CHAPTER ONE
INTRODUCTION

1.1 Background

Nepal is the richest country in water resources in Asia and the second richest in the world after Brazil. Nepal has about 6300 large and small rivers hurling from the Himalayas and high mountains towards the plain area of Terai. And also we have innumerable streams, rivulets, glaciers, lakes, ponds and underground water stock. The total length of these large and small rivers is about 45,000 km. The perennial nature of Nepalese rivers and the steep gradient of the country's topography provide ideal conditions for the development of some of the world's largest hydropower projects in Nepal.The total potential of these rivers is estimated about 83,290 MW of which45,520 MW (54.65%) and 42,133 MW (50.59%) are technically andeconomically feasible from 93 and 66 sites respectively.

This organization Kaligandaki is the holiest river of Nepal, named after theGoddess Kali. Gandaki, hurtling down between Dhaulagiri and Annapurnaranges, creates one of the world's deepest river canyons. Adventure in thismajestic river brings together great white water rapids with extraordinaryscenic beauty. Passing through remote hamlets amidst tranquil surroundingsis a remarkable experience. Abundant wildlife on the banks of the river andimpressive waterfalls has charm of their own. Beautiful Nepali villages onthe riverside like Rampur in Palpa district,Chapakot in Syngja district,Puttar and Nangetar in Tanahun district,Dedhagaun and Buling Tar inNawalparai district have high population as these are plenary and fertile foragriculture. Especially Kali Gandaki river rafting is famous for ultraexcitement all over the world. It attracts the lovers of adventure from the places of far and wide.

Energy is the basis need for all the sectors; moreover, energy is necessary in every step and moment of human life. The world has been modernizedthrough energy generation and application. So energy is the yardstick for the economic development of a country in modem age. The degree of economic development is largely determined by per capita energy consumption. Energy as an indicator shows the living standard of people. Demand for energy is

gradually increasing along with growing population and economic activities.Adequate andaffordable supply of energy is the basis of pre-requisite for socio economic development of a nation.

Kaligandaki 'A' Hydroelectric Power Station is situated at Mirmi of Syangja District about 300 km to the West of Kathmandu and 100 km from Pokhara in the same direction. The Head works is situated in Mirmi at the intersection of two perennial rivers,Andhikhola and Kaligandaki 'A' whereas the power house is in Beltari (About 7 km towards the South-East of Mirmi).

It is a run ofriver type of project and currently is the largest power plant of any kind in Nepal capable of generating 144 MWs of Electricity. Construction started in the year 1997 and was completed in the year 2002. It was constructed primarily to curb the ever increasing energy demand at that time and eliminate load-shedding prevalent due to the imbalance in demand and supply of energy. It was constructed with the financial aid of the Asian Development Bank with total costs reaching up to 50 billion NPR (Approx).These days it plays a pivotal role in balancing the power management system in Nepal.

The project is a daily peaking type ROR project able to generate 144 MWP for full 24 hrs during the 3 months of Monsoon with the Generation dropping to about 70 Mega-Watts during the dry season. The Project however is equipped with Peaking pondage facility which enables it to generate 144 MWs for about 6 hrs even in the extreme dry season every day when demands are high (evenings). The Natural path of the river has been used for the pondage facility thus eliminating the need of a separate infrastructure for pondage.

The power generated by the three turbines is evacuated to the central grid via a 132kV single circuit, a 66 kilometers (41 mi) long transmission line to Pokhara, and a 44 kilometers (27 mi) double circuit transmission line to Butwal. The electricity is sent to Lekhnath Municipality and Butwal (known as Butwal-1 and Butwal-2). A sub-station has been constructed in Lekhnath

Municipality,Kaski district and the existing Jogikuti substation in Butwal has been upgraded.

The Kaligandaki'A' Hydroelectric Project on the Kaligandaki River begun in 1997 completed in 2002. It was an integral part of the Nepal Electricity Authority's least-cost generation expansion plan to meet rising electricity demand. Although the project, supported by the Asian Development Bank (ADB), has long been completed, it was considered worthwhile to conduct a performance evaluation on its effectiveness, efficiency, relevance and sustainability, as well as to draw lessons for othersustainable energy projects. In addition, many environmental and social impacts were not understood immediately after the project completion.

ADB assisted with the project design and a $160 million loan. Overall, the project was rated successful. It effectively contributed to economic growth by producing on average close to 592 gigawatt-hours per year since commissioning, thus benefiting consumers nationwide. And some 4,142 households were connected to the grid under the project. This study assesses the performance of ADB country strategies and assistance programs to Nepal in this difficult operating environment (during 2004-2008). ADB approved $574.7 million in assistance from Asian Development Fund resources in the period, 61.8% in grants, 34.1% lending, and 4.1% technical assistance. Overall, the assessment of ADB assistance to Nepal is rated partly successful.

Nepal is a landlocked mountainous country, which is sandwiched between India and China. It is 1,127 Km far from the nearest point of the sea. It occupies 0.3 percent area of Asia and 0.003 percent area of the world respectively. Nepal is located in between latitude of 26°22' N. to 30°27' N. and the latitude of 80°4' E to 88°.12' E. The country is rectangular in shape and its average length from East to West is 885 km. and 183 km. from North to South. Nepal is divided on the various bases such as topographically mountains, hills,terai; river basin wise Koshi, Gandaki, Karnali. Likewise, in five development regions, fourteen zones, seventy-five districts 3915 VDCsand 58 municipalities administratively. Capacity of Kaligandaki"A" hydropower is 144 MW.

Through the history of human being, major advantage in civilization has been accompanied by increased consumption of energy. Moreover, energy is necessary in every step and moment of human life. The world has been modernized through energy. So, energy is the yardstick for the economic development of the country in modern age. The degree of economic development is largely determined by per capita energy consumption. Energy, as an indicator, shows the living standard of people. Demand for energy is gradually increasing along with growing population and economic activities. Large amount of foreign exchange is required for petroleum fuel. Because of absence of production of petroleum products within the country, hydro-electricity power generation is justified. It is non-polluting and available energy resource within the country.

The major energy sources consumed in Nepal are forest organic matters, petroleum products, hydro electricity and coal. Other alternative energy sources are wind, solar and biogas, which are gradually being used. However, Nepalese energy sector is dominated by traditional sources of energy such as firewood, agriculture residue and animal dung. The process of converting the solar energy into electricity and other kind of energy in order to meet the need of modern industry, transport, household activities and others, in general, has been found to be very costly. The Small Hydro Development Board (SHDB) was formed in 1975 AD to implement small hydro installation in remote areas, particularly, at district headquarters. It was unable to fulfill its ambitious plan because of technical, financial and managerial problems and also due to the lack of overall condition and forward planning in this sector. Moreover, the need of energy has been emphasized and programs related to this sector was started to include inevery plan. The programs have covered implementation of big, middle and small hydro projects.

1.2 Statement of Problem

"Hope for light to people living in dark"

Energy plays a vital role in sustainable economic growth. The role of energy in our economy development is important both from the stand point of

domestic use and export. The pace of industrialization was sluggish in the past due to the shortage of energy. The pace in industrial development can not be accelerated until the obstacle of the availability of energy is removed; the case is same in agriculture sector for food processing, cottage and small industries related to rice, pulse and oil mill, lift irrigation for drinking water and so on.

Hydropower and its development is said to be inevitable in Syangja because it is economically disadvantaged and geographically difficult for provide the national transmission line of electricity. Development history of KG energy sector and faced a host of problem needless to say, some of these challenge and problem still very much around. Due to the lack of management, lack of adquite government budged, lack of transportation for service delivery, GK was facing such problem to develop essential infrastructure of energy development.

Hydropower is only appropriate technology to fulfill the energy demand of the rural, Hill, Terai, Himalayan and urban areas. The hydropower is one of the well known energy sources. This energy source is continuously renewable non-polluting efficient, widely distributed and available resource in Nepal. Operation system of hydropower if flexible and in process no fuel cost. As a whole we can say that hydropower technology is a technology which suits to supply energy for isolated rural areas hill and mountains of the country. So, micro and small hydropower plants installation is one of the most appropriate methods of sub-station for other energy source, e.g. fuel, wood, animal dung, agriculture, petroleum products and coal for specially hill area of Nepal.

There are few researches done in the field of hydropower in GKSyangja, both by government and private sector but they electricity problem of Syangja. For the hydropower development resource is not usually enough still the country facing problem of management and implementation of these resources.

Present study try to examine the livelihood status and benefits of this Syanjga hydropower Syangja district. This study was focused on the following research question.

1. What is the current livelihood status of ti people in the study area?

2. How much is the benefit from the project to the community in the study area?

3. What is the socio economic change of the local people establishment of the
   hydropower in the study area?

1.3 Objectives of the Study

The general objective of the study is to explore the socio-economic impact of Kali Gandaki Hydro project in Krishna GandakiVDC.

The Specific objectives are:

1. To assess the energy consumpation of the sample households.

2. To evaluate the benefits from the project to the community in the study area.

3. To make relevant recommendation to policy makers.

1.4 Significance of the Study

Hydropower occupies a very eminent place in the energy sector of Nepal. The utilization of energy is centered in urban areas and most of rural areas have been by these power development schemes existing in Nepal. Nepal is blessed with many small and large rivers numbering almost 6000 and favorable topography for hydropower generation.

In the hill and mountain areas almost all households are found to consume traditional sources for cooking heating and other necessary activities. Kerosene is used for lighting; firewood is also used for lighting and cooking. The energy demand cannot be expected to be diversified living standard can be raised through supply of electricity. The social irnpacts.ofKaliGandaki Hydropower project are:

a) The quality of communication and education was improved through radio, television which can be made available through electricity. It is

necessary to increase knowledge for agriculture, information, whether condition, family planning etc.

b) Electricity can be used for heating cooking and lighting facility and other related activities.

c) Employment opportunities can be created through small and cottage industries.

d) Improvement in extra-curricular activities, such as cultural programmers, community meeting at night and adult education etc.

e) Improving rural clinics by providing refrigeneration for has some advantage and also disadvantages.

Construction of the Kaligandaki Hydropower project in micro level of the economy by connection into Krishna Gandaki VDC areas. But it has some impact on different sectors of projects areas. The study was attempted to reveal the socioeconomic impact, which help different stakeholders to take more benefits from this and similar hydro power schemes as well as the finding of the study was provided guideline to the government organization, NGO/1NGO private sectors and other concern organization working in the sector of hydro power in Nepal and particular to the Syangja district.And also finding of the study will be helpful to the policy makers to make appropriate policies, Strategies regarding hydro power in Nepal in general particular to the Syangja district.

1.5 Limitations of the Study

This study is concentrated in general on the present status, growth of hydropower and impact of Kali Gandaki Hydropower on socio-economic aspects of the local people in the project area. Despite the great potential of positive impact in the local economy by small hydropower the relized benefit are very low in many service area of small scale hydropower. Impact studies of installed hydropower plants are very scarce, through many impact assessments are done before the construction phase. In this context the

research problem of this dissertation is to asses the socioconomic benefit of Krishna Gandaki Hydropower with a view to prepare recommendation to argumentation the positive benefit and minimize negative benefits. Some of the limitations the studies are pointing below.

a) This study is based on primary and secondary data about the socio-economic impact of Kali Gandaki Hydro project.

b) This study takes the benefit of hydro power electricity user so, that the study does not represent the view of non- user of hydro power electricity.

c) This study is limited at Krishna GandakiVDC of Syangja district particular at word no. 1 to 9. Therefore the finding may not be generalized for all over the nation.

d) Conclusion might be valid to some extent to those areas, which have similar geographic socio-economic and environmental setting.

e) This study was limited in terms of deeper analysis as only a few variable selected from the numerous factor affecting the HP energy consumption in the study area.

The present study was covered only Krishna GandakiVDC of Syangja District. The study was very specific, So the conclusion drawn from the study might not be conclusive. The study was concentrated in participating local consumer of this HP. And try to identify the socio-economic impact of HP. in the study area.

1.6 Organization of the Study

This study was organized into five chapters. The first chapter deals with the introduction. It includes the background of the study, statement of the problem, objective of the study, significance of the study, limitation of the study, organization of the study. The second chapter presents the literature review. The third chapter deals with the research methodology. It includes the rational for the selection of study area, research design, nature and source of

data, universe and sampling, data collection technique and tools, limitation of the study. The forth chapter presents the data presentation and analysis with the profile of the study area. The last chapter of the study offers summary/finding, conclusion and suggestion. Appendices and reference have been kept at the end of this report.

CHAPTER-II

LITERATURE REVIEW

It is important to preserve the various religious and cultural heritages situated in deferent regions of the country and take an appropriate action towards the development of such heritages. Especially to preserve, develop in overall and promote the Kaligandaki region; all the scholars and citizens of the region are required to contribute something from their level to the society. So, for the preservation, development and endorsement of such e heritages of religious and cultural importance; for the eradication of gender and cast disparity; and for the promotion of religious and social cultures, economy, environment, health, education and all other essential areas; Kaligandaki Integrated Development Centre (KIDC) is established in2067 BC (2010 AD).

Acharya (1983), "Hydroelectricity Development in Nepal and its contribution to Nepalese Economy" mentions the contribution of hydroelectricity to Nepalese economy. It plays significant role by developing various fields such as agriculture, industries, transportation, social services etc. Water resource is the Nepal's greatest asset but unfortunately very insignificant portion has been harnessed to this date. She says that there is unequal distribution of electricity in different development regions. Nepal is facing many problems with respect to hydropower development. These are: lack of capital, skilled manpower, technical knowhow, sufficient market and economic status of people as well as the country.

Dhungel (2002), in his article "Trends and Patterns of Energy Consumption in Nepal", has mentioned that main sources of energies are biomass (traditional), which constitutes fuel wood, agriculture waste, animal dungetc. and commercial sources which constitute coal, petroleum products, hydro-electricity etc. Energy consumption in Nepal is dominated by biomass, which accounted for 95%, 94.9%, 91.7%,86.4% and remained shares of commercial energy in total energy consumption in FY 1984/85, FY 1989/90, FY 1995/96, and FY 2000/01 respectively. Average growth of biomass and commercial energy consumption during the FY 1984/85 and FY 2000/01 were 2.4% and

10% respectively. Combining both an average growth rate was more than 3% per annum during this period. The trend of energy consumption in Nepal during the FY 1984/85 — FY 1995/96 also shows that biomass was growing by 2.2% per annum. Similarly, commercial energy consumption was growing by more than 5% per annum. Annual growth rate of fuel wood, coal, petroleum products and electricity during the FY 1984/85 to FY 2000/0 1 were 2.7%, 27.2%, 12.7% and 10% respectively. Income elasticity of electro-products consumption and electricity were 1.75% and 1.14% respectively. He found that elasticity coefficients are greater than one, which reveals that an increase in per capita real GDP will increase to the amount of per capita energy consumption. By assuming 2.24% population growth rate and 4% economic growth annually, he predicts that energy consumption increase by 4.2% per annum during the FY 1994/95-FY 2004/05.

A report [UNDP, 1993] by United Nations Development Program published in 1993, entitled study on new and renewable source was conducted by UNDP to study the situation of new and renewable sources of energy in Nepal. The study is based on the survey covered some districts in the Central and Western Development Regions mainly in hills and mountains. This study depicts the status of new and renewable energy sources via small andhydropower, water turbines, biogas, solar and wind power. The study has assessed the potentiality of these resources and also identified the areas, which needs further development. The study covers out with the conclusion that most hydropower installations are either operating under capacity or generating inadequate electricity to meet local demands due to insufficient water during the dry season to generate electricity in full capacity. During the winter season, operation of some plants is often hampered by the formation of ice in the intake and frequent breakdown of the electro mechanical parts. Thus the study concluded that the hydro projects run effectively for about nine months in a year.

The study suggests that the government should provide facilities to set up new and renewable energy source (NRES) and there should be provision of financial support through subsidy in initial investment bank financing in

working capital, canalizing of donors' resources to promote healthy growth of NRES technologies. Further, there needs to be integration of cottage industries, ropeways and other income generating activities as a means of improving load factors and viability in isolated hydroelectricity.

"Social Economy and National Development: Lessons from Nepalese Experience" (1996), edited by Dahal and Mund, published by NEFAS, is another valuable and marvelous publication in this regard. This publication includes five major areas of social economy and national development in the context of Nepal. These are: Outward oriented economical nationalism, Local Development, People's Participation, Self-help Organization and Cottage and Small-Scale Industries. In this article, "Outward Oriented Economic Nationalism",Madan Kumar Dahal, has discussed about water resources. He says that Nepal's economic future lies in her water resources, which flow pricelessly from Nepal to India. The present estimatedcommercial potential of water resources in Nepal, if harnessed properly through bilateral, regional and international cooperation, not only Nepal but also the whole SAARC region was benefited.

The water resource is Nepal's most valuable asset and it is commercially unexploited yet. Fifty percent of the total theoretical hydropower potentiality is estimated to have commercial feasibility. Only 12.5 percent of the total population has had access to electricity with 253 MW installed capacity, which is 0.3 percent of total theoretical potential. Nepalese prospect for hydro resources development is further jeopardized by the lack of national consensus on harnessing water resources and its utilization, on the basis of constitutional provision.

Paudel (1996),"Hydroelectricity Development in Nepal" has studied about the development of hydroelectricity during different plan periods and major projects. Harnessing our water resources is easier to say than to do as the wide topographical variation has created hitch in our development efforts. However, this variation can be turned into nature's gift and ultimately can pave the steps for economic prosperity. Proper utilization of the water resources is essential for generating electricity and reducing the import of

expensive petroleum products. Hydropower projects seem to have brought some changes in attitude, behavior, habit and consciousness of the local people. It has mainly contributed to transportation, market and communication facilities. The physical characteristics and rivers naturally affect Nepal's hydropower development activities and human interaction. He concludes that small hydropower plants, which may be the only means of rural electrification in the country, are viable at present.

www.kaligandankihydropower.com.np The evaluation report makes three key recommendations: (1) Nepal Electricity Authority should invest $20 million in the plant to rectify problems, which include vibrations in the powerhouse; and ADB should consider making funds available to carry this out; (ii) the government should revise electricity tariffs to encourage cost recovery and foreign investment in the energy sector; and (iii) environmental and social mitigation measures should be formulated comprehensively in an area development approach to ensure the "do good" in addition to "do no harm" principle is applied-and particularly because many future hydro projects will likely be undertaken by the private sector or as public-private partnerships, which will require far more streamlined approaches to addressing environmental and social impacts.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research Design

The research design study was both exploratory and descriptive research. Descriptive design was adopted to describe the economic condition of women in the particular setting while exploratory research was conducted so as to access Socio-Economic impact of Kaligandaki Hydropower 'A' in the Syangja,Gulmi, Parbat. This study was mainly based on primary information collected from Mirmi VDCSyangja, ArbiniVDC of Gulmi, SaligramVDC of Prabat district. No preconceived idea about the hypothesis and variable were kept the hypothesis and variable were kept in mind before starting fieldwork. Therefore, it would create further curiosity to other research in the future. The primary data consists of information collected from the field research, from villagers through interview, information and observation.

3.2 Nature of Data Collection

The source of data collection was both primary and secondary data collection.

Primary Source: The researcher was collected raw data from field with the help of different tools and techniques such as: observation, Survey, Interview schedule, focus group discussion etc.

Secondary Source: Secondary source was collect through published and unpublished journals, books, thesis and articles etc.

a. Field visit and Observation:

This method was used to collect the relevant information directly. This method was found out what is the currently lifestyle and socio-economic impact of the Kaligandaki Hydropower 'A'. It also validates the data collected through questionnaire and interview schedule. This method was found more information past to present situation or socio-economic impact of the Kaligandaki Hydropower 'A'. This observation was focused on the

lifestyle, living standard, education, health and socio-economic impact of the Kaligandaki Hydropower 'A'.

b. Data Collection Tools and Techniques

To generate the primary tools and techniques was applied require data:

Questionnaire Schedule: The questionnaire schedule was used to collect the quantitative information from the respondents such as cause, impact so on.

Interview schedule: Structured and semi-structured schedule was developed to conduct with individual women and it was useful for the primary data collection.

c. Sample Size and Sampling Method

The universe of the study was MirmiVDC of Syanja,ArbiniVDC of word no. 3,Nrbini Village Gulmi,SaligramVDC word no. … Saligram Village of Parbat districts of local households those who are local stakeholders. Out of total 20 local households from each village and Majhi caste was selected for the study. The researcher will use random sampling method to collect household. First of all visit the secretary of VDC, related local NGOs and police office key information from the other stakeholders.

d. Key information

The primary data was collected from key information using the semi or unstructured interview method. The interview was taken as checking for data obtained from questionnaire. This method was found more information about respondent. Key information was taken from related VDC people or local households.

3.3 Limitation of the Study

Every research has its own limitation I will focus on the Kaligandaki Hydropower 'A' which will depend on the socio-economic impact of Mirmi VDC of SyangjaArbiniVDC of GulmiSaligramVDC of Prabat District. The finding was equally generalized to the other parts of Nepal.

Research will base on both qualitative and quantitative analysis on economic condition of women returned from foreign countries. The purpose of this study was fulfilled the research objectives under limited time and resource in which questionnaire, interview and focus group discussion. Interview schedule is used to collect the primary data.

3.4 Data Analysis and Presentation

The collection data was processed and tabulated towards the completion of the study although quantitative and qualitative data analysis was used in this research.

Nepal is a agricultural oriented country. Most of the people in Nepal live in rural areas; per capita income of the country is very low. According to CBS 20 12/13 economic survey, per capita income of Nepalese people is 721 US$ under productive. Most of the rural people are engaged in agriculture sector. The rural people are suffering from traditional practice.

Nepal, located on the lap of the mighty Himalayas, has no proven deposits of petroleum products or natural gas, and hence the only native supply of commercial energy is electricity. Nepal is stowed with water resources where more than 6,000 perennial rivers and rivulets flow with an annual average water runoff of 225 billion m3 thereby providing huge hydropower potential. It is estimated that Nepal has a total hydropower potential of 83,000 MW of which 43,000 MW is technically and economically feasible. Despite having huge hydropower potential, by the end of fiscal year (FY) 2012/2013, only 758 MW including 56MW from thermal plants of electricity has been generated in Nepal and 33% is the population live without electricity, per capita energy consumption 15 GJ.

The major energy sources of Nepal are forest biomas, agriculture, cattle dunk, petroleum products, hydro-electricity, and coal. Other alternative energy sources are wind, solar,microhydro and biogas, which are gradually being used. However. Nepalese energy sector is dominated by traditional sources of energy suci' as fuel wood, agriculture residue and animal dung. The process of converting the solar energy into electricity and other kind of energy in order to

meet the need of modern industry, transport, household and others in general has been found to be very costly.

Electricity, the most efficient and cleanest form of modern energy, is a critical component of economic development. An efficient provision of electricity can improve the socio-economic conditions and technological aspects of a nation that ultimately improves the living standard of the people. However, more than 13 million people still lack access to electricity and depend on traditional biomass such asfirewood, agricultural residues, and animal dung for cooking, heating and lighting in their homes.

Throughout the history of human being, major advances in civilization have been accompanied by increased consumption of energy. Moreover, most of the developing countries are suffering from energy crisis. Nepal has not been an exception from it. Demand or consumption of energy is gradually increasing along with population growth and economic development. Large amount of foreign exchange is required for petroleum fuel import. Because of lack of production of petroleum products within the country, every year 60-70 billion rupies has to bear for the import bill.

Hydro-electricity power is known as renewable, non-polluting and available energy resource within, the country. Micro hydropower plants also known as 'micro hydro', power plant, which are installed in Nepal's remote hilly and mountainous areas. These are useful to provide electricity for lighting facility mainly. Agro-processing like grinding, hulling, operating radio, TV, computers and some other end users are its benefits. Electricity is one of the key determinants for economic growth of a nation. Although the benefits of rural electrification are immense, more than of the people do not have access to electricity in Nepal. Micro-hydropower (MHP) scheme is considered the most feasible decentralized renewable energy option for providing reliable and affordable electricity to the remote and isolated areas of Nepal.. According to Webster distionary “Electricity is a term referring to the large body of physical phenomena arising from stationary and moving charge particles” [Webster, 1981].

According to Encyclopedia Britannica Hydro Electricity power is the phenomenon associated with positively and negatively charged particles of matter at rest, in motion, individually. Beginning several centuries before the birth of Christ the Greeks studied the effects and ability of amber to attract small objects after being rubbed and the attraction for one another of natural magnetic lodestones for long time these were considered to be one and it. It was not until the 161h century that the English physician and physics William Gilbert (known as father of electricity) clearly distinguished between magnetic and electric effects in his book 'The Magnet' [Mandible, 1960]. After 1800 the science of electricity developed rapidly with the invention of the firstbattery called Voltaic by Alessandro Volta. The discovery of magnetic field was produced by an electric current by Hans Christian in 1820, the almost simultaneous discovery of electromagnetic induction by Joseph Hennery and Michael Faraday made generator in 1831, theoretical compilation of electrical and magnetic observation and prediction of the existence of electromagnetic waves by James Clerk Maxwell [Encyclopedia Americana Vol. 10]. American scientist Thomas Alva Addition developed more - than thousand use of electricity like bulb. Addition opened company and built a power station at New York in (1881). This company supplied electricity in New York's 900 homes. This was the first time supply of electricity for commercial households lighting (Arnold, 1960). After that the earlier hydro electric development begin with the first commercial central power station which was placed in operation in 1882 at American city 'Appleton was composed of hydraulic turbines driving direct current generators from which the electric energy could be transmitted over wires [Encyclopedia Americana Vol. XIV, 1963].

These are useful to provide electricity for lighting facility mainly. Agroprocessing like grinding, hulling, operating radio, TV, computers and some other end uses are its benefits. Nepal's techno-entrepreneurs have gained immense expertise in this technology as they are in this trade for around 40 years. They have expertise to carry out all services for feasibility study, survey, design, manufacturing of turbines and other machines and equipment, installation, commissioning, and repair and maintenance required to micro

hydropower plants. This technology has been successful to generate approximately 20 Mega Watt of electricity establishing 2500H plants of different size and capacity. Achievement in this technical expertise also have been appreciated abroad as services, materials and know how beyond the country have been extended. Around 50 privately run firms/companies are there in this trade these days to render services to establish micro hydropower projects to generate of 5000 Kilo Watt of electricity annually in the country. The plants up to 1000 Kilo Watt capacity are to be known as Micro Hydropower as defined recently where as it was limited to 200 Kilo Watt in the past. The schemes of 5 Kilo Watt or less, now, have to be known as 'Pico'. Nepal HydropowerDevelopment Association was established, in Hydropower Development Association was established, in 1992, by eight privately run micro hydropower development firms/companies to set as an umbrella organization of those dedicated to serve thenation with micro hydropower technology, skill and expertise. The Association is also to support formulating policies, plans and programme to concerned agencies. Likewise, professional welfare is one of its objectives. Electricity is one of the key determinants for economic growth of a nation. Although the benefits of rural electrification are immense, more than 44% of the people do not have access to electricity in Nepal. Hydropower (HP) scheme is considered the most feasible decentralized renewable energy option for providing reliable and affordable electricity to the remote and isolated areas of Nepal. This study assesses the impact of a HP plant on socio-economic conditions in the remote village,Sikles, in Nepal. Cross-sectional research design was used to collect information with a structured questionnaire, key informant interviews, and focus group discussions. Results revealed that the village electrification had brought a series of positive changes in the rural livelihoods. Traditional kerosene lamps like Tuki and Panas were completely abandoned, and firewood consumption was reduced. Electric.lights in households extended the day providing additional hours for evening reading and work. The micro hydro based electricity was used to power modern agro-processing mills in the village, which reduced drudgery for women as they no longer had to use ineffective and distant traditional water mills. Thus,Hydro Power scheme provides clean, affordable and sustainable renewable energy both locally and

Globally. According to Encyclopedia Britannica “Hydro electric power is electricity produced from generators that are driven by hydraulic turbines to insure the requisite head of water and constancy of flow. The turbines are emplaced in dams that impound the stream flow. Thus creating reservoir that can be used for recreation or water supply purposes” [Encyclopedia Britannica Vol. 30, 15th Edition].

After Tennessee Valley's big hydroelectric project was built in America this established the most popular energy source of the world. Many invens and researchers had proved that Hydro electricity is renewable non-polluting and sustainable source of energy and it is generated in low social and economic cost.

Nepal is situated in the southern transitional of central Himalayas in Asia. It covers the total land area of 1,47,181 sq. km. and length 885 km east to west, 193 km north to south between 26°22' and 30°27' latitude and 80°4' and 88'12' east longitude in a rectangular shape, land locked country. Nepalis bordered in north by China. Insouth, east and west, Surrounded by India. The country can be divided into three major parts, the northern high altitude belt referred to as the mountain region including Mt. Everest (8848m.) perpetual snow glaciers and high altitudes river valleys where human habitation. The middle region called the hill region including Kathmandu,Pokhara and numerous rivers valleys. This belt is historically most populated area. And third the southern most portions of low-lying plains are known as Tarai region.

Considering the resources position and utilization of different regions, the government of Nepal has divided the whole country in the five development regions- Eastern, Central, Western, Midwestern and Far-western regions for development planning purpose. The three geographical regions, Mountain, Hill and Terai incorporate themselves in five development planning regions, which ultimately come to 75 geographical planning sub-regions called district.

Throughout the history of human being, major advances in civilization have been accompanied by increased consumption of energy. Moreover, most of the developing countries are suffering from energy crisis. Nepal has not been

an exception from it. Demand or consumption of energy is gradually increasing along with population growth and economic development. Large amount of foreign exchange is required for petroleum fuel. Because of absence of production of petroleum products within the country, electricity production is justified. In Nepal, solar and wind energy are comparatively costly than water based electricity. Hydroelectricity is known as renewable, non-polluting and available energy resource within the country.

Presently energy consumption appears to be directly related to the living standard of the people and the degree of industrialization of country.Therefore, energy is the basic requirement of development without which the pace of economic growth cannot be accelerated; the development of all the productive sector of an economy largely depends on development of energy sector. Realizing was initiated a long time back. Many technological developments started depending on these extracted fuels. Furthermore, from the beginning of human race, firewood energy has been used to fulfill their energy demand.

An adequate and affordable supply of energy is basic pre-requisite for socio-economic development of the nation. Land clearing for agriculture uses due to high growth of populations in Nepal have placed serious pressure on the traditional energy source base and have raised serious environmental concern.

It is generated internally; hydropower can substitute the import of fossils fuel. The demand of traditional energy is rising and it is closely related with the population growth. Due to high fertility rate of 3.1 percent with low crude death rate of 9 per thousand, the growth rate of population is 2.4 percent per year. Thus the pressure of energy demand is increasing day by day with the increasing pressure of population. At the same time uplift lighting of living standard of the people is a challenge for Nepal, which calls for modernization of agriculture practices and the other activities. This in turn requires intervention of the rural activities through introducing the commercial form of energy such as electricity services sectors and urban development are all factors leading to an increase in over all energy requirements. Without petroleum products reserves and with limited capacity energy from solar and

wind sources, Nepal is depending on hydropower and traditional sources to sustain its increasing energy needs.

The major energy sources of Nepal are forest organic matters, petroleum products, hydro-electricity, thermal plant, electricity and coal. Other alternative energy sources are wind, solar and biogas, which are gradually being used. However, Nepalese energy sector is dominated by traditional sources of energy such as fuel wood, agriculture residue and animal dung. The process of converting the solar energy into electricity and other kind of energy in order to meet the need of modern industry, transport, household and others in general has been found to be very costly. It is necessary to be able to gradually the first hydro-electric installation in Nepal was built at Pharping (500KW) in 1911 AD to supply electricity to Kathmandu, now the powerhouse is closed. Second hydro-power installation was built at Sundarijal Hydropower plant (640KW) in 1934, which is still in operation. There was electricity office named BijuliAdda to operate and maintain powerhouse transmission line and distribution to the people at that time. After that various diesel plants and Hydro power plants were constructed. As governmental department, Electricity Department was established and BijuliAdda was organized under Electricity Department. In 1962as autonomous body Nepal Electricity Corporation (NEC) was formed and BijuliAdda became NEC today NEC is called NEA. After that there was little further development until the 1 960s. Then oil crisis of early 1970's rapidly accelerated for installation of hydroelectric projects. At the same time, the government became concerned with improving its administrative structure around the country and gives more priority to this sector. The Small Hydro Development Board was formed in 1975 to implement small hydro installation in remote areas, particularly at district head quarter SFIDB. It was unable to fulfill its ambitious plan because of technical, financial and managerial problems and also due to the lack of overall condition and forward planning in this sector. Moreover, the need of energy has been emphasized and the programme related to this sector was started to.

Electricity, the most efficient and cleanest form of modern energy, is a critical component of economic development. An efficient provision of electricity can improve the socio-economic conditions and technological aspects of a nation that ultimately improves the living standard of the people. However, more than two billion people still lack access to electricity and rely on traditional biomass such as firewood, agricultural residues, charcoal, and animal dung for cooking, heating and lighting in their homes. Using these insufficient technologies, basic energy needs can hardly be met and contributes to maintaining the cycle of poverty in developing countries (Pokharel, 2007).

Nepal, located on the lap of the mighty Himalayas, has no proven deposits of petroleum products or natural gas, and hence the only native supply of commercial energy is electricity. Nepal is stowed with water resources where more than 6,000 perennial rivers and rivulets flow with an annual average water runoff of 225 billion m3 thereby providing huge hydropower potential. It is estimated that Nepal has a total hydropower potential of 82,000 MW of which 42,000 MW is technically and economically feasible. Despite having huge hydropower potential, by the end of fiscal year (FY) 2009/2010, only 716 MW including 53MW from thermal plants of electricity has been generated in Nepal and 44% of the population live without electricity. Nepal has a very low electricity consumption rate averaging 87 kWh/yearperson. During 2010,the total national annual energy demand was met through available resources, there was a power deficit of 677.86 GWh, which caused lockouts16H per day country wide. Power deficits are further exaggerated ruing the long dry period October to March as most of the larger hydropower projects are based on the seasonal flow of rivers (Sangroula, 2009).

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).

Nepal is divided in to five-development regional zone, 14 zones, 75 districts 58 municipalities and 3915 VDC. Out of the total population 86.66 percent

people live in rural and remote area. And 80.77 percent people depend on agriculture. The landlocked position of Nepal rugged, topography with limited arable land. Poor resources base and high extent of poverty are major economic vulnerabilities Nepalese economy feeling these• days and because of this makes it susceptible to increasing imports and foreign dependents Nepal has the largest natural resources. Unfortunately, Nepalese people are still poor and least developed because of underutilization of the available resources. Here, one hand, Nepalese economic growth rate is decreasing day per day. On the other hand Nepal's population is growing rapidly.

In the present condition of Nepal, energy plays the vital role of fulfillment 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. Usually, the trends of energy consumption is predominated by traditional resources particularly fuel wood. Over utilization of forest create serious environmental problem. 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).

But the water resources is immensely available in Nepal and hydropower is clean renewable among this micro-hydropower is more than more renewable pollution free, relievable and easily available. So the region in mountain and hillside of Nepal.So hydropower is the best alternative among all the available energy in the context of our country.

Nepal is the second richest country of the world and first richest country in Asia in the context of water resources. Nepal has about 6300 large and small river hurling from the Himalayas and high mountains towards the plain and Terai. The total length of those large and small rivers is about 45000 km. The perennial nature of Nepalese river and stepped grand of the country topography provided ideal condition for the development of some of the world's largest hydropower project in Nepal. The total hydropower potential of these rivers is estimated about 83,290 MW of and which 45,520 MW

(54.69%) and 42,133 MWE 50.59 percent are technically and economically feasible from 93 and 66 sites respectively, the countries theoretical potentiality occupies 2.77 percent of words at pot entity of hydropower. Nepal has generated 552.201 MW hydropower up to the end up to FY 2003/04 it is 0.67 percent and 1.33 theoretical and economic potentialities respectively. Out of the total installed power 414.188 MW and 144.083 MW power have been installed from public and private sector respectively. Total installed capacity has reached 609.057 MW including thermal power.

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,thisprojects 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 greatpotentiality for fulfilling the energy requirements of rural Nepal to a great extent (WECS, 1995: 7).

The, two-third of its land mass hilly and mountains region and 85 percents area of the country still rural. So, special rural electrification scheme need to be adopted to electrify such region. The country's still rough terrain about micro-hydro means that extending the gride to isolated rural communities scattered in the hills across the nation in slow, and prohibitively expensive. Today, only 15 percent of the country 21 million population have accessibility

to electricity through grid connection. Due to the consciousness about the negative environmental and socioeconomic impact of large-scale hydropower development, electrification through small-scale decentralization micro-hydropower (MHP) emerges as available alternative for rural electrification in Nepal (NPC, 2002).

3.5 Energy Source of Nepal

Commercial and traditional fuel has remained as two principal source of national energy. 90 percent people are living in rural areas that are consuming traditional energy source. In urban area people areas that are consuming traditional energy. Commercial energy is rarely available in rural areas. Where, they use fired wood Diyalo to light their house. Commercial energy is available in urban areas. However, M-ioro-hydro projects, biogas, solar and small scale wind energy are currently; being development in rural areas except biogas other forms of renewable energy contribute to lighting energy.

Traditional Energy Source

It is clear that sustainable energy is supplied by firewood, animal dung agriculture residue; which cover 90.5 percent of total energy consumption leaving 9.5 percentages to commercial source. Supply of fuel wood can not be maintained from uncontrolled destroy of forest which is the main source of traditional energy shared 67.6 percentage. In rural area energy is substituted by agriculture residues and cattle wastage. Human labors and animal draft power is also referred to traditional energy (Economic Survey, 2011).

Forest Resources

Forest is the major source of traditional energy in rural areas. People are depending on this source. Various programs and project are launched for the promotions and conservation of forest resource, which is one of the most important natural (traditional) resources of the country. Total traditional energy is shared of fuel wood by 67.6 percent. (Economic Survey, 2011).

Agricultural Residues

Agricultural residues are also traditional source of energy, which is used in Nepal. Such as rice husks and straw are increasingly using for in traditional stoves in houses. At present agriculture residue constitutes 15 percentage of the energy consumption (Economic Survey, 2011).

Animal Dung

Animal residue is used for cooking either in front of dung cakes or in family scale biogas digests. Dung is mostly dried and burned directly for cooking purpose. Alternatively, it is used for biogas plants in which it is used both for energy and organic fertilizer. 7.9 percent of energy contributes to traditional source by animal or cattle wastage sector.

Commercial Energy Source

In Nepal, Commercial energy (petroleum and coal) consumption is very low compared with other countries. It contributed only 9.5 percent of total energy consumption (Economic, Survey, 2008) the demand of most of commercial energy, e.g. coal, petroleum product or mineral oils are fulfilled through import. Commercial energy is mainly supplied in urban areas. Internal product of commercial energy is electricity, which contributed 1 percent of total energy supply. Its contribution is very low because of high project cost and limited capital to invest in this sector. Commercial energy consumption is very low than traditional energy.

Petroleum Product and Coal

Commercial energy like petroleum product and coal are another option. But they are not available in our country. So they are imported from India and abroad. So they are expensive too. A huge amount of export earning is drained to import petroleum product and coal have been increasing every years. Economic Survey 2008 shows that consumption of traditional commercial source of energy is estimated to grow by 2.2 and 9.7 percent respectively. The causes of that would be rapid increasing urbanization; increase in large

number of vehicles and someone also use kerosene for cooking in areas, lighting in rural areas and rapid population growth.

Solar Energy

The use of solar energy power in the country is at early stage development. Solar energy is used for domestic water heating drying agro products in urban areas. The solar energy products are not only expensive but also technically complicated so it is under utilized. Solar energy potential of Nepal is estimated equivalent 026.6 million M.W. (Economical Survey, 2011). The major solar power station in Nepal in Simikot (Humla) and Gamagadhi (Mugu) have setup capacity 50 K.W. each and generate electricity form solar power (NEA, 2003).

Wind Energy

Utilization of wind energy is still at the research stage in Nepal. But while considering its geographical feature and wind velocity, there is possibility to develop wind energy. Moreover, the only one project is installed at Kagbeni of Mustang district to generate 20KW electricity from wind power (Bhattrai, 2002). To develop this type of technology is technically costly too.

Hydro-Electricity

It is the main resource, which will ultimately become the dominate source of indigenous energy resource. It has been calculated the size of theoretical hydropower potential based on average flow of six thousand rivers are 83,000 MW where as technically potential 114 major schemes are identified total capacity of those schemes are 45610 MW. Those are economically potential major hydropower schemes whosebenefit cost ratio is more than one amount 42330 MW (Mishra S.N., 2000). With such capacity current utilized Hydro electricity is 549.2 MW (NEA, 2003). Nepal has 6000 rivers having capacity to generate electricity. So Nepal is rich energy sector if all that resource was utilized, Hydropower development required high initial investment, infrastructure like road etc. Electricity generated in Nepal essentially consists of both in the interconnected system and remote isolated areas, which is

backbone of our economic development and earning foreign currency (Thapa and Pradhan, 1995).

This study was sketched the impact of a HP on the rural livelihood in theremote village,KG VDCin Nepal. Thus, hydropower scheme provides clean, affordable and sustainable renewable energy both locally and globally. Presently energy consumption appears to be directly related to the living standard of the people and the degree of industrialization of country. Therefore, energy is the basic requirement of development without which the peace of economy cannot be accelerated.

CHAPTER - FOUR

DATA PRESENTATION AND ANALYSIS

4.1 General Background of the Study Area

This section deals with the overall analysis of the field that the researcher had acquired through the field study. In the process of analysis, research highlights socioeconomic impact of micro-hydro project. To justify the statement the researcher has analyzed both qualitative and quantitative data Micro-Hydro is the leading sector for the development of Nepal, It being a comparative advantage of Nepal has important role in Nepalese economy.

4.2 Socio-Economic Status

To study the socio-economic status through respondents the concerning data was carried out, which has been presented in the following table shown below.

Table 4.1

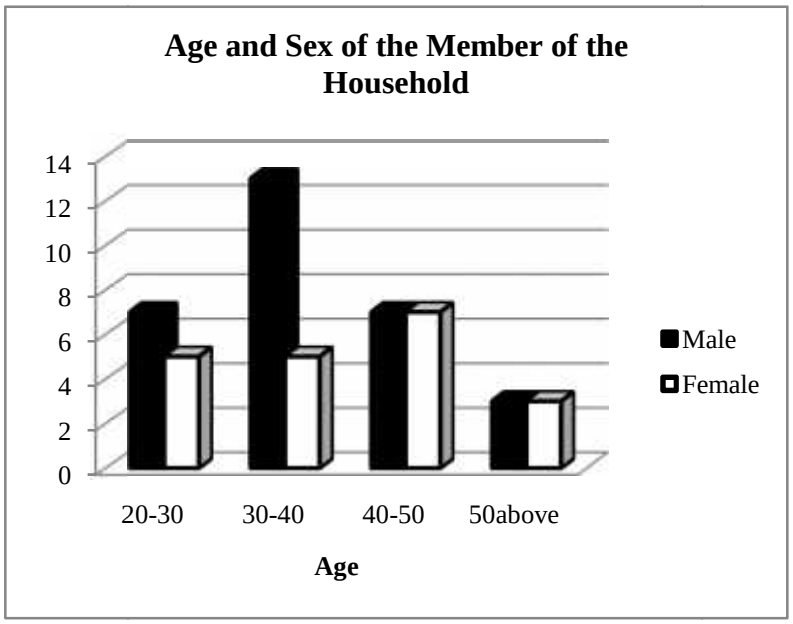
Age and sex of the Members of the households

Age	Male	Female	Total	Sex Ratio%
20-30	7	5	12	24
30-40	13	5	18	36
40-50	7	7	14	28
50above	3	3	6	12
Total	**30**	**20**	**50**	**100**

Source, Field Survey 2014

Table 4.1 shows the age and sex structure of population out 50 households.Total 50 population, are male and 30(60 %) are female (40%).

The above table is shown in bar- diagram in below:



4.3 Literacy of the Study Area by Sex

The following given table shows the literacy of the study area of the male and female which are given below.

Table 4.2

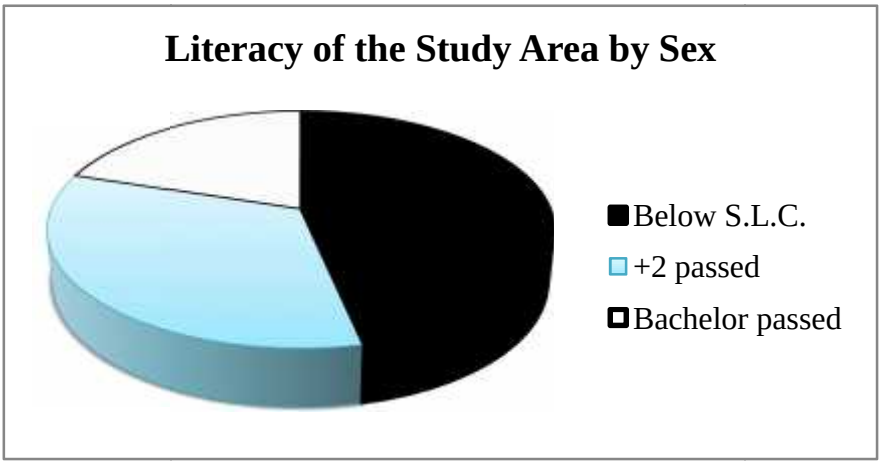
Literacy of the Study Area by Sex

Educational Level	Male	Percent	Female	Percent
Below S.L.C.	14	46.66	14	70
+2 passed	10	33.33	3	15
Bachelor passed	6	20	3	15
Total	**30**	**100**	**20**	**100**

Source: Field Survey, 2014.

The definitions of literary included those people who can read and write. The value of education is means of social mobilization it builds self-confidence in people and enhances their ability and efficiency. It also helps community development activities with collective efforts. Sometime development cannot be accelerated without quality education.

The above table shown in below pie-chart



4.4 Ownership of Land

To study the condition of land holding pattern of sampled household through respondents the concerning data was carried out which has been presented in the following table shown below.

Table 4.3

Land Holding Pattern of Sampled Household

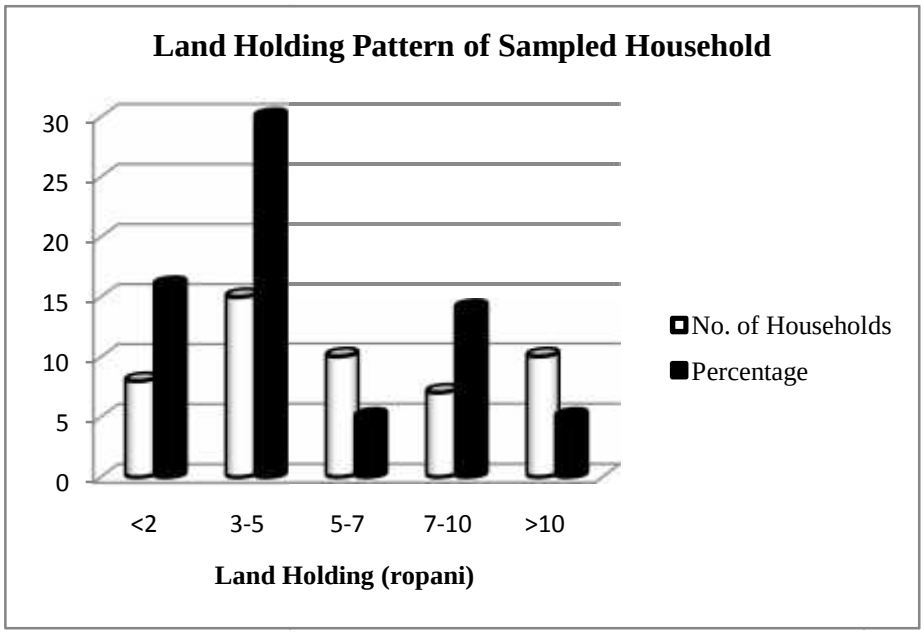
Land Holding (Ropani)	No. of Households	Percentage
<2	8	16
3-5	15	30
5-7	10	5
6-10	7	14
>10	10	5
Total	**50**	**100**

Source: Field Survey, 2014

Table 4.4 shows the land holding pattern of sample household in the study area. In hill and mountain, land is measured in Ropani, out of 50 household, 16 percent people have above 2 Ropani land 30 percent people have 3-5 Ropani, 5 percentage people have 5-7 Ropani land, 14 percent people have 7-10 Ropani and 5 percent people have more than 10 Ropani land. It shows that

the land is not the sufficient for households, so economic status of the people is becoming detonating.

The above data shown figure in below:



4.5 Income Sources

To study the condition of source of income in the sample household through respondents the concerning data was Carrie.

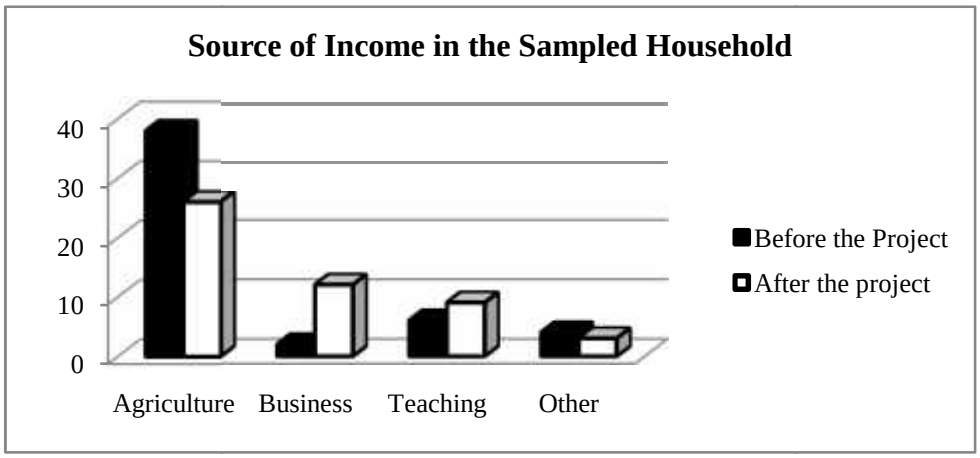
Table 4.4

Source of Income in the Sampled Household

Source	**Number of Household**	
	Before the Project	After the project
Agriculture	38	26
Business	2	12
Teaching	6	9
Other	4	3
Total	**50**	**50**

Source: Field Survey, 2014

The above table shown in Bar-diagram in below soon:



4.6 Socio-Economic Impact

It is no doubt that the project has revolutionized enough in community's life style. Their quality of life has been increased from the project than before. Before the implementations of the project. They were very conservative and poor. They were very poor and low living standard. Therewere no physical facilities such as electricity, toilet, irrigation, agriculture tools and machines, sanitation and transportation. But now all of the above things are available there. And the people are benefited with the knowledge and accessibility and they are utilizing them vigorously. All these are the features of the standard of living so the status of their life has been standard. All of the above have been shown with following diagram.

4.6.1 Housing Condition

Table 4.5

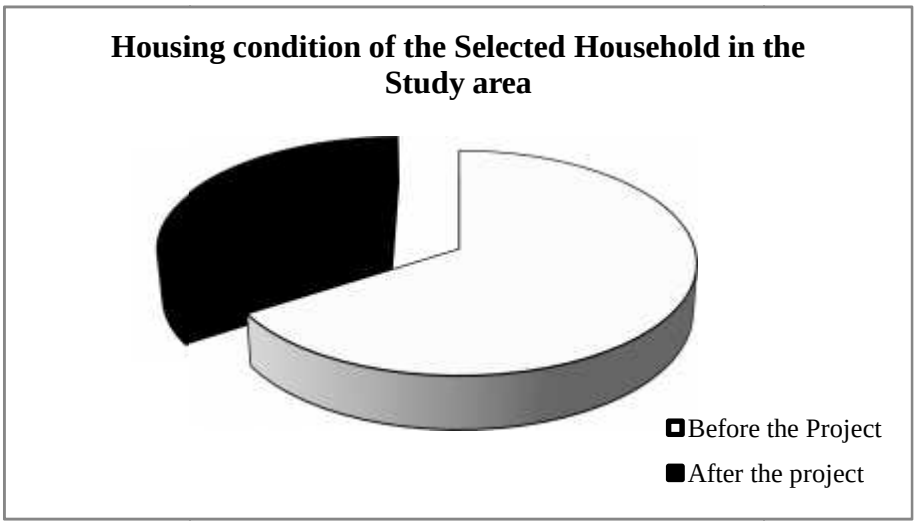
Housing Condition of the Selected Household in the Study area

Types of House	**Number of Household**	
	Before the Project	After the project
Kachhi-Stone	50	26
Pakki-Cement	0	24
Total	**50**	**50**

Source: Field Survey, 2014

Table 4.7, it is clear that 100 percent of households were living in KachhiS tone made by mud and stone before the project. After the project only 24 household have became in cemented house. From the figure it can be concluded that more people are lived in Kachhi-Stone, which are the symptoms of low level of standards. Based on the data of table 4.7, figure 4.3 shows the house holding condition of the selected household in the study area.

Housing Condition of the Selected Household in the Study Area



4.6.2 Use of Toilet

Table 4.6

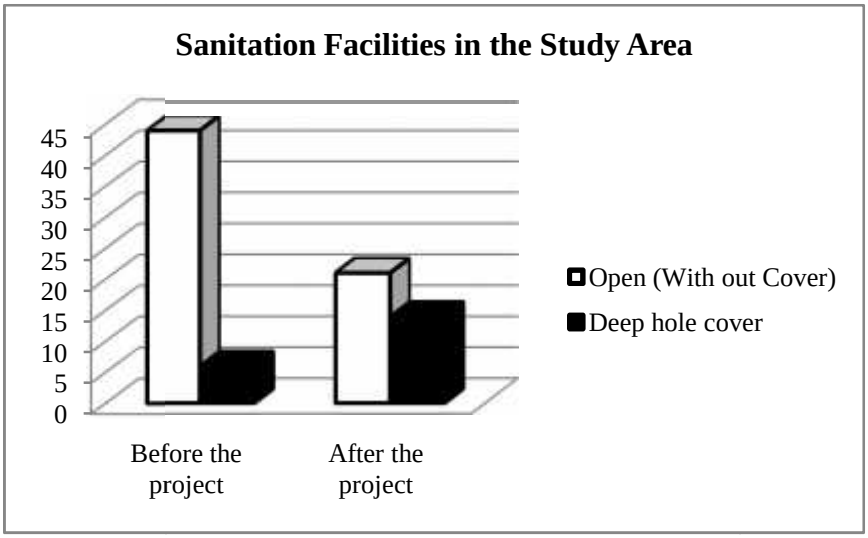
Sanitation Facilities in the Study Area

Types of Toilets	Numbers of Households		Change in Percent
	Before the project	After the project	
Open (With outCover)	44	21	42
Deep hole cover	6	14	28
Modern	0	15	30
Total	**50**	**50**	**100**

Source: Field survey, 2014

Sanitation is one of the indicators of living standard of the people. The above table shows that the using of open toilet has been decreased on the other hand use of modern toilet has been increased and use of covered also raised.

The above table shown has in bar diagram in below.



4.6.3 Energy used for Cooking Food

Table 4.7

Energy Uses for Coking in one Year

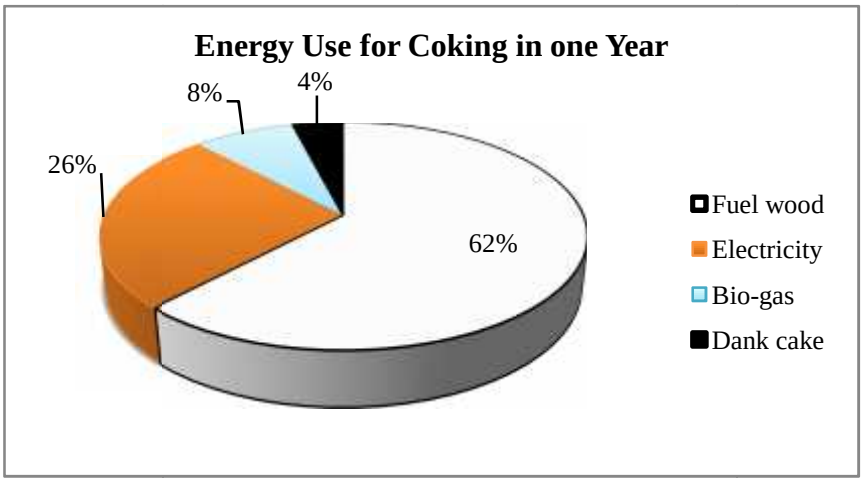
Sources	Number of Household	Percent
Fuel wood	**31**	**62**
Electricity	**13**	**26**
Bio-gas	**4**	**8**
Dankcake	**2**	**4**
Total	**50**	**100**

Source Field Survey, 2014

Table 4.7 shows that out 50 household survey. 40 household of 62 percent depend on forest and 8 percent of Gobar Gas for the purpose of cooking, heating and so on. After availability of 26 percentage used electricity no one has used it for cooking and heating. It means until they have depended on fuel

wood for cooking as before. These people have electricity they do not use it for the substitution of fuel wood purpose.

The above table shown in pie- chart in below:



4.7 Positive Impact of the Project in the Study Area

Table 4.8

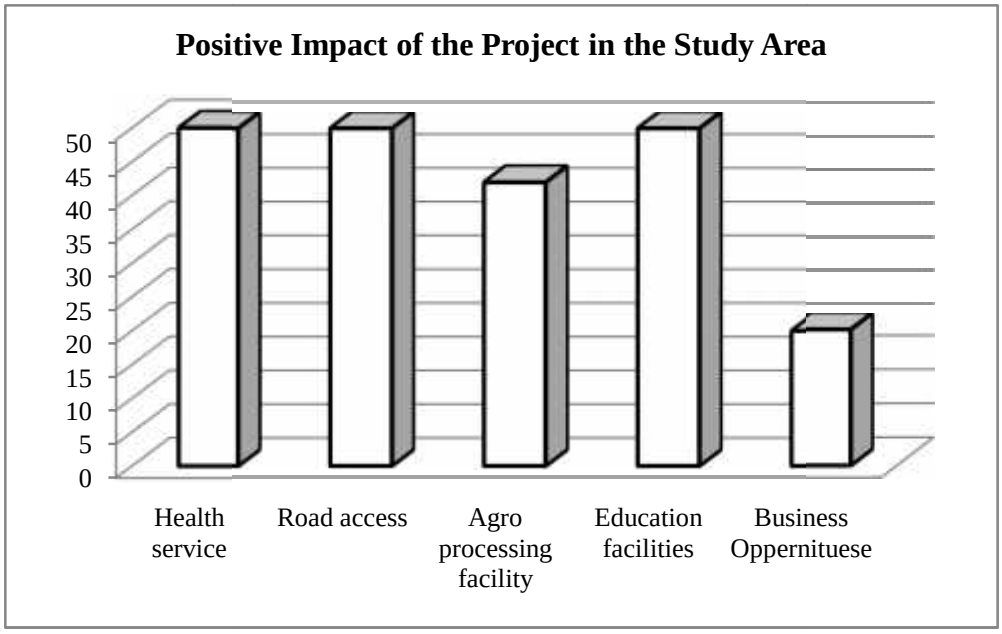
Positive Impact of the Project in the Study Area

Service	Number of household	Percent
Health service	50	100
Road access	50	100
Agro processing facility	42	84
Education facilities	50	10
Business Oppernituese	20	40
Forest conversation	**30**	**60**

Source: Field Survey, 2014

The above table shows that 50 person has got the job from this hydropower of the Krishna GandakiVDC. The road touched the 50 household of Krishna GandakiVDC. In this way, access to the river bridge drinking water and other opportunities are the positive impact of the project in the study area

The above table shown in following dig-gram in given below



4.7.1 Impact of the Project

Table 4.9

Impact of the Project in the Study Area

Impact	Total no. of Respondents	Percentage
Positive	30	60
Negative	20	40
Total	**50**	**100**

Source: Field Survey, 2014

From the above study, out of 50 households, questionnaire were implemented through the respondents, to study the positive or negative impact of the project on the study area, 20 households or 40 percent respondents were dislike about the project and 30 or 60 percent respondents like the project. So the above table shows that the negative impact found negligible than the positive impact.

4.7.2 Income Generation

As we could analyze that by the establishment of hydropower in the Syangja Krishna Gandaki there we could see the development in manyaspect and in the generation of the income also. Many people have been ingaged in the

income generating work. As the help of the electricity people ingage in different works and they establish small scale industry. As they established cold store in the way to make the good use of the milk and to make its different verаties. As we could see that many small scale industry have be established. As we could see the bready industry, politery farming, established in which the local re cources have been used and the local people have got the opportunity ofjob in which firstly they have the poor economic condition but now there living standard have been increased in the way that they have good, prosperous, and hygienic life. So as we conclude that establishment of hydropower in the Syangja Krishna Gandaki have play vital role in the peoples of Syangja. Now we could see that they have as well as the standard life.

4.7.3 Time Saving

By the establishment of hydropower it have save the time of people. As people used to go far at the forest inserch of firewood which was quite difficult and risky works for them sometime they have to get injured as well as lost the part of the body also. Now it is quite easy for them as they cook food in the rice cooker which is quite convient and faster. They should not loss their time after all it have made the work easyier and faster. As in the past people used to cook food in the fire as by the smoke of firewood it have affected the life of the people. Many people used to suffer from the smoke of fire. People have good health condition now. As we could see that the forest has been conserved because in the past people used to cut down the trees for the firewood but now this trend have abolished or gone out. As their time have been saved now days they are engaging in development works. As they are establishing good income, in which they have standard life.

4.7.4 Education of the children

As the electricity have helped the students also. As in the past they used to study by the help of lamp which was quite difficult to study as well it used to pollute the area and the smoke coming from the lamp have the negative impact on the students, on the students help as students have to suffer a lot in

which they have to suffer from the hedache, and many students have the problems in the lungs also in which they have difficult to inhale and exhale the oxygen. But now by the help of electricity it have become the students to study easiyer. As we could see that it have helped in the progress in the education also. We could see that they have gain the quality education. By the help of electricity they have god knowledge of computer also.

CHAPTER - FIVE

SUMMARY, FINDINGS AND RECOMMENDATIONS

5.1 Summary

The study has analyzed on the impact of hydropower project on Rural livelihood study meanly based on data obtained from (field survey 2014) proved with the different socio - economic status of the people of the study area. The study is based on primary data gathered from the local people and concern agencies, local bodies through the random sampling method.

All together, 267 local people of major site, 50 households were taken sample for this study. The study is of both qualitative and quantative. The finding of the study has been summarized as follows.

- The literacy rate of the male and female is highly different. The total literacy rate of male is 60 percent and female literacy rate is 40 percent.
- Educational attainment of the household's member by sex of the age group of above 3 0-40 years male and female participation is 36 percent of study area. Agriculture land is not sufficient for farmers for the adjoining area, so the economic status of the people is becoming deteriorating.
- 100 percent of households were living in kachhi stone before the project and after the project only 24 households were living in cemented house. It concluded that more people are lived in Kachhi-stone which are the symptoms of low level of standard.
- The using of open toilet has been decreased 9.24 percent on the other hand the use of modern toilet has been increased 30 percent and deephole toilet has increased before the project. It shows that it improves the people health and sanitation.
- After the construction of project, it has employment opportunity increased by 100 percent Govt. and Non. Govt. and the 6 percent in

business on the study area. Therefore no change in other secondary occupation.

- It shows that 50households survey, 62 households percent depend on forest and 8 percent of Gobar Gas for the purpose of cooking and heating after viability of electricity no one has it use for cooking and heating.

5.2 Finding

The Kali Gandaki hydropower project is specially schemed to provide the electricity to the people of it adjoining area and this purpose is partially fulfilled.

This project imparted the excessive drinking water facilities to the local people and employment opportunities to both local and outsider people of study area at the time of construction and operation of the project but these services and benefits could reach to more people, if the project had been well implemented. Electricity supply has extended the socail and recreation activities. Increasing education, purchase and use of tape recorders, use of TV, radios, bulbs shows increasing socio-economic activities of the people in the study area.

Fishermen and fishes have been affected in the section of the river where the down stream of river is significantly affected. Physical structure of the project utilizes the fertile and hill land, which have impacted on potentiality of agriculture productions. Environmental mitigation measures have not been completely followed. In terms, the impact of the project can be judged as moderate in absolute term and satisfactory in relative term, which mean similar in comparison to the other project.

5.3 Recommendations

The present study reveals that the feasibility study and action plan for mitigating environmental problems resulted from the implementation of the project has not been properly considered and taken care of. The mitigation

measures should have been closely monitored with the local NGOs or pressure groups.

- Thus it is suggested that there are also negative socio-economic impacts as well as positive socio-economic impacts of the project. But there negative socio-economic impacts are fewer than positive socio-economic impacts. Therefore, it should be tried to enlarge positive impacts and avoid negative impact, which would be beneficial.

- It is suggested that mitigation measures have to be closely imparted and hydropower project in the near future, should fulfill the shortcomings of Hydropower Project.

- Alternative energy resource should be made available to minimize the pressure the forest.

- Appropriate policy on pricing, market arrangement and energy quality regulation needs to be developing for sustainable energy development in the rural part of the country.

- An integrated approach to promoting micro-hydropower development needs to be adopted.

- Simple and transparent procedures for loan sanctioning should be developed and institutionalized.

- Technology promotion and entrepreneurial development programs should be organized.

- Capabilities should be built of at village level for maintenance and repairing.

- Community owned and managed micro-hydropower should be promoted.

- Technical training is needed in both public and private sectors particularly at the operative level to improve present stander

- To less dependent on foreign aid for financial resources even in big hydropower projects, government floats "Hydropower Development Bond" in the market to mobilize people's saving and reduce investment in unproductive sector. Among the domestic sector, private sector should be encouraged to invest in hydro electricity sector and in the external sector; soft loan should be accepted on the basis of confessional rates.

- The existing legal as well as institutional problems hindering FDI in hydropower sector should be resolved. Various problems associated with FDI such as: lack of investment guarantee, heavy and dual taxation on earning, lack of provision of re-investment of earning, lack of promotion of private sector partnership for investment should be addressed properly and in time.

Implication:

If' the above recommended action is undertaken following result was obtained:

- Raises capital from the local and foreign capital market to finance its development plan.

5.3.1 Habit of Expenditure

With the establishment of Kali Gandaki'A' hydropower project, the increment on employment had resulted the better growth in income of the resident of that area. With the growing income, the habit of expenditure had been increased. If the habit of expenditure is maintained and in place of increasing expenditure, if the saving is, increased then, it would have the following positive impacts towards the people, society and country.

Implication:

- This is the phenomena that if the expenditure is decreased then automatically the saving will be the increased. From this, there will be the positive effects in the economic status of the people. The economy

of the people will be strength. This will also play vital role to increase the rational saving of our country.

- This will also help to maintain the crisis in economic sector of the resident of the area. Hence, due to this, there will be the creation of healthiest society in every sector such as education, health and so on.

5.3.2 Drinking Water Facility

Though the area around Kali Gandaki 'A' hydropower project is featured with the infrastructures necessary for proper drinking water facility, the scarcity of pure drinking water is found to have in existence. The problems regarding drinking water facility must be maintained as it has the following advantages.

Implication

- The availability of the pure drinking water facility leads to the positive effects on the health of the people. Hence, it makes the person healthy which increases the participation of them in development activities. It also saves the other expenditure which can be specified to cure the diseases as the impure water causes about 80% of the diseases.

- The complain proclaimed by the people of 'Birgha' VDC regarding the unavailability of both pure drinking water and infrastructures essential for that will have been eliminated due to which their contribution towards the project, society and country will be increased.

- Likewise, the complain enunciated by the people of 'Krishna Gandaki' VDC i.e. "There is tap but no water" will have resulted been reduced.

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www. kaligandakihydropower.np

APPENDIX-I

1. Personal Details

a) Name of the Respondents ……..

b) VDC ……

c) Age ……..…… d) Sex …….

e) Caste …….. f) Education …….

g) Religion …….. h) Occupation ……...

2. Your annual income can support your family?

a) 1-3 month b) 4-6 month c) 7-9 month d) 10-12 month

e) More then 12 month

3. Your house hold annual income Rs ……?

Your house hold annual expenditure Rs……?

4. How was the housing condition before lunching the project?

a) Kachhi-Stone b) Pakki-Cement/Brick c) Others

5. How was the housing condition after lunching the project?

a) Kachhi-Stone b) Pakki-Cement/Brick c) Others

6. How was the hygienic condition before the project?

a) Poor b) Medium c) Good d) Others

7. How was the hygienic condition after the project?

a) Poor b) Medium c) Good d) Others

8.Have you taken facility of electricity?

a) Yes b) No

9. For what purpose are you using micro-hydro electricity?

a) Lighting and cooking b) cottage Industry

c) Business d) Others/TV, Radio, Fredge, Iron, Micro Oven etc.

10. How was the condition of toilet using households before the project?

a) Open (without cover) b)Deep hole(cover) c) Modem

11. How was the condition of toilet using households after the project?

a) Open (without cover) b) Deep hole (cover)

c) Modern d) Others

12. What was the main occupation of head of the family before the project?

a) Agriculture b) Business c) Teaching

d) Service e) Others

13. What was the main occupation of head of the family after the project?

a) Agriculture b) Business c)Teaching

d) Service e) Others

14. After the establishment of the HPP do you think?

a) Your income generates opportunity improved.

b) Your education status improved.

c) Your commutation level improved.

d) Your living standard improved,

15. How much land do you have now?

Ans ……Ropani

16. How much money do you earn in a annual?

AnsRs ……

17. How do you meet your expenditure?

a) Labors b) business c) Job/Service

d) Loans e) Others

18. How much money do you spend on lighting the following energy in one month?

Sources **of energy**	**Amount RS**	**Before**	**After**
Kerosene Litre			
Electricity KWH			
Battery			
Others			

19. What types of energy do you use for cooking food! in one years?

Marketuser for the Resource

a) fuelwood ……. kg/mtRs/Kg b) Electricity Kwh Rs/kwh

c) Biogas m3 cost of biogas plant d) dung cake kg/mtRs/kg

20. What positive impact of the following have you found after the project?

Impact	Yes	No
Road Access		
Agro-Processing		
Forest Conservation		
Drinking water availability		
Business opportunities Health service Education facilities Other		

21. What negative impact of the following have you found after the project?

Impact	Total no of respondents	Percentage
Positive		
Negative		
Total		

22. Are you satisfied with the rural electricity service delivery by HPP?

    a)Yes b) No

23. If you have any complain about the electricity supply by the rural hydro power plant?

    Ans…….