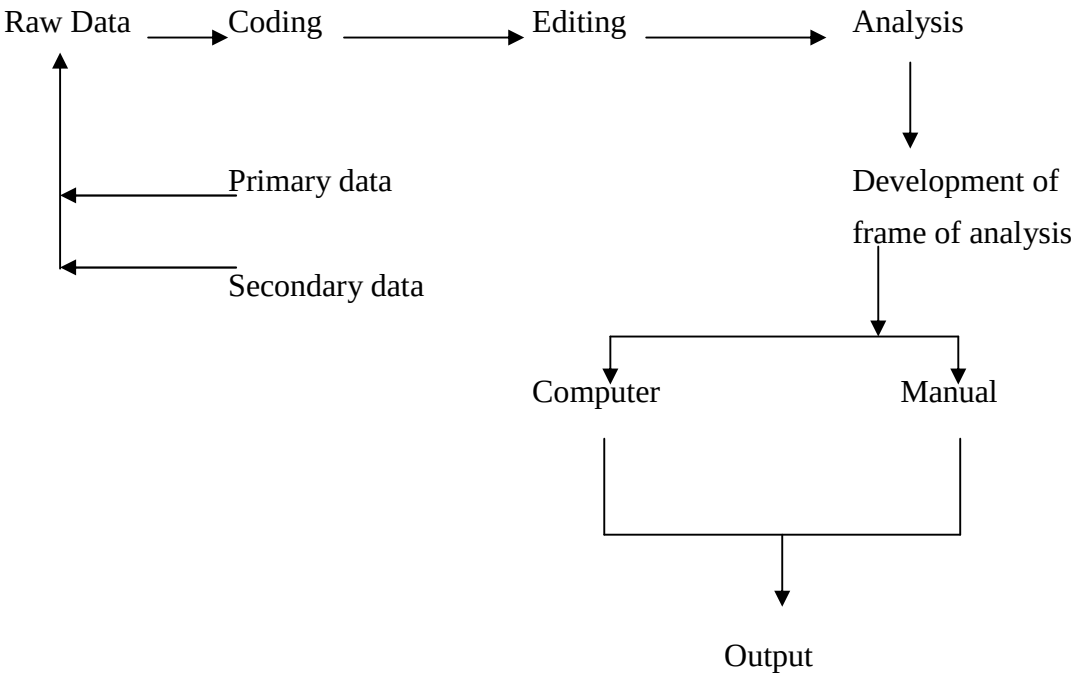
To support and triangulate the information of respondent interview is also conducted with key informants such as environmentalist, Micro Hydro Power Specialist and other governmental and non-governmental personnel who are directly or indirectly working in the Micro Hydro Power and livelihood sector. Ten of them are surveyed.

3.4.3 Field Observation

The working and living condition of people, their agricultural system, physical settings, uses and impact of Micro Hydro Power and others is observed. Such observation helps to make judgment on the information provided by the respondents

3.5 Data Processing and Analysis

Data processing & analysis is done by both ways, manually as well as by using computer software SPSS act. The data obtained from the field were categorized, tabulated, processed and analyzed.



CHAPTE -IV

DESCRIPTION OF STUDY AREA

The study site is mainly located in ward no. 4, 5, 8 and 9 of Budhathum VDC in Dhading district. Central Development Region of the country. It takes about 5 hrs. by bus from the district headquarter (Dhading Basi) in summer and winter season but there is no transportation facility in rainy season. So, it takes one day for trekker from the district head quarter (Dhading Basi).

Budathum VDC lies in Northen Part from the District Headquarter. The total area of Dhading district is 1924.9 km^2. It is facilated by the agricultural Road.

The total population of Budhathum VDC according to the CBS census 2001 was 4575 (2184 male and 2391 female). The numbers of households are 844. This VDC consists of various ethnic group but the dominating groups are Chhetri & Brahmin and Gurungs. Nuclear family system represents the main basis of social structure.

Agriculture represents the main source of income of Budhathum VDC. The average farm size is medium and fragmented. More then 50 percent the farm household own less than 40 Ropani of land. The agricultural production consists of food grains such as wheat, maize, paddy and cash crops; livestock consists of cow, buffalo, goat and sheep; literacy estimated at out of 60 percent. Health facilities are very poor in this village. But for general treatment there is facility. If person get ill, they have to go district headquarter or private hospital in Dhading Besi for the treatment. In the case of drinking water facilities, large sector of people's drinks water from piped drinking water. Rural road and communication linkages on this village are somehow well because various parts of the village are moterable now. And there are some public telephone booths and Nepal Telecom and Spice Nepal(Mero Mobile) have provided mobile services too which serves all the population of the Budhathum. Most of the population are benefited from the micro hydro power facility in the village.

Agriculture is the main sources of livelihood. More then 70 percent people are engaged in farming activities. Livestock are friends of the farmer. They use the dung of the animal in their farming land. It is the good sources of pesticide as well as energy for the plants or crops. They can able to get fresh milk and milk related product, meat, which is essential for sound health. Animal like Bull are used for plunging as well as donkey are used as the rural transportation. People who are in service sector they are especially in Nepal Army and Police force. Now a days young people are interested to go aboard for better education and better income. Among them the rate of visiting Malesia and Quatar as a wage labour is high it is because of the poverty and lack of Skilful Education.

CHAPTER – V
DATA ANALYSIS AND PRESENTATION

The chapter five includes the analysis and interpretation of data. For this purpose data are tabulated at first then analyzed. This chapter is divided in to three sub-chapters. The first part of the chapter covers the socio-economic and environmental impact of Manpang-I MHP plant. Second part covers the attitude of community towards Manpang-I micro-hydro-power project, and third part of the chapter covers the sustainability of micro-hydro-power project in the rural area.

5.1 Socio-Economic and Environmental Impacts

There may be so many impacts of everything; the first part of the chapter covers the socio-economic and environmental impact of the MPH plant. This study is focused specially what types of change occurred in social as well as economic sector. Then what kinds of effect have seen in environment after the plant implemented. For detail different related data are tabulated and interpreted as follow.

5.1.1 Caste/Ethnicity

Nepal is rich in caste/ethnic Nepal is also known as common garden of different caste/ethnicity and language. So there are different caste/ethnicity in the study area. It is attempted to present the caste/ethnicity group separately. Mainly there are so many Janajati and Dalit people. The table 5.1 shows the distribution of respondents by caste/ethnicity.

Table 5.1

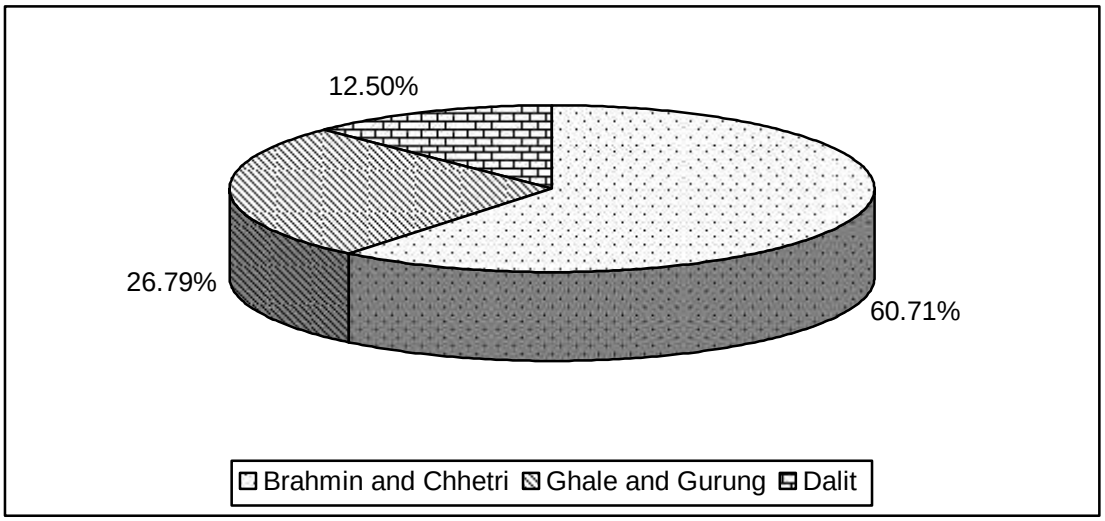
Distribution of Respondents by Caste /Ethnicity

Caste	Number	Percent
Brahmin and Chhetri	34	60.71
Ghale and Gurung	15	26.79
Dalits	7	12.50
Total	56	100.00

Source: Field Survey, 2009.

Figure 5.1

Distribution of Respondents by Caste/Ethnicity



The table 5.1 shows the distribution of respondents by caste/ethnicity. Out of the total 56 respondents highest proportion is known Brahmin and Chhetri i.e. 34 (60.71%). Then lowest proportion is known Dalit i.e. 7 (12.50%) and out of the total 56 respondents i.e. 15 (26.79%) are Ghale and Gurung.

In addition, some of the VDC of Dhading are dominated by Brahmin and Chhetri, indigenous people like Dalit, Janajati. So, Ghale and Gurung proportion is found highest. The interview is also focused on such types of respondents.

Nepal is a rich in caste/ethnic Nepal is also known as common garden of different caste/ethnicity and language.

5.1.2 Change in Living Standard

The modern facilities mostly affects in human being. After using such facilities it is expected that there must change in living standard of human. Actually living standard refers to the higher living. The table 5.2 and 3 shows that aggregate status of living standard after electrical facility.

Table 5.2

Change in Living Standard after Electricity

Change	Number	Percent
Yes	56	100.00
No	0	0.00
Total	56	100.00

Source: Field Survey, 2009.

It is expected that modern facility like electricity may effect in human life style. So, this table shows the status of living standard of respondents. The question was asked to respondents that have their living standard been changed or not. After the MHP plant, all respondents i.e. 56 (100%) reported that living standard has been changed after the MHP.

In addition, it is proved that electricity is one of the most affecting factors of living standard.

5.1.3 Status of Family Income

Table 5.3

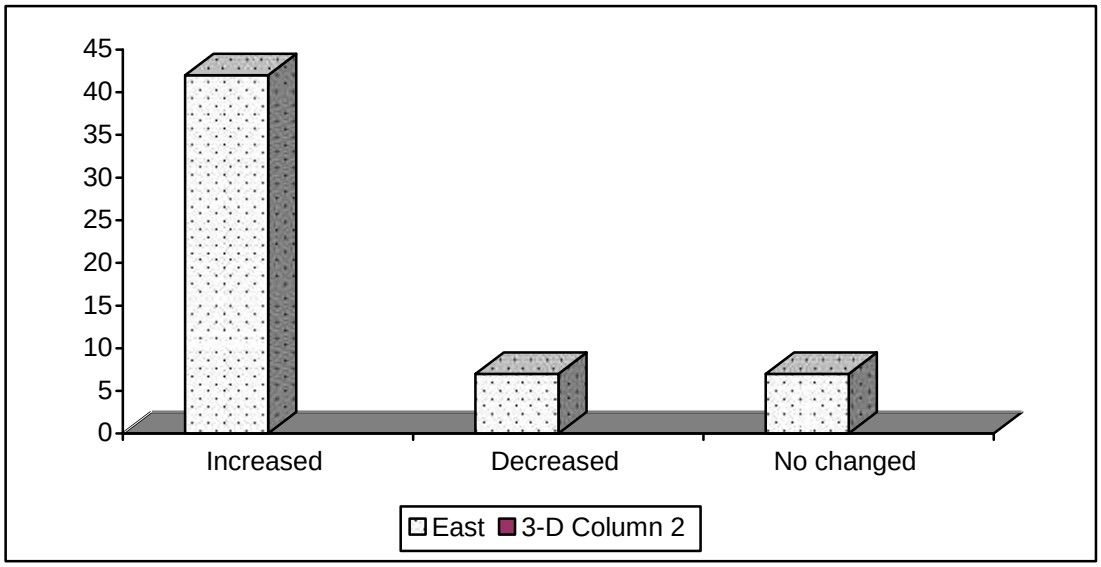
Status of Family Income after having Electricity

Status	Number	Percent
Increased	42	75.00
Decreased	7	12.50
No changed	7	12.50
Total	56	100.00

Source: Field Survey, 2009.

Figure 5.2

Status of Family Income after having Electricity



The table shows that the status of family income of respondents. Out of total 56 respondents highest proportion i.e. 42 (75%) reported that their family income has increased. Among 56 respondents only 7 (12.50%) reported their family income decreased after using electricity and remaining 7 (12.50%) respondents reported their family income is in neutral situation.

To sum up, those respondents who have able to use the electricity properly, who have sufficient knowledge and ways about electricity facilities, they have been able to increase family income. Those people who have credit of loan when interested in MHP. They reported that their family income decreased. Some of the respondent's income neither increased nor decreased. They are living in neutral position after electricity.

5.1.4 Food Supply

Nepal is known as agriculture based country. Most of the people i.e. 68 percent (CBS, 2001) are farmer in Nepal but they have not able to meet basic needs by crops and livestock. The Table 4 shows the status of crops and live stock i.e. either the crops and live stock are able to meet their annual food demand or not.

Table 5.4

Status of Crops and Livestock

Status	Number	Percent
Yes (Sufficient)	20	35.71
No (Not Sufficient)	36	64.29
Total	56	100.00

Source: Field Survey, 2009.

Nepal is known as agriculture based country. Most of the people i.e. 68 percent (CBS, 2001) are farmer in Nepal but they have not able to meet basic needs by crops and livestock. The table shows the status of crops and livestock i.e. either the crops or livestock are able to meet their annual food demand or not. Maximum proportion i.e. 36 (64.29%) out of 56 respondents reported that they are unable to meet their annual food demand by crops and livestock. Remaing 20 (35.71%) respondents reported they are able to meet their annual food demand by crops and livestock.

To sum up Dalit and Janajati are known as backward and indigenous. So they have not proper land for cropping and livestock and unable to meet their basic need as well as annual food demand. Those people who has medium level land and other grassy land they are able to meet annual food demand of by crops and livestock.

5.1.5 Situation of Irrigation

Irrigation is known as the important factor for farming. There is not chance of maximum production of crops in the absence of irrigation. The study area is located in hilly region. It is attempted to find out that either there is facility of irrigation or not.

Table 5.5

Situation of Irrigation in Farm

Irrigation	Number	Percent
Regularly	1	1.79
Irregularly	55	98.21
Sometimes	0	0
Total	56	100.00

Source: Field Survey, 2009.

The table shows that the availability or situation of irrigation in study area. Out of 56 respondents, maximum proportion i.e. 55 (98.21%) respondents reported that they have not irrigation facilities in their farm. Remaining only 1 (1.79%) respondents has irrigation facility in farm.

To sum up, irrigation is necessary to produce sufficient crops and other eating sources, but the absence there is not proper management of irrigation in rural and hilly regions. This may also affects negatively in socio-economic status.

5.1.6 Status of Forest

The infrastructural development may affects in natural resources like forest. It is attempted to find out the condition of forest in the study area. What kinds of effect has seen in the forest, shows the Table4. 6.

Table 5.6

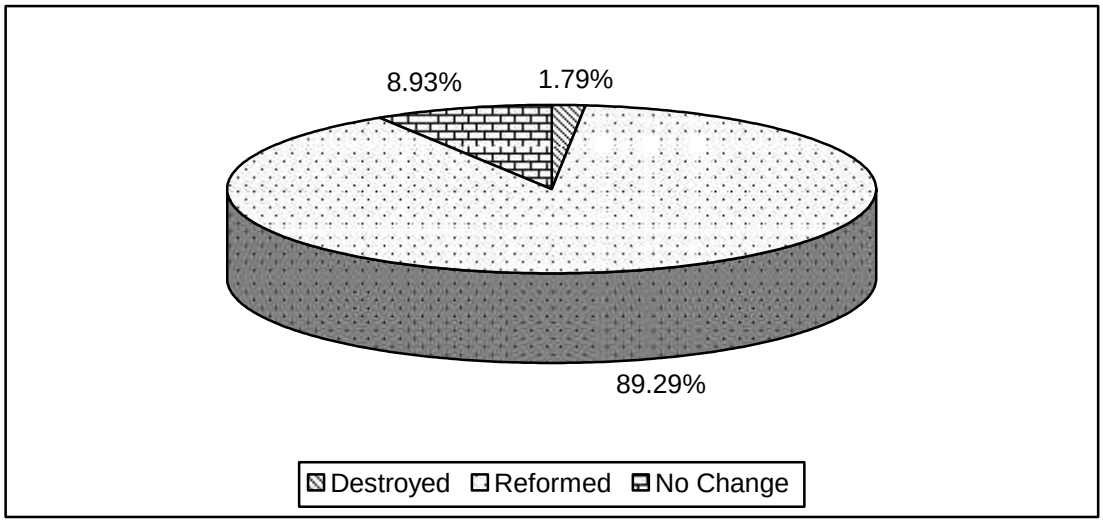
Status of Forest after Project Launched

Status	Number	Percent
Destroyed	1	1.78
Reformed	50	89.29
No change	5	8.93
Total	56	100.00

Source: Field Survey, 2009.

Figure 5.3

Status of Forest after Project Launched



The table and picture shows the status of forest after the project launched with reference to environmental impact. Out of the total 56 respondents maximum proportion i.e. 50 (89.29%) reported the forest have been reforming or improving. The lowest proportion i.e. only 1 (1.78%) respondents reported the forest is destroyed. Remaining 5 (8.93%) respondents reported the status of forest is no change same as before.

To sum up, most of the people have been using the firewood as fuel and other lighting purpose in rural area. After launching the MHP all people have been using the electricity as main lighting source and some of the people started to use heater for cooking, Therefore, forest has not been destroying but improving. This is the positive symptoms of electricity in conservation of natural resources and environment.

5.1.7 Status of Sanitation

People most be cared about indoor and out door sanitation. In the negligence of sanitation there may happen different kinds of problems. Human health has been riskly with out sanitation. It is hoped that people would be able to get awareness and sensitive about sanitation after using modern technology. Electricity is also known as modern technology therefore it is attempted to find out the status of sanitation after electricity in the study area (Table 5.7).

Table 5.7

Status of Sanitation after Electricity

Status	Number	Percent
Improved	30	53.57
Same as before	26	46.43
Total	56	100.00

Source: Field Survey, 2009.

The table shows the status of sanitation after electricity with reference to environmental impact. Out of 56 respondents maximum proportion i.e. 30 (53.57%) reported the sanitation is improved. Remaining 26 (46.43%) reported there is not any change occurred in sanitation after electricity i.e. same as before.

To sum up, who have proper knowledge that what is the use of electricity those people changed their behaviour and cared about indoor and outdoor sanitation. It is proved that most of the negligence about sanitation happened at the time of night. But after electricity people have been using the lighting time to remove the pollution.

5.1.8 Impact of Project

Impact of MHP project in human health may be positive and negative both. It is attempted to find out how many respondents positively and negatively affected by this after MHP with reference to human health (Table 5.8).

Table 5.8

Impact of Project on Human Health

Impact	Number	Percent
Positive	42	75.00
Negative	0	0
No change	14	25.00
Total	56	100.00

Source: Field Survey, 2009.

The table presents the impact of project on human health. Out of total 56 respondents maximum proportion i.e. 42 (75%) reported that the electricity have occurred positive effect on human health. Minimum proportion i.e. 14 (25%) respondents reported that electricity may not affect on human health. Nobody respondents not found in the support of negative effect.

To, sum up, people of rural areas have been using the most firewood and kerosene for lighting or lamp. After the MHP people have drown up the use of kerosene and firewood as lamp then they are faraway from such types smoking and feeling easy and healthy.

5.1.9 Effect in Drinking Water

Some of the constructions may effects on different sectors. Electricity is nearest to water, therefore, it may affects on drinking water in some places but not everywhere. This table 5.9 presents the situation that what is the effect of projects in drinking water supply.

Table 5.9

Effect of Project in Drinking Water Supply

Effect	Number	Percent
Yes affect	-	-
No affect	55	98.21
Unknown	1	1.79
Total	56	100.00

Source: Field Survey, 2009.

Out of the total 56 respondents, maximum proportion i.e. 55 (98.212%) reported that the project has not affected on drinking water. Only 1 (1.79%) respondents reported that he is unknown about any kinds of effect. No body told whether the project affected on drinking water.

In addition, it can be proved that the main origin of MHP water and drinking water are in different places.

5.1.10 Establishment of Industries

Electricity is main foundation of any kinds of industries. Without electricity no one industries can be conducted. Although the MHP is known as small scale but it is attempted to find out that what types of industries are there established or not? (Table 5.10)

Table 5.10

Establishment of Industries After Electricity

Establishment	Number	Percent
Yes established	10	17.80
No established	46	82.14
Total	56	100.00

Source: Field Survey, 2009.

Among 56 total respondents maximum, proportion i.e. 46 (82.14%) people reported that the industries are not established after electricity in their village. But lowest proportion i.e. 10 (17.86%) reported that the industries are established in their village or ward.

To sum up the researcher asked the questions to respondents either industries are established or not in their village or especially in ward. The respondents who are from industries ward they told yes and who are not from those ward where industries are not established they told no. Flour mill and oil mill is established there after electricity.

5.1.11 Status of Education

Nepal is stated is second position with reference to water resource in the world. Most of the rural areas of Nepal have been dark at the night. People have been using kerosene and burning firewood for light. By this situation schooling aged generation is mostly affected. It is attempted to find out that what is the status of student's education after electricity (Table 5.11).

Table No. 5.11

Status of Student's Education after Electricity

Status	Number	Percent
Improved	36	64.29
No improved	16	28.57
Unknown	4	7.14
Total	56	100.00

Source: Field Survey, 2009.

Among total 56 respondents most proportion i.e. 36 (64.29%) reported that the education status of their children is improved. Lowest proportion of respondents i.e. 4 (7.14%) respondents is unknown about their children's educational status and 16 (28.57%) respondents the education reported that status is not improved or same as before and after electricity.

In addition, most of the guardian of schooling children found that their children have been studying at the night time using electricity by this situation, it can be said that most of the student's educational status is improved after electricity.

5.1.12 Pollution by Project

There are different kinds of pollution. In this stud y it is attempted to find out the status of environmental pollution. Is there seen any kinds of pollution after MHP plant? If so what kinds of pollution have occurred? The table 5.12 and 5.13 shows about that.

Table No. 5.12

Status of Environmental Pollution after the Project

Pollution	Number	Percent
Yes	20	35.71
No	36	64.29
Total	56	100.00

Source: Field Survey, 2009.

Most of the infrastructure may occur the environmental degradation and pollution. In this situation a question was asked either there is environmental pollution or not in the study area. Out of the total 56 respondents. Most proportion i.e. 36 (64.29%) reported that there is not any kinds of environmental pollution and remaining 20 (35.71%) respondents reported there is environmental pollution after project.

In addition, positive and negative result occurs after every changes but disadvantages must be dominated by advantages. So after the project there is not bad environmental pollution in study area.

Table No. 5.13

Type of Pollution Occurred after Project

Type of pollution	Number	Percent
Landslide	10	50.00
Rock fall	5	25.00
Soil erosion	5	25.00
Total	20	100.00

Source: Field Survey, 2009.

Out of 56 total respondents only 20 respondents reported that there is environmental pollution after the project. The researcher asked them what kinds of pollution occurred after the project. Out of 20 respondents maximum proportion i.e. 10 (50%) respondents reported landslide occurred in the place, 5 i.e. (25%) respondents reported rock fall and 5 (25%) respondents reported soil erosion occurred after the project.

To sum up, there is minor environmental pollution occurred after the MHP plant.

5.1.13 Status of Wild Animal

Some of the developmental tasks like road and major MHP plants may affects the shelter of wild animals. What is the status of wild animals? Are they in dangerous

situation? To find out about this issue a question is asked to respondents. The table 5.14 shows about that.

Table 5.14

Status of Wild Animals after Project

Extincted	Number	Percent
Extincted	0	0.00
No extincted	56	100.00
Total	56	100.00

Source: Field Survey, 2009.

Out of 56 respondents all i.e. 56 (100.00%) respondents reported that there is not any animal extracted after MHP.

In addition. MHP of study area is lower powered and the origin of water is situated in the middle of the village. So there may neither wild animal nor chance of extricated.

5.1.14 Trend of Migration

Naturally people want many more facilities and easy living. Where the availability of services people wants to move there from another places. There is two factors of migration, those are pull factors attracts the people and push factor push the people from origin. Electricity is one of the important pull factors in urban areas. To find out the types of situation the table 5.15 presents the migration trend after the MHP implementation in the study area.

Table 5.15

Trend of Migration after Project

Trend	Number	Percent
Increased	0	0.00
Not Increased	56	100.00
Total	56	100.00

Source: Field Survey, 2009.

Out of 56 respondents i.e. 56 (100%) respondents reported that migration trend is not increased that means there is not entrance. There is not immigration and emigration of men.

In addition, the MHP is implemented in rural area; therefore there was not chance of immigration and emigration.

5.2 Attitude of Community towards MHP

The chapter four is divided into three section according to objectives. In this sub-chapter or section it is attempted to find out the thinking, feeling and vision of the community towards MHP. What kinds of mind making with respondents for MHP related data are tabulated and analyzed.

5.2.1 Effects in Social and Culture

The invention of new technology can effect directly and indirectly in different sectors. The electricity is also knows as modern technology in rural areas of Nepal. The table 5.16 and 5.17 presents the effect of plant and factors affected by MHP in social and cultural properties.

Table No. 5.16

Effect of Plant in Social and Culture Properties

Effect	Number	Percent
Yes	48	85.71
No	8	14.29
Total	56	100.00

Source: Field Survey, 2009.

Among the total 56 respondents highest proportion i.e. 48 (85.71%) respondents reported that the plant affected in social and cultural properties. Likewise among 56 respondents lowest proportion i.e. 8 (14.29%) respondents reported the MHP has not affected on social and cultural properties.

In addition modern services directly and indirectly affects in traditional attitudes, eating, speaking, clothing and behavior. So MHP has also affected in social and cultural properties.

Table No. 5.17

Factor Affected by Project

Factors	Number	Percent
Change in behavior	25	52.08
Change in thinking	18	37.50
Change in fashion	3	6.25
Others	2	4.17
Total	48	100.00

Source: Field Survey, 2009.

The table represents the respondent's attitudes towards project, so it is attempted to find out the factors affected by the MHP. Of the total 56 respondents 48 reported the project can affects the social and cultural properties, therefore the question is asked for them what are the factors affected by the plant? In this question among the total 48 respondents, highest proportion i.e. (52.08%) reported change in behavior. Lowest proportion i.e. 2 (4.17%) reported in other factors. Likewise change in thinking constitutes 18 (37.50%) change in fashion, 3 (6.25%) respectively.

To sum up, when electricity facility is available there increases the use of audio and video visual media. By those types of media new generation can imitate or copy of every things that they have heared or saw. So it is proved that projects has affected in social and cultural properties.

5.2.2 Feeling/Concept of People

Feeling or concept refers the any kinds of response towards and things. People have either satisfaction or dis-satisfaction toward electricity. What they have been feeling after MHP established. It is attempted to find out that what is the feeling of people towards electricity in the study area (Table 5.18).

Table No. 5.18

Feeling of People towards Electricity

Feeling	Number	Percent
Satisfied	42	75.00
Unsatisfied	2	3.57
All right	12	21.43
Total	56	100.00

Source: Field Survey, 2009.

Among total 56 respondents highest proportion i.e. 42 (75%) reported that they are satisfied by electricity service. The lowest proportion i.e. only 2 (3.57%) respondents reported they are unsatisfied and remaining 12 (21.43%) respondents reported all right.

In addition electricity facility is closely related with human life. It is not only necessary in day time, but also in might time. Electricity made the human life easier and comfortable. It is also able, to make the whole world as a one state. In rural area electricity is a strange thing. So must of the respondents are satisfied by electricity.

5.2.3 Interest of Loan

There is need of loan for the completion of any kinds of project. For this MHP plant people have taken the private loan. It is attempted to find out the respondent's feeling about the interest rate of the loan high low, or medium. What's they have feeling (Table 5.19).

Table No. 5.19

Feeling of Respondents towards Interest Rate of the Loan

Feeling	Number	Percent
High	27	48.21
Low	1	1.79
Medium	28	50.00
Total	56	100.00

Source: Field Survey, 2009.

The table shows the feeling of respondents towards interest rate of the loan, which they have taken for MHP. Among the total 56 respondents highest proportion i.e. 28 (50%) reported that the interest rate is medium. Only 1 (1.79%) respondents reported the low and remaining 27 (48.21%) respondent reported the interest rate of the loan is high.

In addition the entire user group has taken private loan to conduct MHP. Most of the people have known that as medium because the rate is monthly 3 percent.

5.3 Sustainability of MHP

Invention of anything is not only better itself, but also repairing and maintenance should be necessary. There is not worth of construction in the absence of sustainability. For this purpose this third part of chapter four includes the ways of sustainability of MHP in rural area. What kinds of methods and ways should be implemented for maintenance, which must be responsible for operation and maintenance? Here is attempted to explain the ways of sustainability. Related data are tabulated and analyzed respectively.

5.3.1 Operation Schedule

A clothes needs to be washed, houses needs to be colored and so many things needs repairing and maintenance. So that there is necessity of operation schedule in powerhouse. It is attempted to find out that either there is operation schedule or not, regular or irregular schedule have been practiced (Table 5.20).

Table No. 5.20

Status of Operation Schedule in Power House

Operation schedule	Number	Percent
Regular	50	89.29
Irregular	6	10.71
Total	56	100.00

Source: Field Survey, 2009.

The table shows that the statuses of operation schedule in powerhouse. Among the total 56 respondents highest proportion i.e. 50 (89.29%) respondents reported that

there is regular operation schedule in powerhouse and remaining only 6 (10.71%) respondents reported there is not regular operation schedule in powerhouse.

To sum up it is known that repairing and maintenance is necessary every non-living things. So MHP must needs repair and maintenance. That makes things sustainable. Most of the people are known about operation schedule and least people unknown about that.

5.3.2 Peoples' Responsibility

Responsibility is also known as accountability. Everything needs maintenance. For this purpose some one must be responsible. In this study it is attempted to find out who is responsible for maintenance, what is the concept of people (Table 5.21).

Table No. 5.21

Concept of People towards Maintenance Responsibility

Responsibility	Number	Percent
User	3	5.36
User committee	53	94.64
The plan owner	0	0.00
Total	56	100.00

Source: Field Survey, 2009.

The table presents the concept of people towards maintenance responsibility. Among 56 respondent highest proportion i.e. 53 (94.64%) respondent reported the maintenance responsibility goes to user committee and remaining 3 (5.36%) reported on the favor of users. Nobody reported on the plant owner.

To sum up it is known that "it take to makes a quarrel" therefore user community and a kind of committee organized by selected people must take such responsibility.

5.3.3 Women's Participation

Women are backward in our society with reference to every issue. They have not courage and proper knowledge about every subject matter. Men and women are

known as two cards of a wheel but it is limited only in saying not in reality. It is attempted to find out the status of women's participation in maintenance and use of electricity by a question high, low or zero (Table 5.22).

Table No. 5.22

Status of Women's Participation in Maintenance and Use of Electricity

Status	Number	Percent
High	11	19.94
Low	25	44.64
No	20	35.72
Total	56	100.00

Source: Field Survey, 2009.

The table shows that status of women participation in maintenance and use of electricity. Out of the total 56 respondents highest proportion i.e. 25 (44.64%) reported that women's participation is low in maintenance and use of electricity. Likewise lowest proportion 11 (19.64%) reported high and remaining 20 (35.72%) reported there is not women's participation in maintenance and use of electricity.

To sum up it is known that "Men and women are two cards of wheel." So equal opportunity and participation is necessary in maintenance and use of electricity. Due to lack of awareness and traditional thinking women's participation is constituted low proportion.

CHAPTER – VI
SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Summary

Nepal has occupied the second position in the field of the water resource in the world. The feasibility is shown there may be possibility of 83000 MW electricity but nowadays load shading is known as burning issue in Nepal. In this complex context lower power MHP may be note worthy in the rural areas of Nepal. The Manpang-I MHP is known as an innovative attempts by a courageous.

This has brought noteworthy modification on the rural society.

This is a descriptive study designed to find out the socio-economic and environmental impact of micro-hydropower project of Manpang-I Budhathum VDC, Dhading.

This study conducted from the direct interview method among 56 respondents. Those respondents were selected by random selection. The major findings of the study are as follows:

- Proportion of Brahmin and Chhetri caste is found highest (i.e. 60.71%) in study area and lowest proportion of respondents found in Dalit i.e. (12.50%).
- The living standard of all respondents (i.e. 100%) has changed after electricity.
- The highest proportion of respondent's (i.e. 75%) family income increased after having the electricity facility.
- The highest proportion of respondents (i.e. 64.29%) unable to meet their annual food demand by crops and livestock.
- The maximum percentage of respondents (i.e. 89.29%) reported the condition of forest is reformed after MHP.
- The highest percentage of respondents (i.e. 56.57%) reported the sanitation situation is improved.

- 75 percent respondents reported that the MHP positively affected in human life.
- 98.21 percent respondents reported they have not irrigated land for farming.
- Maximum percentage of respondents (i.e. 98.21%) reported the MHP has not affected the drinking water.
- 64.29 percent respondents reported that their children's education status is improved.
- Some percentage respondents reported that there is not environmental pollution.
- The highest percentage of respondent (i.e. 85.71%) reported that the MHP affected the social and cultural properties.
- The highest percentage of respondents (i.e. 75%) is satisfied by electricity.
- Majority of the respondents (i.e. 89.21%) reported there is regular operation schedule in powerhouse.
- Most of the respondents (i.e. 44.64%) reported there is low participation of women in maintenance and use of electricity.

6.2 Conclusion

Lower scale MHP may be most useful in rural and remote areas. There is sufficient feasibility of such types of lower scale MHP, but neither governmental nor private sector's vision goes there. The conclusion of the study area as follows:

- Dhading district is known as main place of ethnic diversity which is presented by Brahmin and Chhetri, Dalit and Janajati.
- Electricity is the closely related with human life therefore all respondent's living standard have been changed after MHP.
- After electricity facility most of the respondent's family income is increased.

- In rural areas, farming and keeping livestock is main occupation but the respondents have not able to meet their annual food needs by that occupation.
- Before electricity people have been using maximum firewood as light or lamp and cooking but when MHP established the condition of forest is improved.
- The status of sanitation is improved after electricity facility.
- Before electrical facility people have been using he flaming firewood and Kerosene at the night, after electricity they are reduced such types of materials, so positive impact is found in human health. Most of the respondents are satisfied by MHP.
- There is poor irrigation facility in study area.
- The origin of drinking water and MHP used water is in difference places. So the project has not affected in drinking water.
- After electrical facility students have been using evening time for study therefore it is found that educational status of student is improved.
- Major environmental pollution has not seen after MHP but minor pollution has found.
- The MHP is known as lower scale plan and established in rural hilly area, therefore there is neither immigration nor emigration trend.
- Respondents has started to use audio and audio-visual materials, therefore plant has effected on social and cultural practices like change in behaviour, changing in clothing and thinking.
- To build the MHP sustainable, repair, maintenance and operation schedule should be necessary therefore there is operation schedule in powerhouse. For these propose user committee is fully responsible.
- Men and women are known as two cards of a wheel but in rural and remote area of Nepal the statement is limited in saying. In some places there is zero

participation and some places lower participation of women found in maintenance and using electricity.

6.3 Recommendations

Nepal is second rich country in the world with respect to water resources, but people of the rural area always have been living in dark not only at night time but also in day. People are far away from modern technology. Nowadays the most of the urban area, which are known as facilitated, have compulsions of load shading. This complex issue has become the headache of governor and common people.

Due to this conclusion the lower scale MHP is relevance in remote and hilly areas. The following recommendations are presented.

- Electrical energy must be established as a fundamental and basic needs of human being.
- Nepal is rich in water resource but there is not specific vision and policy of state. Therefore the government should formulate and implement the proper policy.
- In conflict-affected areas like Dhading district, the establishment of NGOs and INGOs is like mushroom but no one of them are related to small and large scale MHP. Their attention should go in this field and government must ruling them to do so.
- Government is frosted and quiet in the sector of small as well as large scale MHP. Government should increase the amount of subsidy for this projects.
- The government in the sector of electricity should conduct feasibility survey.
- Community must be sensitive to demand necessary facilities.

REFERENCES

AEPC (2000), *An Introduction to Alternative Energy Technology in Nepal*, His Ministry of Government of Nepal, Ministry of Science and Technology, Dhobighat, Lalitpur, Nepal.

APEC (2001), *An Introduction to Alternative Energy Technology in Nepal*, Ministry of Science and Technology, Kathmandu, Nepal.

CBS (2002), *Population Census Report of Nepal-2001,* Kathmandu: Central Bureau of Statistics.

DDC (2066), *"DDC Profile"*, District Development Committee, Dhading, Nepal.

Dhital, R.P. and et. al. (2003), *Financial Sustainability,* A Challenging Issue for Micro-Hydropower Development in Nepal.

East Consult, P. Ltd. (1999), *Socio-Economic Impact Evaluation of the MHP Schemes in Rural Communities of Nepal,* East Consult, Kathmandu.

Energy Sector Assistance Program (2004), *Social Mobilization for Micro-Hydro Schemes,* HMG ESAP Nepal, Dhobighat, Lalitpur, Nepal.

HMG/N (2002), *Annual Report of Rural Energy,* UNDP Supported, Rural Energy Development Program, Ministry of Water and Resource, Kathmandu, Nepal.

Hora, Prabina, *Role of Micro-Hydropower in Rural Electrification,* Thesis in Economics, T.U., Kirtipur, Kathmandu.

MOF (2009), *Economic Survey 2008/09,* MOF/ GON/N, Singha Durbar, Kathmandu, Nepal.

NPC (2002), *"Tenth Plan" (2002-2007),* NPC/ HMG/N, Kathmandu, Nepal.

Shrestha, B.K. (2000), *Role of Hydro-Power Electricity in Economic Development,* M.A. Thesis Submitted to Central Development of Geography, T.U. Kirtipur.

Tiwari, Dan P. (1995), *Micro-Hydro Power in Nepal: A Case Study of Bhorletar MHP Plan,* An Unpublished Dissertation Paper Submitted to the Central Department of Rural Development, T.U.

WECS (1995), *Nepal Water Resources Strategy,* Ministry of Water Resources, Kathmandu, Nepal.

ANNEX – 1

SOCIO-ECONOMIC AND ENVIRONMENTAL IMPACT OF MICRO-HYDRO POWER PROJECT

QUESTIONNAIRE

General Information

Household No.:

Interview Date:

1. Respondent's name:

   a) Age: b) sex: c) Village: d)Ward No.:

2. Family Size : .....

3. Occupation : .....

4. Annual Income:.....

5. Caste/Ethnicity:.....

Questionnaires :

1. Have your living-standard been changed after electricity?

   a) Yes b) No

2. What is the status of your family income after having electricity ?

   a) Increase b) Decreased c) No change

3. Is the product of crops and livestock meet the annual food demand of your family ?

   a) Yes b) No

4. How much time did you spend to collect the firewood before and after this project ?

   a) Before ……. b) After …….

5. What is the condition of forest after this project launched ?

   a) Destroyed b) Improved c) No change

6. What is he status of sanitation in the village after electricity ?

   a) Improved b) Same as before

7. What kind of change occurred on your health after the project being implemented ?

   a) positive b) Negative c) No change

8. Is there irrigation facility in your farm ?

   a) Yes b) No

9. If yes, what is the status of irrigation of facilities ?

a) Regularly b) Irregularly c) Sometimes

10. Is the project affected to drinking water supplies ?

a) Yes b) No c) Unknown

11. Are there established any kinds of industries ?

a) Yes b) No

12. If yes what kinds of industries established ?

Name and types of industries	Function of industries

13. Are your family employed in the industries ?

a) Yes b) No

14. What is the educational status of your children after electricity facilities ?

a) Improved b) No improved c) Unknown

15. Is there environmental pollution after this project ?

a) Yes b) No

16. If yes, what types of pollution ?

a) Landslide b) Rock fall c) Soil erosion

d) Dust/Water/air pollution

17. Is there wild animal extricated after project ?

a) Yes b) No

18. If yes, which animal is extricated?

……..

19. Is there any increase in migrated people after this project ?

a) Yes b) No

20. If yes how many people ?

…….

21. Has the plant affected your social and cultural practices ?

a) Yes b) No

22. If yes, in which factor is affected after project?

a) Change fashion b) Change behavior

c) Change in thinking d) others ……..

23. Is there any change occurred in governmental and non-governmental sectors after established project? Yes given name.

……..

24. What is the impact of project in infrastructural development ?

a) Positive b) Negative

……. …….

……. …….

25. What was the installation cost of project?

……..

26. How did your self-fund to install MHP ?

Rs. ……

27. How much subsidiary did you get about it ?

Rs. ……

28. Have you taken self-loan for project ?

a) Yes Rs. ……. B) No Rs. ……..

29. What do you fell about interest rate of the loan ?

a) High b) Low c) Medium

30. Do you have the continuous operation schedule in power house ?

a) Yes b) No

31. If no, have you done maintenance schedule?

a) Yes b) No

32. Who is responsible for maintenance?

a) User b) User committee c) The plant owner

33. What is the women's participation the use of the electricity?

a) High b) Low c) No change

34. What is your feeling about the electricity facilities?

a) Satisfied b) Unsatisfied c) All right

35. What type of activities should be done for sustainability of the project in loan run term? Give option.

Opinion		Suggestion	
a)	…….	a)	…….
b)	…….	b)	…….
c)	…….	c)	…….
d)	…….	d)	…….