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Financial Feasibility of Solar Energy for Sustainable Energy Management

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Abstract: ***The financial feasibility studies about the pros and cons of solar energy as alternative energy in terms of monetary value. The rural areas of Nepal are deprived of electricity transmission lines because of the scattered resident and the geographical remoteness, the financial cost of extension of electricity transmission is not feasible so that this study focus on the renewable source of energy as solar energy. The cost of installation of solar is low and less time consuming in compared to electricity. The sustainable development of solar energy in the rural tourism contributes to the tourism industry as well as gives new ideas to the emerging scholars.***

Keywords: Financial Feasibility, Solar Energy Sustainability, Economic Stability, Government Practices and policies, Energy Security, Photovoltaic

1. Introduction

As an economic good, energy affects all the sectors of the economy. So, it is taken as a means of achieving sustainable development for addressing the issues related to carbon reduction, reducing production cost and consumption expenditure, reducing energy gap as well as insuring energy security. Alternative sources of energy practices implemented through government policy and change in human behavior is one of the attempts for efficient energy conservation and management.

1.1 Background of the Study

As the population is increasing day by day which results in high demand of energy, from the past nearly 5000 years ago people used to worship the sun as god, later on science has defined solar energy which ease the livelihood of people. The solar energy can be converted to heat and electricity with the use of solar panels. In the 1830s a British astronomer John Herschel used a solar thermal box to take in sunlight and heat was produced to cook his food. Photovoltaic cells used to convert light to electricity. Firstly, the effect of photovoltaic cells was noted by French Physicist Edmund Becquerel in 1839 A. D. Later on, 1905 A. D. Albert Einstein defined the effect of light on photovoltaic cells to generate electricity. This is how the solar energy experienced in the past and continued to use as alternative energy (Rou picheria, 2018).

The energy in the form of heat and radiations absorbed and transformed through photovoltaic cells normally known as solar energy. It is the source of energy which is renewable and couldn't be destroyed, mostly used as alternative source of energy. It is used for drying fruits and vegetables, lighting, water lifting, heating water etc. in households. Adequate researches have been done for the development of efficient economic solar panels, cells as well as module to access in low budget. This energy is easily reachable to all people because of low cost compared to fossil fuels and oils. Solar energy requires low manpower in case of conventional methods of energy generation. This study is based on use of solar energy in rural different sectors in Nepal. It focuses on sustainable development of the energy supply as well as the solar energy. The financial feasibility looks over the pros and cons of using solar energy in terms of monetary value which will benefit the entrepreneur for the long run. The new body of knowledge in this study is that it links the financial aspect with the solar energy generation as well as consumption. This study will also link solar energy with energy efficiency which will help in the sustainable development of solar energy for household consumption in rural areas. Due to the geographical territory and remoteness the extension of electricity transmission line is more difficult and not feasible in financial terms so this study focuses on solar energy development in rural Nepal.

1.2 Statement of the Problem

As I have been visiting to various places of Nepal, I realized the power deficiency in the rural areas which is not sufficient for the normal daily power consumption to the households. As the height increase the power deficiency increases and vice versa. The lower height places are covered by electricity supply as well as facilitated with the alternative sources of energy as solar power. The rural areas located above the height of 2500 meters are deprived of electricity facility and using solar energy as the main source of energy. The subsidy policy of the Nepal Government has not glanced there. In my personal opinion the density of people living there is very low so that they are back from the electricity supply which is financially not feasible. If we can use innovative technology to use solar energy the number of tourists would increase as well as the quality of life of local resident would improve. There places are focused mainly in ecotourism, the biodiversity is the major attraction of these places. The hotels and lodges of these places take charges to tourists for charging the electronic appliances such as mobile, touch light, camera etc. if the solar power could be generated with innovative ideas it would economically beneficial to the tourists as well as the

local residents. As per the interaction to the local people lightening destroys the most of the solar panels and replacing every time is a financial burden so that they use the panels of low cost which result in low energy generation.

Solar energy has also been used for drying and cooking food, powering electronic devices like computers, radio, etc. irrigation and drinking water systems but very limited use has been noticed (INFORSE, 2018).

S. N.	Fuel Types	Amount (000GJ)	% share
1	Fuel Wood	352229.10	70.47
2	Agriculture-residue	17408.43	3.48
3	Animal dung	18401.96	3.68
4	Coal	19819.09	3.97
5	Petroleum	62618.27	12.53
6	Electricity	16932.75	3.39
7	Renewable	12430.26	2.49
Total		499839.86	

Monthly energy consumption, GHG emission and environmental impact are relatively lower in the household having access to electricity provision and LPG as cooking energy (Uddin, Iqbal, & Talukdar, 2023).

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Nepal is a mountainous landlocked country situated in between India and China. It extends latitudinally from 26°22′ to 30°27′ and longitudinally from 80°04′ to 88°12′. The country is approximately 885 km long from east to west and its width from north–south varies from 130 to 260 km. Nepal can be broadly classified into three regions: the mountain, hill, and Terai regions, all of which extend from east to west with irregular widths from north to south

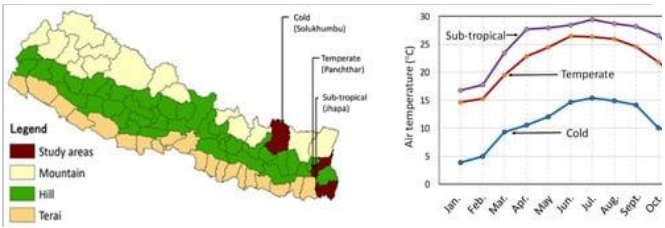


Figure 1: (**a**) Map of Nepal showing study area; (**b**) monthly mean outdoor air temperature of study area obtained from the climatological and agro-meteorological records of Damak (sub-tropical), Phidim (temperate) and Salleri (Cold).

To represent three regions, this study selected three non-adjoining districts for household survey with different levels of road and energy infrastructure accessibility as shown in Table 1. These three regions were the Solukhumbu district from the mountain region, having a cold climate; Panchthar district from the hill region, having a temperate climate; and Jhapa district from the Terai region, having a sub-tropical climate. The altitude of the study area in the mountainous region is over 2000 m, between 1000 and 2000 m in the hill region, and below 500 m to sea level in the Terai region.

Table 1: General information on the study district, area and surveyed houses.

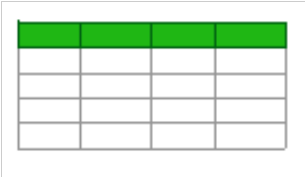


Figure 1 shows the monthly mean outdoor air temperatures of the study areas in the three regions. The monthly mean outdoor air temperature was the lowest during winter (December–January), sharply increasing in March due to an increase in the amount of solar radiation. The arrival of monsoon rain tends to mitigate the increase in the outdoor air temperature during the monsoon period. May and June are the hottest months in Nepal.

1.3 Energy Use Survey

A household questionnaire survey was carried out in 516 households, comprising 78 households in the Lalitpur district (Salleri), 262 households in the Rupendehi district , and 176 households in the Jhapa district (Gauradaha) in the winter season of 2018 and 2019 (Table 1). We selected three municipalities for this survey from the three districts. Each municipality has semi-urban and rural settlements, with distinctive variations in the energy availability. The distribution of grid electricity was uneven and only available in temperate and sub-tropical regions. All households in the sub-tropical region and only 60% of the households in the temperate region were connected to grid electricity at the time of the survey. Inhabitants of cold regions use electricity from locally generated micro-hydroelectric power plants and standalone photovoltaic solar power.

The questionnaire was based on information on the types and sources of energy and types of cooking stoves used in the study areas. Questions related to feelings and preference of their cooking fuels used were also asked to understand their opinions. The cook stoves available in the study were classified as traditional cook stoves, improved cooking stoves, LPG stoves, biogas stoves, and electric rice cookers. Kerosene and animal dung were not used as cooking fuels in the surveyed households.

1.4 Classification of the Use of Traditional, Mix, and Commercial Fuels in Households

Based on the cook stoves used in the study areas, this study categorized all the surveyed households into one of the three types of fuel-using households: traditional fuel-using households with traditional cook stoves and improved cook stoves used only with traditional biomass fuels, such as firewood and agricultural residue; mixed fuel-using households with multiple types of cooking stoves for traditional fuels, as well as for commercial fuels; and finally, commercial fuel-using households with cook stoves only compatible with modern commercial fuels, such as electricity and LPG .

2. Results and Discussion

2.1 Per-Capita Electricity Consumption

Electricity is a modern energy resource used for various purposes with modern technology. In Nepal, almost all the electricity is generated via clean hydroelectric resources. Access to electricity is a determining factor for improving quality of life. There has been a recent substantial increase in the electrification rate, reaching up to 82% of the population in 2016. In the rural areas of developing countries, people use electricity for lighting and charging mobiles. In contrast, in urban areas, people also use electricity for cooking, as well as for mechanical heating and cooling purposes.

Figure shows the annual rate of per-capita electricity consumption and per-capita gross domestic production (GDP) from 2000 to 2018 in Nepal. Vertical bars show the per-capita electricity consumption and the line graph shows the GDP. Both values appear to have grown steadily during that period. The per-capita electricity consumption increased from 63 KWh/y in 2000 to 238 KWh/y in 2018; however, this per-capita electricity consumption still remains the lowest among contemporary global societies. These data imply that per-capita electricity consumption will substantially increase over the next decade and it will increase the electricity demand of the country. A recent study carried out by using energy modelling predicted that per-capita electricity consumption of Nepal will increase to 496 kWh in 2025 and 1070 kWh in 2030. The electricity demand forecast report also predicted similar increasing trends of future electricity demand.

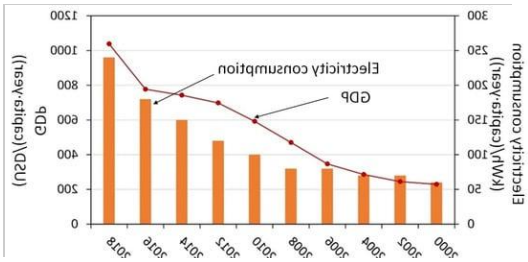


Figure 1: Per-capita electricity consumption trends from 2000 to 2018

Table 2 presents the per-capita energy consumption of some neighboring countries and the global average. This shows that Nepal consumes marginally less per-capita electricity than other developed and developing countries. Several reasons are associated with the low per-capita electricity consumption in Nepal. First, Nepal relies heavily on locally available traditional energy sources, such as firewood and agricultural residues, which represent 78% of the total energy consumption in Nepal. Second, low-income levels and high electricity prices also impact poor people who, upon gaining access to electricity, are unable to fully use electricity for cooking and space heating. According to Poudyal et al., the cost of electricity was 0.90 USD/KWh for end-users in 2018, which is among the highest in the world. Such a high price for electricity and the low-income levels may also minimize the per-capita electricity consumption. Shahi et al. reported that household income has a positive correlation with electricity consumption, where low-income residents use less per-capita electricity. Third, the electricity crisis in Nepal disrupts the daily lives of individuals and businesses through frequent power outages. As a result, residents must face 12–14 h of load shedding every day, especially during the winter months . Previous study found that people living in the extreme cold region exhibit low energy lifestyle and have adapted well to extreme cold climate.

Table 2: Comparison of per-capita electricity consumption in neighboring countries

In Nepal, the residential sector is the major electricity-consuming sector, accounting for nearly 87% of the total electricity consumption. Owing to the high price, unreliable electricity supply, and the availability of firewood adjacent to their houses, most of the households that participated in our case study reported that they did not prefer to use any mechanical heating and cooling system in their houses. This revealed that an affordable price, reliable supply, and use of electricity for cooking and heating in the domestic sector may increase the per-capita electricity consumption, which can play a vital role in socioeconomic development and well-being of the residents. Low per-capita electricity-consuming countries, including Nepal, must promote the use of clean sources of electricity to the greatest extent possible, instead of traditional biomass and imported fossil fuels.

2.2. Trends in Electricity Consumption for sustainable Development in Nepal

Hydropower has been considered one of the sources of clean electricity because it does not emit polluting materials into the air or onto land. Nepal is characterized by significant hydropower resources, where more than 6000 perennial rivers and rivulet flow with an average annual water runoff of 225 billion m3, thereby providing a substantial energy potential. Previous studies have estimated that the feasible potential of Nepal for hydropower generation is approximately 83 GW, of which approximately 43 GW are considered technically and economically viable. Hydropower development in Nepal began on 22 May 1911 with the installation of 500 kW of electricity at Pharping.

Figure2 shows the installed capacity of hydroelectricity in Nepal from 1995 to 2019 by the NEA and the private sector. This shows that the growth in the installation capacity of hydroelectricity began to visibly occur in from 1997 to 2002, and is characterized by a continuously increasing trend. The first hydropower development policy was announced in 1992 to attract the private sector for hydropower development. which plays a significant role in partially fulfilling the electricity demand.

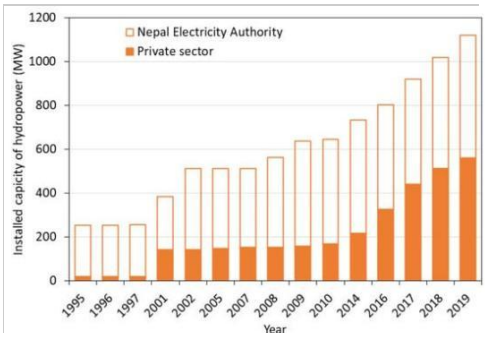


Figure 2: Installed capacity of hydroelectricity in Nepal from 1995 to 2019.

During the political unrest period, investors were not willing to take risks for hydropower development; from 2001 to 2010, the private sector was unable to develop hydropower projects [28]. After 10 years of civil war, a peace agreement was signed in 2006, and the political environment became stable, allowing hydroelectricity development. Table 3 and Table 4 list the hydropower plants developed by the NEA and private sector with their respective locations and capacities. Hydropower development in Nepal began on 22 May 1911 with the installation of 500 kW of electricity at Pharping. In recent years, the rapidly increasing trend of hydroelectricity production in Nepal shows that the energy situation has changed to an optimistic attitude toward clean resources; however, the replacement of traditional fuels for cooking and heating is a challenging task. Energy transition toward modern clean energy sources can improve the future of Nepalese citizens in various ways. For example, the use of electricity for cooking and heating, instead of traditional fuels, can benefit millions of people with respect to respiratory health risks caused by indoor air pollution.

Table 3: Hydropower plants developed by the Nepal Electricity Authority in each district.

Table 4: Hydropower plants developed by independent power producers (IPP) in each district

Moreover, fuel collection is a time-consuming task in rural societies, and its replacement by electricity can conserve a considerable amount of time. There must be improvements to the current state of low per-capita electricity consumption and the high dependency on traditional fuels for cooking and space heating. The Nepalese government must implement policies to enhance electricity use in all households for cooking and heating by providing subsidies to adopt new and clean technologies. They must also simultaneously promote clean and renewable energy development in all parts of the country.

As the installed capacity of hydroelectricity growth begins slowly and then accelerate rapidly, this study carried out exponential regression analysis on installed capacity of hydroelectricity and time (year of establishment). All values plotted in this figure were obtained from **Table 3** and **Table 4**. However, we did not plot the small projects, less than 5 MW, which are shown in **Table 4**. The trend line in **Figure 4**a represents only the hydropower development trend of the NEA. As the number of projects developed by the private sector increases and the size decreases, it does not show a similar trend to that of the NEA. Therefore, we combined installed capacity of hydroelectricity on a yearly basis and obtained 28 plots. The result showed positive correlation ($r = 0.73$, $p < 0.001$) between installed capacity and time. The regression line showed the continuous increasing trend of hydroelectricity capacity in Nepal. We speculate that, in the coming years, a significant amount of the electricity demand of the country will be fulfilled by hydroelectricity. However, it is still below the current electricity demand and this is being fulfilled by importing electricity from India.

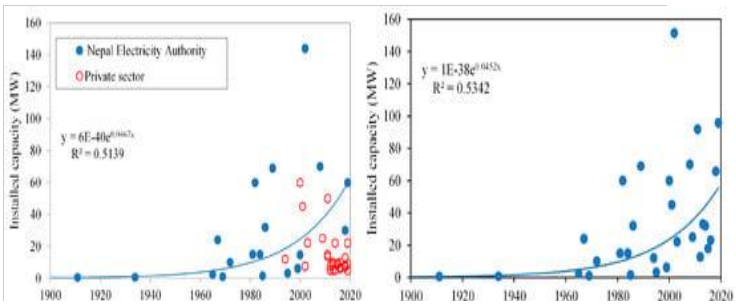


Figure 4: Hydropower development trends from 1900 to 2019; (**a**) number and capacity of individual hydropower plants developed by NEA and private sector and (**b**) total annual installed capacity of hydroelectricity in Nepal.

Total electricity consumption in 2021/22 was 6422 GWh, a slight increase over the corresponding value of 6303 GWh in 2018/19, of which 22% was imported from India. It suggested that current electricity production is still too low to fulfil the energy demand of the people in Nepal. Therefore, energy policy should encourage hydropower development in order to get clean energy and reduce the country's financial burden of importing electricity and other fuels.

2.3 Objectives of the study

The objectives of the study are as follows:
1) To do feasibility study of solar project in Nepal
- Financial
- Socioeconomic
- Environment

2) To do comparative study of hydro and solar energy
- Solar Photovoltaic Technology
- Hydro: Pumped Storage

3) To develop mechanism of integrity hydro and solar system

2.4 Research questions

1) What is the management system of using solar energy in Nepal for different aspect?
2) What is the way of improving the solar speed data?
3) What is the supplementary role to meet the growing power demands in country?

2.5 Significance of the study

The three main sources of economy in Nepal are hydro power, solar, and agriculture. Most of all energy is the main source that can easily generate money in low investment which can directly support the economy level of the country in great extent by providing various employments to the youth inside the country. Solar not only generates money but also create social benefits with preserving the environment and protecting the health status financially. This study will help the policy makers to develop sustainable government policies through banking and financial support. The study is also significant, as findings would allow policy makers in identifying economic strategies that seek to balance economic growth while reducing pollutant emission and curving energy usage. The policy implication of this study's findings would be relevant to other rural economies where solar energy plays an important role in fostering economic. The study primarily focuses on the feasibility study of solar energy in Nepalese economy. This study will give clear guidelines of implementation of solar energy through financial and banking support for economic development purpose.

2.6 Limitations of the study

The presents study covers only energy effects in remote area of Nepal and mostly focus on solar energy aspect. The information based only on primary and secondary data are the main limitation of the study. The study is fully depending upon the field visit inspection as well as interviews, data and response of local people of the study area which will be conducted. Both quantitative and qualitative methodology will be applied in this study.

2.7 Organization of the Study

The study will be divided into six chapters.

The first chapter will start with an introduction that will include background of the study, statement of the problem, research questions, and objectives of the study, limitations, and organization of the study.

Second chapter will include literature review on various variables under study based on the objective of the study. It will include theoretical as well as empirical review of literature and research gap.

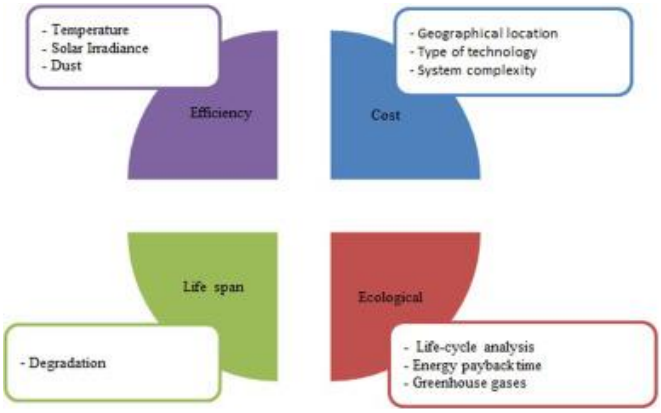
Third chapter will be Research methodology. It will cover research design, data collection procedure, process of data analysis and tools used for analyzing qualitative and quantitative data.

Fourth chapter will try to elaborate the measurement methods of energy efficiency and product export diversification. It will help to justify the selection of energy efficiency and product export diversification measurement tool.

Fifth chapter will include the data analysis based on the selected objectives.

Sixth chapter will conclude the study by mentioning summary, findings and recommendations.

3. Conceptual Framework



4. Literature Review

Literature review as an essential part of the research work provides guideline for development of the framework of the study. It provides overall basis for the generation of the idea as well as justifies the idea conceptually, theoretically and empirically. This chapter includes support behind following the use of the renewable source of energy. This chapter includes thematic, theoretical and empirical review.

4.1 Thematic Review

According to (CES, 2018), the annual total final energy consumption in the country is estimated to grow at 1.9% (i. e., from 369 Pj in 2010 to 536 PJ in 2030) and the sectoral final energy consumption would grow at 5.8%, 5.0%, 5.0% and 3.4% in the industrial, transport, commercial and agriculture sector respectively. Such prediction creates ground for thinking about energy efficiency practices in Nepal. Energy efficiency practices have impact on trade balance, industry output, employment, energy and GHG intensity, energy diversity, energy import dependency and so on. While having energy efficiency practices certain concerns are to be given for energy demand and energy price that affect the level of energy efficiency. There are several challenges while having such efficiency practices. Magnitude of energy efficiency savings, diversification of energy efficiency savings, and connecting energy efficiency outcomes with carbon reduction (Greenwich, 2022) are some of the challenges. Energy efficiency supports for sustainable development of small and medium enterprises. Energy intensive SMEs like food processing industries, bakeries, brick industries, steel industries, etc. massively use different forms of energy. Sustainable use of energy

supports for the growth of such industries. But in most of the developing countries energy has become one of the significant obstacles for the growth consumption of solar energy for financial feasibility. Sustainable growth of SMEs for solar energy is questioned due to negative environmental impact generated through inefficient use of available energy. UN (2022) highlighted the household, transportation and business sector related best policies practiced for energy efficiency (Fig.1).

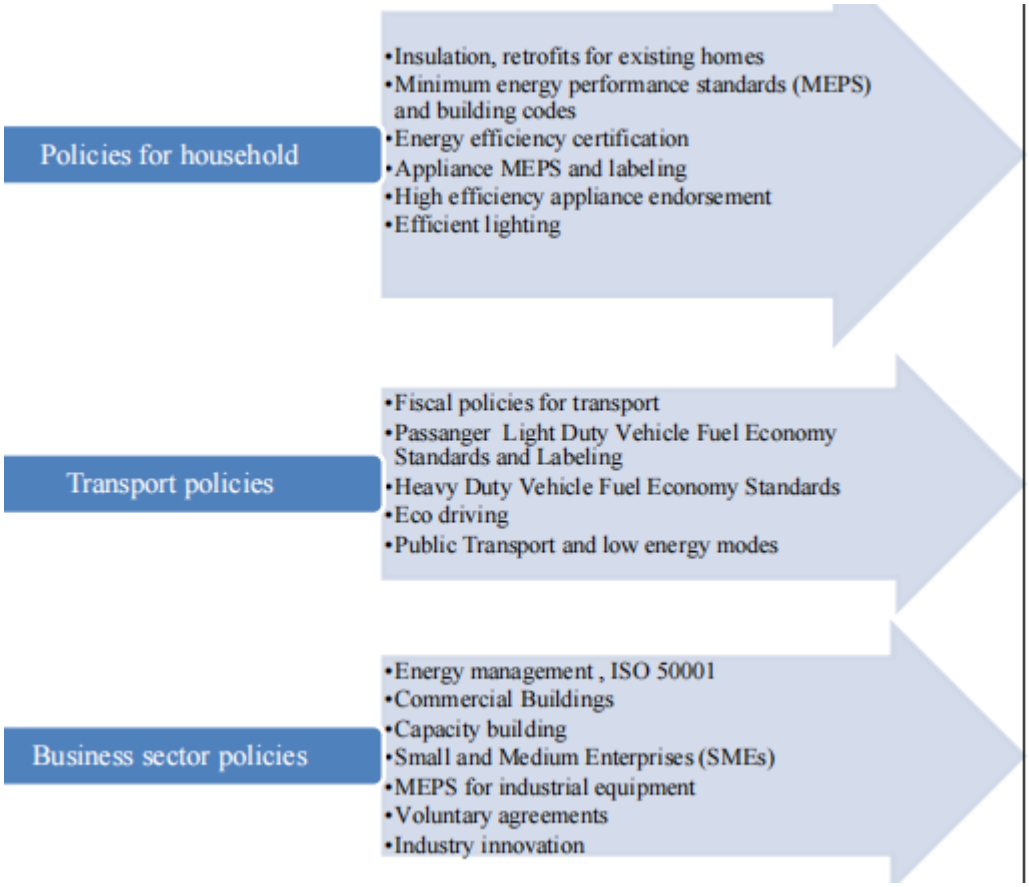


Figure 1: Best Policies Practiced for Solar Energy Efficiency.
Source: UN (2022), Executive Summary

Energy efficiency improvements result in an effective cut in energy prices, which leads to increase in output, competitiveness and income effects that stimulate energy demand (Hanley et al., 2008). Similarly, improvements in energy efficiency can have impacts on economic, social, energy and environment.

4.2 Theoretical Review

Though there is not the separate and specific theory of firm linking with energy, yet Neo classical theory of the firm, institutional theory of the firm and managerial theory of firm directly and indirectly agree energy consumption behavior of the firm as a part of managerial activities. The neoclassical economic theory of the firm asserts that the primary goal of the firm is to maximize the profit. Along with other tools, cost minimization is one of the major bases for maximizing profit. Energy efficiency practices support for minimizing cost of production. Today, non - economic objectives like environment friendly working environment inside the firm, supporting for environment protection plan of the government, etc. are also taken in consideration by the firm. So, the way and the type of energy the firms use matters much. Export diversification is a technique of reducing export revenue risk and trade dependency by allocating export products and market. It can occur across products, sectors, or trading partners (IMF, 2018). Some ideas and thoughts of traditional trade theories support for export diversification and economic growth. David Ricardo's comparative advantage theory emphasizes on taking benefit from trade by producing products on which it has a comparative advantage with another country. Heckscher - Ohlin theory emphasizes that trade can be made beneficial on the basis of factor abundance in comparison to other countries. Similarly, the Imitation Lag Hypothesis introduced by Michael V. Posner in 1961 opines that there is time lag in the imitation of technical know - how as well as creation of demand for new product abroad. So, innovation, and continual research as well as production of new products support for export diversification. Similarly, the Product Life Cycle Theory developed by Raymond Vernon in 1960s and Harry. Markowitz's Portfolio theory also supports for export diversification. Endogenous growth theory opines that learning by doing plays a greater role for sustained growth in the manufacturing sector. The level of export diversification can be strengthened through knowledge transfer in terms of techniques of production as well as management and marketing practices. The idea of the preceding theories has left ground for promoting trade as well as environmental

issues that can be linked up with innovation, cost minimization and development of environment friendly product with efficient use of energy.

4.3 Empirical Review

4.3.1 Nepalese Context

Pant &Panta (2018) in a paper titled "Export Diversification and Competitiveness: Nepal's Experiences" opined that despite economic liberalization and growth of trade in the 1990s, the competitiveness of Nepalese economy is rather low and labor productivity is one of the lowest among its neighboring and competitor countries. It threw light on the fact that different policy measures announced from time to time to identify new exportable products and encourage diversification of export markets have hardly been executed. Based on the estimation of the real effective exchange rate (REER), this paper has shown that Nepal is gradually losing its competitiveness. Piya et al. (2010) in a research article titled 'Evaluating the Impact of Geographic Concentration on Nepalese Agricultural Export analyzed the behavior of Nepalese agricultural export using annual time series data covering the period 1970 - 2005. It used SITC Rev - 1 mirror data and used SITC code 0, 1, 2 and 4 for agricultural products. With the help of vector error correction model (VECM) the paper tested the dynamic relationship among agricultural export, geographical concentration and total agricultural production. The empirical result showed that agricultural export has positive relation with the geographic concentration index in the long run. Similarly, long run effect of increase in agricultural production on export was positive. Analysis based on vector auto regression (VAR) technique showed the insignificant relationship between export of niche products and geographic concentration. Furthermore, Granger causality test showed that the production grander causes export and export granger causes geographic concentration.

4.3.2 Research Gap

As per the reviewed literature financial feasibility of solar energy through bank and financial support is the most relevant in Nepalese context. Recently highlighted subject, government has announced bio gas using solar energy and energy efficiency. Existing literatures on feasibility of solar energy mainly focuses on the relationship between solar energy and house hold consumption, growth and income. However, majority of the research work based on solar energy are not connected up with household consumption of energy efficiency (Gozgor and Can 2022; Piya et al.2016; Siddiqui 2018; Forgha, et al.2018; Nwosa et al.2022; Pant and Panta 2019; Agosin et al.2016; Giri, R. et al.2022; Oliveria H. et al.2022). These studies are mainly focused on the relationship between export solar energy and economic growth as well as determinants of using solar energy feasibly. They have mainly used the macroeconomic variables like GDP growth, trade openness, human capital, domestic credit, trade, finance and terms of trade as the major determinants of financial feasibility. Energy efficiency variables are rarely used as the determinants of export diversification. Hence, linkage between energy efficiency and export diversification is a new area of research. There is lack of sufficient empirical research work on financial feasibility diversification as well as energy efficiency of using solar energy as alternative sources in Nepal.

Likewise, exploring knowledge regarding sustainable energy management practices by local community and government of Nepal and their concern regarding solar mobilization also has a new scope for the study in Nepal. In case of Nepal, still there is not wide use of and discussion regarding rationale for using energy efficiency policies. The government policy, National Energy Efficiency Strategy (2018) also has identified that there is lack of awareness and publicity about the positive role energy efficiency can play for supply of sustainable, adequate and reliable energy supply in Nepal. Hence, there is the need of justifying the need of energy efficiency practices in Nepal. Similarly, there is the need of in - depth study and review of existing energy related policies of Nepal. In this regard, the study based on energy efficiency will be fruitful in the coming years for different stakeholders of the country.

5. Research Methodology

5.1 Research Design

This is research will be conducted by using the mixed method. The quantitative method will explore the public opinion about using solar energy in various sectors and to explore the feasibility of solar energy aspect. The quantitative method will try to explore the pattern of energy consumption using solar energy by the individual household as well as relation between energy efficiency and financial solar feasibility. Empirical test will be done based on secondary data. Qualitative method will be used to find the energy efficiency behavior of household consumption. Survey will be conducted to collect qualitative and quantitative data related to individual household and firm. Energy policy will be analyzed based on Key Informant Interview.

5.2 Methods and Tools

1) Case Study
2) Focus group discussion method

5.3 Questionnaire construction

A manual analysis of the pilot survey will be carried out and after extensive debriefing by the interviewers, the questionnaire will be finalized. The questionnaire will be designed using a highly structured protocol, where detailed instructions will be provided to the interviewers covering the response options provided and appropriate skips in questions to be asked during face - to - face interviews. Both primary and secondary sources of data are considered for the study and the validity of secondary sources will be considered static as compared to primary source of data.

6. Conclusion

The Government of Nepal (GoN) has set a goal to increase the share of renewable energy from less than 1% to 10% and further improve access to electricity from alternative sources, from 10 to 30% within the next 20 years.

According to the energy progress report 2022, 1.3 million people have no access to electricity, and Nepal has targeted to achieve 100% electricity for all by the year 2030 (Nepal Electricity Authority). Hence the PV system would be the game - changer and help to achieve such targets in future. Hence, solar energy consumption would be one of the convenient game changers for the consumption of electricity in various sectors, as well as rural and urban areas of Nepal. It could be the more beneficial and financially sustainable for the economic growth and development of Nepal.

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