DISTRICT CLIMATE AND ENERGY PLAN
BARDIYA DISTRICT

Alternative Energy Promotion Centre
National Rural and Renewable Energy Programme
Khumaltar Height, Khumaltar

Submitted by
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EXECUTIVE SUMMARY

A. GENERAL BACKGROUND

The main goal of the District Climate and Energy Plan (DCEP) is to create a planning process for accelerating the dissemination of renewable energy technologies at district level, contributing to development goals at national and local level. In addition to energy development, DCEP addresses climate change impacts on energy planning and ensures that women and socially excluded and marginalized groups are addressed throughout the planning and implementation processes.

The overall objective of the DCEP of Bardiya district is to:

Prepare a climate change adaptive, decentralized renewable energy plan that can contribute to climate change mitigation and ensures Gender and Social Inclusion (GSI) issues are addressed, through the institutional set up of the district in relation to requirements of accelerated dissemination of Renewable Energy (RE) and recommendations on organizational arrangements needed to implement the DCEP.

This document has treated climate change and GSI issues in a systematic way at all stages of the planning process. The focus of DCEPs is to expand energy service provision through coordination of implementation.

Primary data were collected from local level and the estimation of energy consumptions are based on primary and secondary information from Water and Energy Commission Secretariat (WECS), Alternative Energy Promotion Center (AEPC), Central Bureau of Statistics (CBS) etc.

Limitations to the study include a general lack of recent disaggregated data of Bardiya on GSI, especially those relating to renewable energy. There is also very limited reliable climate change data for Bardiya. The entire DCEP is primarily focused on residential sector energy planning and projection.

B. GEOGRAPHY OF BARDIYA

Bardiya district lies in Bheri zone of the Mid-Western Development Region of Nepal. It has occupied 2025 km^2 area and lies in the west of Banke district, south of Surkhet district, east of Kailali district of Seti zone. To the south lies Uttar Pradesh, India. It has 2 municipalities and 25 VDCs.

It is located at Latitude 28^0 17″ to 28^0 39″ North and Longitude $81^0$3″ to $83^0$41″ East. It has maximum altitude 1279 meters and Minimum Altitude 138 meters. Its climate consists of mainly lower tropical temperature and maximum temperature recorded here is 40 ºC and minimum temperature is recorded as 4 ºC. Its average annual rainfall is 1900 mm.

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C. DCEP PREPARATION PROCESS

The DCEP guidelines have been followed during the preparation process. An initial desk study was followed by secondary data collection and compilation. Primary data was collected from ward level and secondary data was collected from various relevant institutions. The DCEP task force at the district, facilitated by AEPC/CCU was responsible for coordination at district level to ensure local input into the process.

A planning workshop was held in Bardiya to share the outcomes from the data analysis and the scenario development. The feedbacks have been incorporated into this planning document.

D. SCENARIO DEVELOPMENT

The energy model developed is based on end-use energy accounting model from bottom-up approach. Simple accounting framework and excel software have been used for modeling.

While preparing energy model for DCEP firstly we have collected data regarding availability of resources, existing technologies and devices for energy end use, number of households using different technologies, demographic status and status of current climatic situations. Then data have been disaggregated through different possible ways e.g. gender, ethnicity and caste and for five years projection input parameters have been set for cooking and lightening end use.

Here two different scenarios have been developed for analysis viz; Business As Usual (BAU) and District Climate and Energy Plan (DCEP) and performed technology intervention, energy consumption and GHGs emission projection for five years.

a. Business as Usual Scenario (BAU)

In BAU scenario it has been assumed that technology intervention will be on existing trend without replacement of conventional low efficient technologies. During BAU scenario development following factors has been considered

- Current GDP growth rate
- Current population growth
- Current energy need assessment, and current practice of technology intervention
- Current installation rate

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b. District Climate and Energy Plan Scenario (DCEP)

In DCEP scenario, as possible it has been tried to introduce efficient, renewable, and environment friendly technologies and resources which are locally available. During scenario development following parameters have been included.

- Current GDP growth rate
- Current population growth
- Current energy need assessment, and current practice of technology intervention
- Energy trend: Based on energy need assessment and energy intervention (Consider vulnerability of RET to Climate change, technologies to contribute adaptation and mitigation, GSI perspective, cost and access of technologies)
- RET installation rate: As per adaptive and GSI perspective, RET promotion, and efficiency has gone parallel

E. DCEP SITUATION REPORT

a. Climate change assessment

Bardiya district located in Terai region of Nepal, it has lower tropical climate with temperatures reaching 40 Celsius in May and falling to single digits in winter. Bardiya district has the elevation from 138 m to 1279 m with mostly lower tropical temperature. Average annual rainfall is above 1900 mm with fluctuating pattern. In the year 2008, there was maximum average rainfall of more than 3000 mm. In the few years, due to lack of rainfall data of consecutive years, the graph is not continuous. Similarly, minimum average annual temperature of the district is in the range of 18^{o}C to 20^{o}C. In last 20 years the yearly maximum average temperature has been varied from 28^{o}C to 30.5^{o}C with increasing pattern.

b. Gender and social inclusion assessment

Women are primarily responsible for managing household level energy supplies. Replacing firewood with other RETs (like biogas) or managing firewood supply differently will have greater implication on women. The cost of technologies will be crucial for women and poor groups that do not have access to or control over financial resources even though the technology may be preferred by these groups of people.

- The ownership status on technology shows that most of the RETs installed in the district (Biogas, SHS, and SSHS) are male dominant.

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- While talking about the ethnicity ownership of RETs in the Bardiya district, RETs ownership by *Janajati* group is maximum followed by *Brahmin*, *Chhetree, Thakuri* group and *Dalit.*

c. Energy demand assessment

Energy consumption in Bardiya district is mainly on residential sector. The main source of energy is fuelwood, electricity, biogas, fossil fuels and some part by other renewable energy sources. Energy demand in Bardiya district is growing annually along with the increment in number of households and commercial enterprises.

d. Energy resource assessment

Solar

Bardiya district has good potentiality for solar energy; according to SWERA report, Bardiya district has the 5.465 kWh/m^2/day annual direct solar radiation and 4.469 kWh/m^2/day annual global solar radiations. Similarly the solar energy can be used for heating application and for water pumping also. Thus to meet the demand of electricity in different sector, solar will be good resources.

Biomass

The main source of energy in the district is fuelwood and is generally supply from forest area. The total area of forest land in Bardiya district is 196,164 ha, including community, government owned, and lease private forests.

Biogas

Most of the people are dependent on agricultural base and have cattle in their home and annual dung production potential of the district is 606,630 MT from buffalos and 435,445 MT from cattle. So there is huge potential for biogas generation.

Technology status

Biogas plants installation in Bardiya has also reached more than nine thousand with good increasing trend in recent years. Similarly, if we compare the plant size wise installation, 6 m^3 plants has occupied the huge market and family size of 5-6 members has good potential for 6 m^3 plant size. Cooking stoves used in Bardiya district are mostly of traditional type, and have been replacing by the improved one in recent years. Total solar systems installed in Bardiya district is more than two thousand including small solar home system to institutional system. Solar systems are increasing in number yearly with due capacity and this trend is also increasing for commercial and institutional sector. It is clear that majority of households are still using traditional cook stove for cooking purpose and is a major source of indoor air pollution in rural houses of Bardiya. Thus a good exercise is required to disseminate the improved cook stoves in Bardiya to meet the target of clean cooking solution and GHGs emission reduction.

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S.N.	Type of technology	Ownership	
		Male	Female
1.	Biogas	7,478	1,976
2.	SSHS	449	290
3.	SHS	1,013	462

S.N.	Type of cook stove	User households
1.	Mud ICS	328
2.	Traditional	69,358
Total		69,686

F. IMPLEMENTATION PLAN

The number of household using different cooking technologies has been projected and is mentioned below:

Technology	User HH					
	2070/71	2071/72	2072/73	2073/74	2074/75	2075/76
TCS	69,358	63,909	38,006	11,429	-	-
ICS	328	5,375	30,926	57,035	69,146	69,691
Biogas	9,454	10,717	12,007	13,324	14,669	16,041
Kerosene	348	352	356	360	363	367
LPG	3,643	3,683	3,723	3,764	3,805	3,846
Electricity	16	16	16	17	17	17

Energy consumption by various cooking technologies has been described below which shows maximum consumption by TCS and MICS and remaining share by other technologies.

DCEP scenario for lightening as end use has been described below with solar system intervention to replace kerosene tukis to meet the need of clean lightening solution by 2017.

Technology	User HH					
	2070/71	2071/72	2072/73	2073/74	2074/75	2075/76
Grid Electricity	51,932	54,393	56,901	59,457	62,063	64,718
SSHS	739	957	1,341	1,732	2,133	2,541
SHS	1,475	2,332	4,057	5,819	7,620	9,459
Kerosene	29,001	26,374	22,677	18,895	15,028	11,074
Total	83,147	84,056	84,975	85,903	86,842	87,791

Implementation plan for other RETs for the renewable energy development and climate change mitigation perspective has been mentioned below;

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Technology	2071/72	2072/73	2073/74	2074/75	2075/76
Commercial large biogas plant (m^3) (Nos.)	-	200	200	200	200
Institutional large biogas plant (m^3) (Nos.)	-	200	200	200	200
Community large biogas plant (m^3) (Nos.)	-	100	100	100	100
Institutional Solar Power System (Nos.)	2	2	2	2	2
Solar Dryer small (3 to 20sq.ft.) (Nos.)	5	2	2	2	2
Solar Dryer large (20 to 85 sq.ft.) (Nos.)	5	2	2	2	2
Institutional solar dryer > 85 sq. ft (Nos.)	2	2	2	2	2
Solar cooker (Nos.)	3	5	5	5	5
RETs traing (Nos.)	-	2	2	2	2

G. FINANCING REQUIREMENTS

For the implementation of DCEP plan, following investment and subsidy amount are estimated to be required.

- To promote the RE technology as per DCEP plan has estimated the amount required NPR 101,312,895; 151,915,358; 153,859,099; 142,280,390 and 133,172,858 in FY 2071/72, 2072/73, 2073/74, 2074/75, and 2075/76 respectively.
- At the same time, subsidy requires NPR 40,922,184; 58,630,096; 59,730,414; 55,748,999 and 52,633,633 in FY 2071/72, 2072/73, 2073/74, 2074/75, and 2075/76 respectively.
- Possible financial sources for the above mentioned investment plan are INGOs, NGOs, AEPC/NRREP, MOF, etc.
- As AEPC is the leading government institution for mainstreaming the distribution of different RETs, the total amount of subsidy from AEPC required for the installation of different RETs in the Bardiya district.

H. MONITORING

District Energy Environment and Climate Change Section (DEECCS) will play role for coordinating and facilitating for monitoring and evaluation. Monitoring should be carried out annually with adequate support from AEPC/NRREP, implementing partners and stakeholders.

I. RECOMMENDATION

Following recommendations have been made for the effective implementation of DCEP

- In coming days, AEPC/NRREP and other organizations have to work for data compilation and other aggregation so that DCEP like other study would have continual and strong mechanism to represent the gender and GSI issues.
- Data collection systems used by organizations including AEPC need to be strengthened so that they are more users friendly and systematic in order to access GSI specific data.

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- It should be ensured that chosen technologies are accessible and affordable to women, women headed households, poor and other marginalized groups. Since accessibility and affordability of the technologies are the key variables to measure its adoptability, appropriate measures like additional subsidies to these groups of people should be made.
- A targeted approach for women, poor, ethnic groups and *Dalit*s is required which is not strong in current service arrangements. At present, DDC provides services as per the demand from the households who have access to information and financial resources.
- More research and study needs to be done in sector of penetration of these technologies by market mapping method.
- Climate proofing technology needs to be studied according to the region wise with prioritization method as a separate study to support DCEP study in future.
- Overall cost that local people can afford has also to be taken into consideration.
- Local diffusion of technology and market availability needs to be studied.
- But for urban region of district commercial fuel based technology, emphasizing on electricity can be the proper solution in near future.
- Similarly, feasibility of gasifier should be studied for the cooking and lightening and Solar PV can be the appropriate solution for lightening end use in the district.
- Since, the population growth of Bardiya is in increasing rate; climate related issues will also seem to increase in BAUs but renewable technologies like ICS, solar PV, and Biogas need to be promoted in order to the people for producing low carbon.
- Fuelwood is the main energy source of the rural people for their daily energy needs. This has contributed almost total energy need nowadays and has been projected that it will occupy more than 85% of energy need in the year 2019.
- Potential livestock need to be increased to make maximum use of bio energy based technology.
- Improved technology like ICS needs to be promoted in rural area to lessen the GHG emission.
- Forest area needs to be protected for CDM finance and also as carbon sink to move in neutral carbon path.
- Promotion of potential low carbon technology along with awareness campaign needs to be done frequently.
- Since, Bardiya is one of the LAPA implemented districts, DCEP implementation plan will have better impact if it works along with LAPA implementation for climate vulnerabilities and adaptation in technologies, gender and social inclusion issues of the districts.

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Similarly our gratitude also extends to chairpersons of VDCs‟ and Municipality, surveyor and local people of Bardiya district for their information, supports and comments. Similarly, we would like to extend our thanks to the DEECCS unit and Local Development Officer (LDO) of Bardiya districts for their support and feedback during survey.

We are also thankful to various organizations and government bodies like Water and Energy Commission Secretariat (WECS), Alternative Energy Promotion Center (AEPC), Department of Hydrology and Metrology (DHM), Department of Transportation Management (DOTM), Central Bureau of Statistics (CBS), etc. for their cooperation during collection of data.

Finally, we are equally thankful to all the people of Bardiya district, organization and bodies who have direct or indirect involvement during completion of the DCEP.

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ACRONYMS AND ABBREVIATIONS

ADT	Air-Dry Tonnes
AEPC	Alternative Energy Promotion Centre
ASS	After Sales Service
B/C/T	Brahmin, Chhetri, Thakuri
BAU	Business as Usual
BPL	Below Poverty Line
BSP	Biogas Support Program
CBOs	Community Based Organizations
CBS	Central Bureau of Statistics
CCU	Climate and Carbon Unit
CDR	Central Development Region
CFL	Compact Fluorescent Lamp
Cons.	Consumption
CRS	Climate Resilient Scenario
CRT/N	Centre for Rural Technology Nepal
CSIDB	Cottage and Small Industries Development Board
DCEP	District Climate and Energy Plan
DDC	District Development Committee
DEC	District Energy Committee
DEECCS	District Energy Environment and Climate Change Section
DEEMC	District Energy and Environment Management Committee
DEPP	District Energy Perspective Plan
DFO	District Forest Office
DHM	Department of Hydrology and Meteorology
DIO	District Irrigation Office
DOTM	Department of Transport Management
EDO	Energy Development Officer
FECOFUN	Federation of Community Forest Users Nepal
FGD	Focus Group Discussion
FY	Fiscal Year
GDP	Gross Domestic Product
GHG	Green House Gas
GIZ	German Federal Enterprise for International Cooperation
GSI	Gender and Social Inclusion
HDI	Human Development Index
HH	Household

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ICS	Improved Cook Stove
INGO	International Non Governmental Organization
IPCC	Intergovernmental Panel on Climate Change
ISPS	Institutional Solar Power System
IWM	Improved Water Mill
LAPA	Local Adaptation Plan of Action
LDO	Local Development Officer
LED	Light Emitting Diode
Lit	Liter
LPG	Liquefied Petroleum Gas
MHP	Micro Hydro Project
MICS	Metallic Improved Cook Stove
MoSTE	Ministry of Science Technology and Environment
MSFP	Multi Stakeholder Forestry Programme
MT	Metric Tonne
NAPA	National Adaptation Plan of Action
NCCSP	Nepal Climate Change Support Programme
NEA	Nepal Electricity Authority
NGO	Non Governmental Organization
NPC	National Planning Commission
NRREP	National Rural and Renewable Energy Programme
Pop.	Population
REDP	Renewable Energy Development Programme
RERL	Renewable Energy for Rural Livelihood
RET	Renewable Energy Technology
RTPA	Rural Technology Promoter‟s Association
SHS	Solar Home System
SNV	Netherlands Development Organization
SSHS	Small Solar Home System
SWERA	Solar and Wind Energy Resource Assessment
UNCED	United Nations Conference on Environment and Development
UNFCCC	United Nations Framework Convention on Climate Change
VDC	Village Development Committee
WECS	Water and Energy Commission Secretariat
Wp	Watt peak
Yr.	Year

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CHAPTER ONE: INTRODUCTION

1.1 Background and rationale

Climate change is an emerging issue in the global context that received high priority, during the United Nations Conference on Environment and Development (UNCED) held in 1992 when the most of the world‟s countries agreed to sign the United Nations Framework Convention on Climate Change (UNFCCC). Its importance has further increased after the UN‟s Copenhagen Conference on the Climate Change held in December, 2009 in Denmark. Nepal as a signatory of the international conventions, has taken a number of initiatives on climate change issues particularly for the development of renewable energy technologies, which contributes to energy supply and environmental protection at local level.

The main goal of the District Climate and Energy Plan (DCEP) is to create a planning process to increase the dissemination of renewable energy technologies at district level, contributing to Nepal‟s national and local development plans. In the DCEP preparation guideline the overall goal of DCEP is "to prepare a climate change adaptive, decentralized renewable energy plan that presents a detailed implementation plan which can contribute to carbon mitigation and also ensures Gender and Social Inclusion issues which are mainstreamed within the plan".

1.2 Rationale

DCEP is a key document that shows how the District Development Committees (DDCs) have to address energy development at district level whilst acknowledging climate change impacts and incorporating gender and social inclusion issues. It has provided an inventory of district energy resources to identify the most appropriate actions, opportunities and intervention techniques to access the Renewable Energy Technologies (RETs) and therefore promoting low carbon development as well as justifying how RET has contributed to climate change adaptation measures.

Addressing climate change requires a rapid development of renewable energy technologies in Nepal and careful planning is vital to achieve this at any level, particularly at the district level. Effectively implemented sound energy plan can improve adaptive capacity of the communities and contributes to carbon abatement. In addition, potential resilience capacity can address Gender and Social Inclusion (GSI) issues increasing resilience capacity of women, children, persons with disability and

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communities with specific livelihood strategies who are vulnerable to different adversities and stresses including the impacts of climate change.

In Nepal, exclusion is seen in line with gender, class, caste, ethnicities and locations causing inequalities in various dimensions: social, cultural economic, technological, political, etc. Because of such exclusionary practices, women, poor, *Dalit*, ethnic groups and people living in remote areas are constrained from voicing their concerns, access to and control over resources and services, and making policies and institutions favorable to them.

Ignoring the meaningful participation and the capacities of women and excluded people into planning process including the choice of energy technologies may lead to wrong selection of the technologies and capacity building.

Hence, mainstreaming GSI issues is the only way to reduce the gap and attain gender and social equalities. DCEP process is looked at addressing these imbalances in the institutional set up of Bardiya in relation to GSI in dissemination of RE and made recommendations about what systems, processes and organizational arrangements has been needed to improve RET dissemination and provide strong links to climate change activities.

1.3 Objectives of DCEP

The overall objective of a DCEP is to prepare a climate change adaptive, decentralized renewable energy plan that presents a detailed implementation plan that can contribute to climate change mitigation and also ensures GSI issues are mainstreamed within the plan.

Some of the specific objectives of the DCEP are:

- To outline energy needs for Bardiya district
- To carry out resource, technology, and institutional assessments
- To outline interventions of renewable energy technologies by mainstreaming climate change and GSI issues
- To identify the capacity development needs to implement the climate change adaptive renewable energy plan
- To outline implementation of the plan with identification of roles and responsibilities of different stakeholders

1.4 Scope of DCEP

This DCEP report maps district energy resources, providing a suitable basis for making decisions on most appropriate actions and interventions necessary for accessing RETs

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incorporating to climate change mitigation and GSI issues. Climate change, particularly its impacts on energy sector, has been considered at each stage of the planning process such as assessment of energy resources, demand and supply. Although assessment of climate change and its impacts in different sectors warrants a separate in depth studies that accrues longer time and resources, the DCEP has focused on the existing and potential impacts of climate change on energy and potential of energy through the DCEP to climate change adaptation and mitigation. The focus of DCEPs is to both expand coordination and service provision of renewable energy at district level identifying opportunities where the GSI responsive energy plan can contribute to climate change mitigation and adaptation in all energy related planning processes.

Some of the specific scopes of the DCEP are:

- Access and analyze energy supply and consumption patterns in the district supported by data disaggregated by gender and caste/ethnicity
- Identify potential of renewable/rural energy sources and associated technologies based on climatic, geographical, and socio-economic variations
- Prepare a broad climate change assessment of the district (based on existing data)
- Prepare integrated rural/renewable energy development and management plan including divisions of responsibility and specific activities of stakeholders
- Identify current and potential stakeholders in the renewable/rural energy (and interlinking) sectors, analyze capacity in terms of ability to implement RE strategy developed taking into consideration climate change and GSI issues
- Prepare an integrated inclusive climate change adaptive district energy plans supporting potential mitigation actions
- Provide tentative financial requirements for identified/proposed plan and suggest ways of finance (grant/ credit), funding mechanisms
- Ensure that GSI planning and processes are mainstreamed into all DCEP plans
- Provide a monitoring and evaluation plan for the implementation of DCEP fully taking into account GSI indicators.

1.5 Limitations of DCEP

It is too rigorous to encapsulate all the aspects of DCEP (RETs, climate change and GSI issues) in a DCEP report. This report focuses mainly on the identification of appropriate RETs in the Bardiya district and to justify the reducing effect of such technology in climate change a comparison of GHG emission trend has been done with that of conventional energy technology.

During analysis of scenarios, minimum energy consumption has been forecasted, the fact that people might be adopting new technology for various needs or cross switching

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to other technologies, etc. has not been considered. Some of the other limitations of the study are highlighted below:

- The study is more focused on energy consumption in residential sector.
- The installation of RETs by survey data may not match due to promotion of RETs by multi stakeholders and switching of technology over the interval of time.
- The scenario building utilizes the fact that the major end uses in residential sector use energy for cooking and lightening . The subsequent planning is also focused on providing for these end uses
- Due to insufficient proper data, no assessment has been done to draw energy demand and consumption scenario for transportation, industrial, and commercial sectors of Bardiya district
- Due to the lack of statistical and disaggregated data available on climate change impacts, contribution to adaptation, and GSI; it was not possible to quantify climate change and GSI issues at district level in order to show their influence on the scenario development process
- The potential energy resources and available energy resources are totally based on primary data regarding renewable one
- People may be using more than one technology for same purpose which has been analyzed using saturation model.
- Since, the biogas plants user in the district mainly use 6 m^3 plants for cooking end use and therefore the DCEP projection for district has been forecasted for this size of plants only. Thus, the other size of domestic biogas plants user 4, 8, 10 m^3 are few in number and hence the 6m^3 of plants projection has been used to forecast the average size of family end use need as overall district effects.
- Population growth rate has been calculated by using district populations of 2001 and 2011 and is assumed to be constant for five year projection in both scenarios.

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CHAPTER TWO: OVERVIEW OF BARDIYA DISTRICT

2.1 Geographic profile

Bardiya district lies in Bheri zone of the Mid-Western Development Region of Nepal. It has occupied 2025 km^2 area and lies in the west of Banke district, south of Surkhet district, east of Kailali district of Seti zone. To the south lies Uttar Pradesh, India.

It is located at Latitude 28^0 17″ to 28^0 39″ North and Longitude $81^0$3″ to $83^0$41″ East. It has maximum altitude 1279 meters at Chepang Gaun and Minimum Altitude 138 meters. Its climate consists of mainly lower tropical temperature and maximum temperature recorded here is 40 ºC and minimum temperature is recorded as 4 ºC. Its average annual rainfall is 1900 mm. In Bardiya, there are 25 VDCs and two municipalities. Recently 6 VDCs (Badalpur, Bhimpur, Daulatpur, Manpurtapara, Nayagaun and Rajapur) are declared as Rajapur municipality and Gulariya municipality is headquarter of the district.

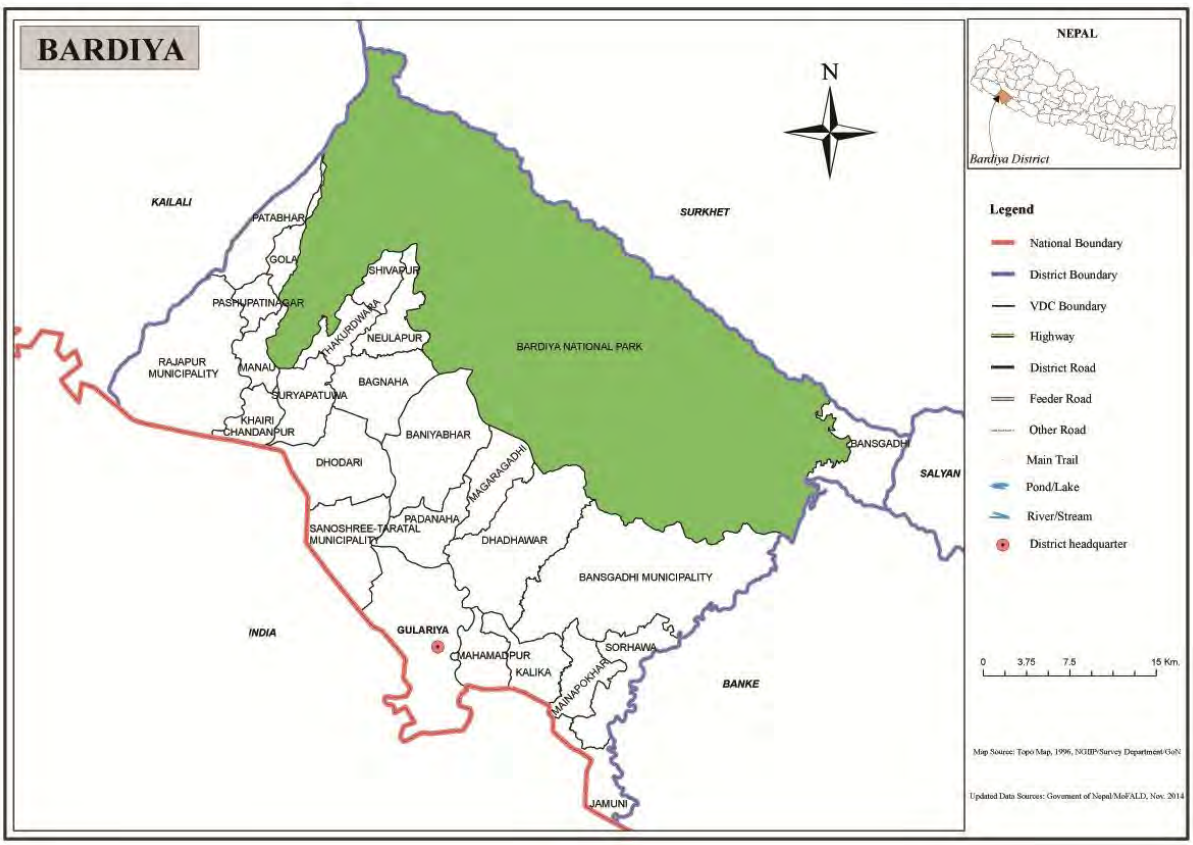

Figure 2.1: Map of Bardiya district

2.2 Demographic structure

The population of the district is counted to be 426,576 by CBS 2011 with population density of 211 people per sq. km. The male and female populations of this district are

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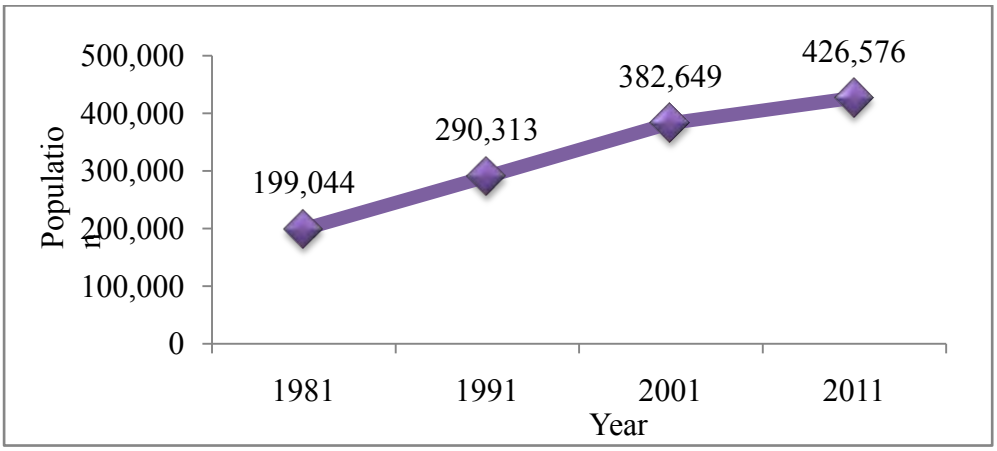
205,080 and 221,496 respectively. The total household is 83,176 with the average household size 5.13 people per household. The population growth rate of the district is about 1.093%. The detail of population growth trend and ethnicity wise population composition is described below in this chart diagram (CBS, 2012).



(CBS, 2012)

Figure 2.2: Population growth trend in Bardiya district

2.3 Land distribution and natural resources

Total area of Bardiya district is 202,500 ha, of which, majority of the land is used for agriculture as it is located in Terai region and ample. Forest also represents a large portion of its area and is divided into community forests, Individual forest, Religious forest and National forest. A lot of families have been benefitted by those forests. Bardiya National Park, one of the most famous National Parks in the country, is also located in this district. Forest of Timber tree (Sal, Salla, Asna, Katus, Chiulaune, Gunras) and Herbal Plants **(**Timur, Ritha, Dalchini, Tejpat, etc.) are found in large quantities. The main cereal crops produced in Bardiya are Paddy, Maize, Wheat, Barley, Millet, and variety of cash crops i.e. Mustard Oil Seed, Potato, Sugarcane, etc are cultivated as winter Seasonal, summer seasonal and Non seasonal (CBS, 2012)

2.4 Roads and infrastructure

All VDCs and municipality of Bardiya district have access to road transportation. Majority of the roads are black topped while few are graveled Due to its low head difference, micro hydro is not a reliable source but biogas plants have been a good source of energy. Apart from that there is significant improvement in energy system due to the subsidy provided on solar panels which produce energy for a single house (CBS, 2012)

2.5 Institutions

Health

The most common health problems in the district are diarrhea, respiratory problems, gastritis, filarial, etc. It is stated by Nepal Government as high risk state for Malaria.

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Apart from government effort, various NGO and INGOs are actively participating to improve the health status.

Bardiya district has a district hospital, along with 3 PHCCs, 8 HPs, 22 SHPs, 156 PHC outreach clinics, 190 EPI clinics, 841 FCHVs, and 18 in NGO/INGO and private sector. Despite of a number of challenges in the health sector, health service seeking behavior has gradually increased, maternal and neonatal mortality rates have decreased and coverage by immunization and safe motherhood services have improved (CBS, 2012)

Education

The number of teachers for primary, lower secondary and secondary level are 1352, 348 and 240 respectively. The teachers are of partly trained, fully trained as well as untrained type. The total number of students in primary lower secondary and secondary level is 72,562; 40,651 and 13,889 respectively. The schools also provide education to disabled students and the amount of Dalit and Janajati enrolled in the schools are considerable. Many national and international organizations are also actively involved in increasing the number of schools and increasing its quality towards education. Some colleges also provide higher secondary education while very few provide education of bachelor"s level (CBS, 2012)

Communication

Most VDCs in Bardiya have one or more communications options: landline, CDMA, GSM mobile or V-SAT telephones. The district has easy access to various national daily and television. Landline connections also provide internet access to government offices and NGOs located in district. Mobile phones have also become a good source of internet recently. Most people have a mobile phone equipped with one or more SIM-cards. The district has few FM stations and local newspapers which publish from district headquarter (CBS, 2012)

Energy

Firewood and kerosene are basically used for cooking and lightening purposes. The use of LPG is considerably low and BSP have launched several projects for the installment of Bio Gas Plants which have made the accessibility of energy a lot simpler and easier. (CBS, 2012)

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CHAPTER THREE: DCEP PROCESS AND METHODOLOGY

3.1 Process

DCEP has been prepared as per tools and framework provided by DCEP preparation guidelines. The DCEP process flow diagram and the details of each step are shown below

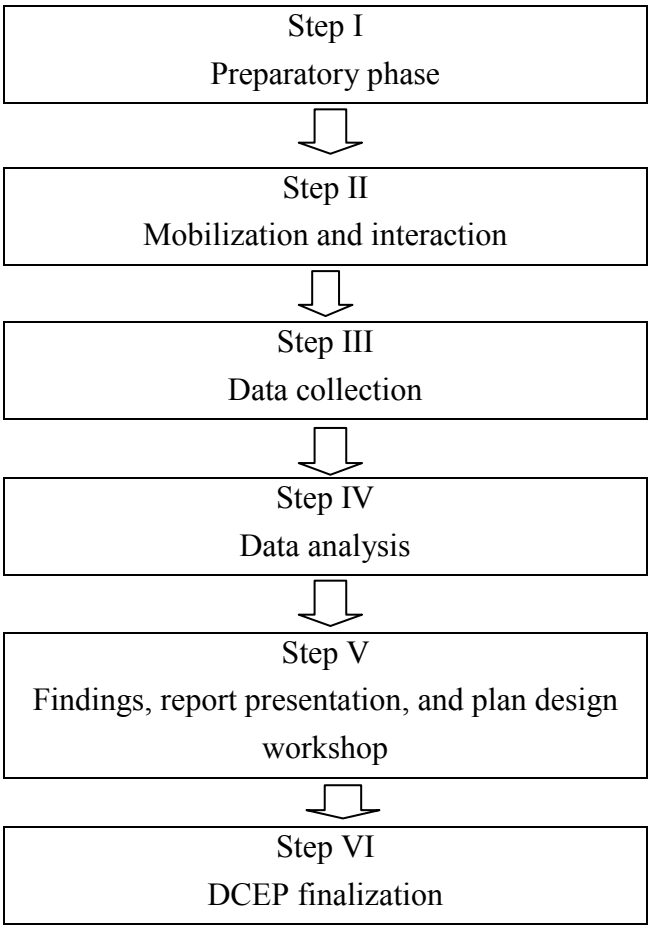

Figure 3.1: DCEP preparation process

3.1.1 Preparatory phase

Detail methodology for working process had been defined. Inception report had been prepared with methodology, time is scheduled for assigned task, proposes, and questionnaires were made for survey.

Before conduction of field work, desk study was carried out for relevant data and information in central, district, and VDC/municipality level. List of potential data sources had been identified at this phase. Along with that, desk study for the relevant material collection for the DECP approach has been performed. District level secondary data has been collected in this phase.

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3.1.2 Mobilization - Interaction at district level

Formation of task force and orientation workshop at the district level are the main tasks in this step.

3.1.3 Formation of DCEP task force

District Energy Environment and Climate Change Sections (DEECCS), and District Development Committees (DDC) of the Bardiya districts had taken the leading role at the district level to assist and coordinate the DCEP process. District Energy and Environment Committee (DEECC) formed by the DDC has been made more responsible specially to coordinate district level actors and to facilitate decision making and interacting with consultants. As per the requirement, DCEP task force had completed its task with the help of AEPC/ CCU. The DCEP task force had included

- Local Development Officer
- DDC Planning Officer/ Programme Officer
- DEECCS – Energy Officer
- Chief of District Forest Coordination Committee of District Forest Office
- Chief of District Women Development Office
- NGOs representative
- Private sector/ service providers representative
- Selected representative to ensure participation of women and ethnic groups
- Representative from political parties
- Orientation to task force has been organized to make them able to support in the planning process in order to execute following roles and responsibilities;

This task force had served as the focal point for DCEP

  - Creates linkage between local stakeholders and consultant focal persons
  - Facilitates access to local data for Provision/ exploration of relevant information
  - Ensures local participation in DCEPs including the participation of women, Dalit Ethnicity
- Serves as the link between the District Development Committee and consultants and AEPC/SNV
- Provides feedback and support DDC for approval of DCEP documents including draft and final reports.

3.1.4 Orientation workshop

An initial workshop was conducted for all RE stakeholders to orient on climate change and energy planning. Work plan was designed and presented for the acceptance of

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responsibilities of stakeholders. This workshop had given a background knowledge of climate change and measures that can be used to address climate change.

3.1.5 Findings report presentation and plan design workshop

After analysis of data with initial finding, it was presented among the stakeholders for their inputs by organizing workshop. This had been done in two steps:

- Preparation of a initial draft report- district climate, energy and gender situation report
- Organization of a planning workshop at district level. This has included :
  - Presentation of a draft of district climate, energy and gender situation report to stakeholders
  - Presentation of preliminary DCEP scenarios
  - Feedback from district task force members and stakeholders
  - Development of implementation and develop different scenarios
  - Development of a draft of implementation plan with a participatory session

3.1.6 DCEP finalization

This involves the finalization of DCEP report, including activity plans, financial sections, and actor identification and monitoring and evaluation plan. Conclusions and recommendations have been developed based on the report.

Executive summery has been developed based on the report. Draft report has been submitted to respective DDC through AEPC/CCU for review and approval. Consultation workshop at district and central level had been organized for the finalization of DCEP.

3.1.7 Discussion approval district level consultation

After finalization of DCEP it will followed by

- Endorsement of DCEP
- Plan Implementation process
- Monitoring and evaluation of DCEP

Endorsement of DCEP: DDC will endorse DCEP into its annual development plan. AEPC/CCU will support respective DEECCS of DDCs for the endorsement.

Plan Implementation process: After approval of the plan, the implementation process will begin. The implementation process will be guided by DCEP.

Monitoring and evaluation of DCEP: AEPC/CCU will support the DDC/ DEECCS during monitoring and evaluation of DCEP.

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3.2 Methodology

3.2.1 Overview

The DCEP guidelines provide the tools and framework necessary to prepare a DCEP, however the overall methodology that was followed to prepare DCEP in Bardiya are as follows:

Data was compiled from both primary and secondary sources particularly from the district. The district profile and VDC/Municipality profile of Nepal published by the Intensive Study and Research Centre had provided much of the information for the district overview including socio-economic data. Particular attention was made to ensure a selection of VDCs/municipalities with varying level of access to RETs compared to the district as a whole. The data was collected from whole VDCs/municipalities at ward level for analysis.

The collected data were utilized to present an overview of the district, the district socioeconomic condition, and energy situation in terms of consumption and supply. The collected data were further used to undertake a climate, GSI, technology, and institutional assessment. Energy consumption data was used to develop the *Business as Usual Scenario* (BAU), where current trends of energy use and technology intervention were assumed to continue.

In developing the scenarios, two different sets of possible future energy demands have to be considered – each corresponding to a future policy case scenario these is:

- Business As Usual (BAU) Scenario
- District Climate and Energy Plan (DCEP) Scenario

For policy analysis, BAU scenario has been taken as reference case or the interim plan scenario with current GDP and population growth rate of respective district. As policy intervention scenario, DCEP scenario has been developed with consultations and suggestions from stakeholders and experts.

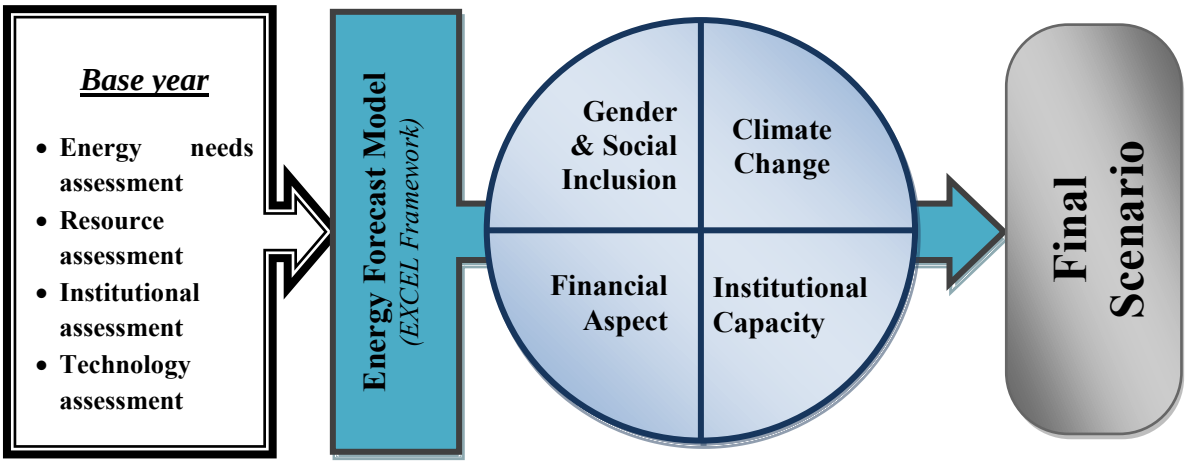

Figure 3.2: Methodological approach for scenario development

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Up to date RET intervention levels were incorporated into the data in order to provide the most up to date information. Following this two further scenarios were developed as per guidelines.

3.2.2 Data collection

In this step primary and secondary data have been collected

A. Data sources and types

Data has been collected for energy use (mainly for residential sector), energy resource (traditional, commercial and renewable), institutional stakeholders, and technology use. Other cross cutting issues of gender, social inclusion, climate change, and institutional capacity assess in terms of how they impact on the energy planning framework are considered.

a. Secondary data collection

Secondary data was collected according to resource assessment, technology assessment, social assessment, and vulnerability assessment to relate the basic energy supply.

This involved information collection from the district based offices DDC, DEECCU, service providers and market actors in RET. District profile and VDC/municipality profile are the major sources of secondary data. Current RET status and trends has been collected from the relevant implementing bodies such as Centre for Rural Technology (CRT/N), National Rural and Renewable Energy Program (NRREP), Biogas Support Programme (BSP) Nepal, and other local and national bodies including NGOs and INGOs. The climate data (30 years temperature and rainfall data) had been collected from Department of Hydrology and Meteorology"s (DHM). Demographic data and maps have been collected from Central Bureau of Statistics and Department of Topographical Survey in Kathmandu. Different secondary data has been collected from the organizations as suggested by DCEP guideline.

b. Primary data collection

Primary data has been collected from every VDCs/municipalities of Bardiya district through the help of District Energy Environment and Climate Change Unit.

B. Information management

For the DCEP process and scenario development, data has be managed in three levels

- District Overview: This has included geographical location, population (including disaggregated information on gender and ethnic groups), climatic conditions, forest situation, agriculture, livestock, communication, electricity and other facilities
- District Climate Change, Energy, and GSI situation Report: This has included base line of district in terms of energy, climate change, and GSI

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data. Specifically, it includes potential energy sources, priority area for each technology and its linkage with climate change gender and social perspective.

- DECP Scenario Development: This has included data management that requires for the projection and recommendation of RET with addressing climate change and social perspective.

C. Data collection components

a. Resource assessment

Potential data for different energy resources such as traditional (fuelwood, agricultural residue, and animal waste), commercial (Electricity, Petroleum products) and renewable energy resources (Hydro, Solar, Wind, Biomass) as possible had been collected from different concern organizations agencies studies reports. Data had been collected with focusing energy resource and its linkage with climate change such as vulnerability to climate change, gender issue, adaptation and mitigation of climate change.

b. Energy demand assessment

The energy demand had been collected in detail, especially in residential sectors. During demand assessment, energy required in the residential sector for cooking, lighting, space heating, agro processing had been collected.

c. Technology assessment

The technology assessment is based on both primary as well as secondary data. The status and trend of specific RETs has been analyzed with respect to data collected from principal implementing organizations: Biomass, solar home systems, watermills and bio fuel from AEPC; Biogas from BSP-Nepal; Micro Hydro Power (MHP) from REDP/AEPC/NRREP; Improved water mills from CRT/N. Technology assessment and prioritization has been done by viewing following factors:

- Climate change aspect
  - Vulnerability due to climate change (focus on climate proofing technologies).
  - Contribution to the climate change adaptation
  - Mitigation Potential
- Gender and Social Inclusion aspect
  - Gender friendly in use
  - Contributes to poverty reduction

d. Gender and Social Inclusion assessment

Gender and social inclusion assessment has been accomplished as per main objective of DCEP. This has focused on access and participation of women and particularly excluded group in the energy and climate sector. This has collected the information on

- General gender statistics – based on availability
- Ethnic Group mapping and development status

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It has been analyzed based on current use and potential use of different energy technologies by different social groups.

e. Climate change assessment

Climate variability and change have been analyzed using hydro-meteorological data and community as well as stakeholders‟ experience and perceptions. Available hydro-meteorological data from the stations in the district has provided trends of climate variability and change. Climate change overview has included

- Collection of general overview of anticipated climate change and climate variations from different stakeholders including National Adaptation Plan of Action (NAPA), Practical action, Intergovernmental Panel on Climate Change (IPCC), GTZ, etc.
- Discussion of extreme climatic events from the focused group discussion.
- Discussion of most vulnerable sector in the respective districts.

f. Institutional assessment

Collection of information of relevant stakeholders in the district has been carried out. During institutional assessment, mainly three components have been covered. They are as follows:

- Stakeholder identification and roles
- Capacity assessment
- Institutional set up policy, infrastructure, government, finance, service delivery with considering GSI issues.

Institutional analysis has been done based on following categories:

- Government or governance status/set up, NGOs/INGOs
- Service providers– construction companies, social mobilizes, ASS and subsidy administration, Private sector organizations
- MFIs/cooperatives micro (microfinance banks, financial intermediaries, NGOs, savings and credit cooperatives).

g. Data analysis

From collected data, situation analysis has been done to show base line situation. Then analysis and processing has been done for collected data for the future energy system. Data analysis has been guided by:

- Energy demand
- Cost and subsidy for the technologies
- Vulnerability to climate change
- Potential GHGs emission

Data analysis tools and output has been as follows:

- Energy demand trend

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- Technology penetration rate
- Number of benefited households and its trend
- Cost and subsidy for the technology
- Vulnerability analysis- vulnerability table
- Trend analysis- various years report

Data processing has been done by using following analytical steps

- Verification of data available from more than one source
- Projection of data for future planning
- Compilation of data from number of sources

3.2.3 Scenario development

Collected data has been is analyzed and processed to create energy in Business as usual and District Climate and Energy Plan Intervention Scenario. For the preparation of the scenarios the excel programs have been used and planning has been done for 5 years by considering FY 2070/71 (2014) as base year.

a) Business as Usual Scenario

BAU scenario has been developed based on current trends of interventions and demand growth. This scenario does not consider any issue such as GSI issues beyond existing interventions. During development of Business as Usual Scenario following input variables are used

- GDP growth rate: Local growth rate
- Population growth: growth rate for particular district from CBS Energy trend: Current energy need assessment and current practice of technology intervention
- RET installation rate: Current rate
- GHG emission trend: Current trend for comparison with DCEP scenario

b) District Climate and Energy Plan Scenario

This scenario has based on technology interventions that address climate change, gender issues, social inclusion etc. During development of DCEP Scenario following input variables are used

- GDP growth rate: Local growth rate
- Population growth: CBS growth for particular district
- Energy trend: Based on energy need assessment and energy intervention (Considering vulnerability of RET to Climate change, technologies to contribute adaptation and mitigation, GSI perspective, cost and access of technologies)

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- RET installation rate: As per adaptive and GSI perspective, RET promotion and efficiency will gone parallel
- GHG emission trend: Comparison with BAU scenario

3.2.4 Detail implementation plan

The detail implementation plan has been developed after data collection, data analysis, and stakeholder input. Detail implementation plan has given the role and responsibilities for the stakeholders. Detail implementation is made for 5 years starting from base year. Detail implementation plan has included:

- Technology option (Different RETs; Solar, Biogas, ICS, etc.) and description for the implementation of these technologies
- Implementation modality of the RETs is based on targeted period of implementation i.e. short term, mid-term and long term
- Cost structure involved while implementing the selected technology
- Targeted households or beneficiaries who are going to get direct benefit from the implemented technology
- Analysis of the impact of implemented technology on the rural and urban people of concerned district

3.2.5 Financial plan

Financial plan has been developed based on existing source of funding and potential source of financing. The financial plan includes:

- Particular technology which is going to be implemented along with its type, size and capacity.
- Unit cost for each type of technology and subsidy available based on its location.
- Other provisions which will facilitate the allocation of finance and implementation of the technologies.

3.2.6 Monitoring and evaluation plan

Detailed monitoring and evaluation of plan has been developed for the DCEP implementation. Role and responsibilities for different stakeholders including DEECCS has been developed.

3.3 Energy modeling framework

The energy model developed is based on end-use energy accounting model from bottom-up approach. Simple accounting framework and excel software have been used for modeling. Rather than optimizing or simulate the behavior of a system, these models require the user of the model to specify all of the individual parameters, which

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are then used to account for the overall integration of individual aspects of the system. The accounting framework simply serves to look at the implications of this in terms of future energy requirements, costs and environmental impacts (Heaps, 2004). The end-use energy accounting models with detailed sector representations produce more realistic projections compared with the econometric models, they can suffer from huge data deficiencies especially in developing countries in absence of sufficient research works. However, end-use accounting models tend to be more versatile in nature and require relatively less skills due to their accounting approach to forecasting (Bhattacharyya & Timilsina, 2009).

The energy for each activity is given by following equation:

$$Energy = \frac{Activity * Energy\ Intensity}{Efficiency}$$

Where,

Energy = Total final energy

Activity = Level of utilization

= Population or household x Penetration of technology (%)

Intensity = Useful energy usage per unit activity

Efficiency = Efficiency of respective technology

The first step of the analysis is to compute the base year parameters from the primary data collected from the survey. The computation of base year data gives the activity level of the base year along with energy intensity of each end-use technology. A basic presumption is that the useful energy intensity for any end use remains similar for short intervals unless these are affected by other externalities of which some are answered by econometric models or might not me calculated due to factors such as natural calamities or consumer behavior. The second step is to project activity level based on demographic situation and energy policy. In base year, the penetrations of the technologies are assumed to be on same trend as on base year. Meanwhile, for energy policy measures, the penetrations of each technology are to be assigned as per policy requirement. The process is however not a onetime cycle. Instead it requires a series of iterations until an optimal final energy scenario is achieved as shown in figure.

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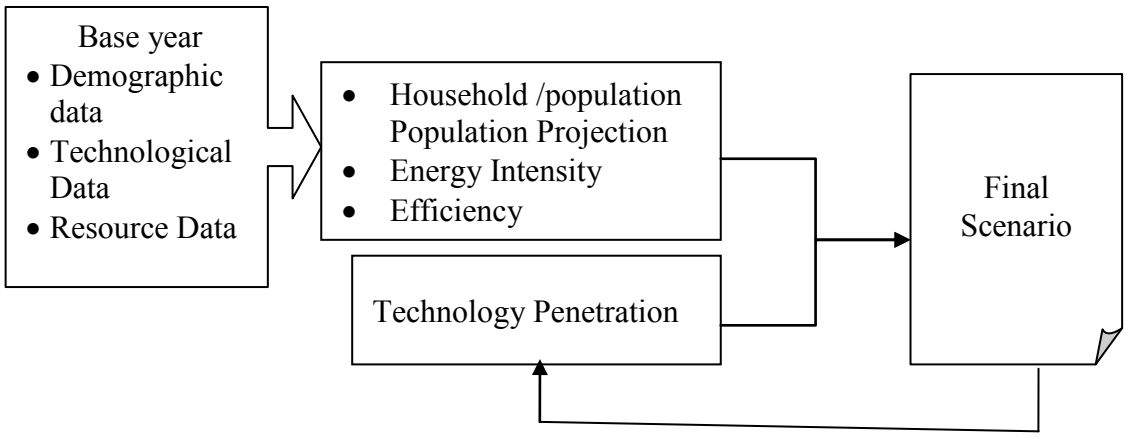

Figure 3.3: Modeling block diagram

While preparing energy model for DCEP firstly we have collected data regarding availability of resources, existing technologies and devices for energy end use, number of households using different technologies, demographic status and effect of such technologies on the environment and climate. Then we have disaggregated the collected data through different possible ways e.g. gender, ethnicity and caste. After collection and disaggregation of available data we have set input parameters for cooking and lightening end use because in most of the districts in Nepal residential cooking and lightening are the primary energy consuming sectors so it is required to pay initial attention on these sectors before making any energy plan. Here two different scenarios have been developed for analysis viz; Business As Usual (BAU) and District Climate and Energy Plan (DCEP) and performed technology intervention, energy consumption and GHGs emission projection for five years. In BAU scenario it has been assumed that technology intervention will be on existing trend without replacement of conventional low efficient technologies which are also susceptible to GHGs emission. But in DCEP scenario, as possible it has been tried to introduce efficient, renewable, and environment friendly technologies and resources which are locally available. For each scenario number technologies for households, energy consumption by different technologies and associated GHGs emission are calculated and compared.

Here along with the energy models a complete implementation plant followed by monitoring and evaluation has been prepared. Suggesting DCEP as the better option for the implementation, complete investment plan along with amount of subsidy need to be allocated for the intervention of each different technology in districts have been prepared.

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CHAPTER FOUR: DISTRICT CLIMATE CHANGE AND ENERGY SITUATION REPORT OF BARDIYA

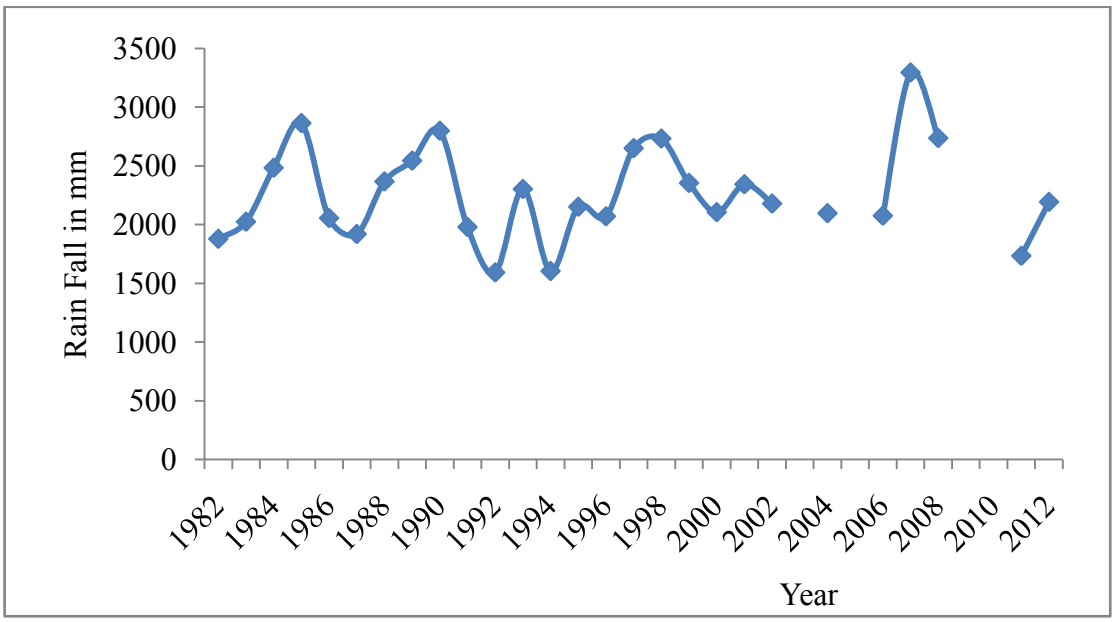
4.1 Climate change assessment

Since, Bardiya district located in Terai region of Nepal, it has lower tropical climate with temperatures reaching 40 Celsius in May and falling to single digits in winter. Bardiya district has the elevation from 138 m to 1279 m with mostly lower tropical temperature.

Table 4-1: Climate zone for different elevation range

Climate Zone	Elevation Range	% of Area
Lower Tropical	300 to 1,000 meters 1,000 to 3,300 ft.	71.40%
Upper Tropical	1,000 to 2,000 meters 3,300 to 6,600 ft.	22.60%
Subtropical	2,000 to 3,000 meters 6,400 to 9,800 ft.	6%

Trend of annual rain fall data of Bardiya is shown in graphical form as below



(DHM, 2014)

Figure 4.1: Trend of annual rainfall data of Bardiya district

Average minimum temperature of the Bardiya district is increasing in the last few years which is in the graph below

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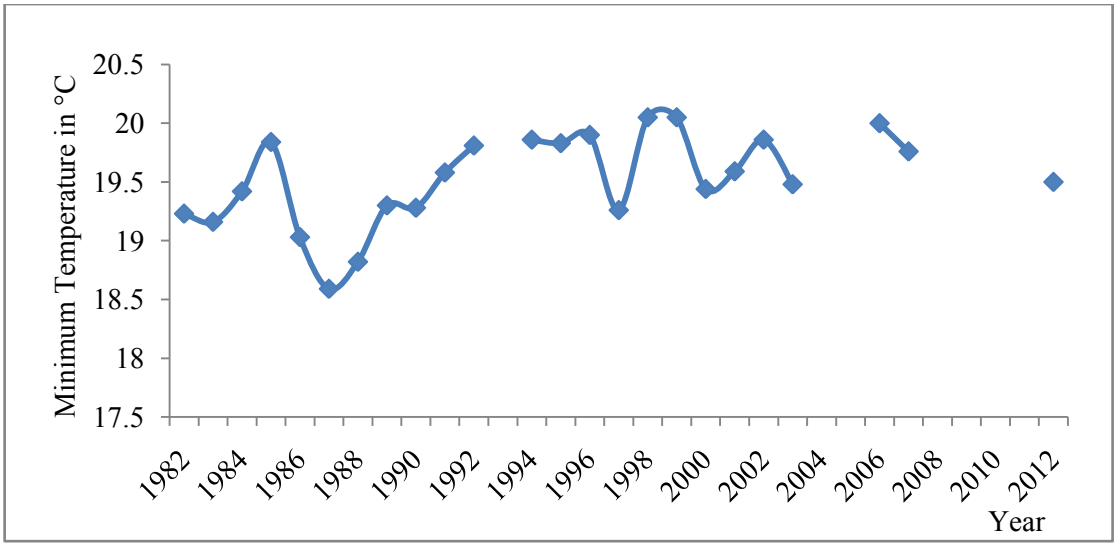
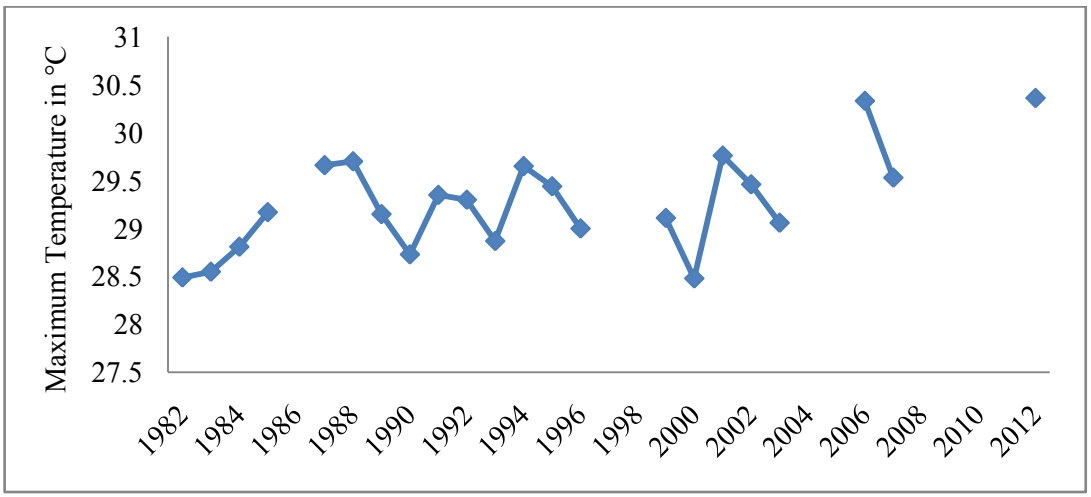


(DHM, 2014)

Figure 4.2: Average minimum temperature of last few years in Bardiya

Average maximum temperature of the Bardiya district is increasing in the last few years which is in the graph below



(DHM, 2014)

Figure 4.3: Maximum temperature of last few years in Bardiya

Average annual rainfall is above 1900 mm with fluctuating pattern. In the year 2008, there was maximum average rainfall of more than 3000 mm. In the few years, due to lack of rainfall data of consecutive years, the graph is not continuous. Similarly, minimum average annual temperature of the district is in the range of 18°C to 20°C. In last 20 years the yearly maximum average temperature has been varied from 28°C to 30.5 °C with increasing pattern. Thus, by observing average annual rainfall and average annual maximum temperature data of last 30 years, the growing influence of climate change can be observed (DHM, 2014).

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4.2 Energy consumption/ demand assessment

Energy consumption in Bardiya district is mainly on residential sector followed by commercial and industrial and the main source of energy are fuelwood, electricity, fossil fuels and some part by renewable energy sources. Energy demand in Bardiya district is growing annually with increase in number of household and commercial enterprises and small industries. Present energy demand in transportation, residential and industrial sectors in Bardiya can be represented below along with their number:

Table 4-2: Total vehicles in Bardiya district

S.N.	Vehicle	Number	Remarks
1.	Tractor	2149	Approx.
2.	Car/Jeep	254	Approx.
3.	Tempo	3	Approx.
4.	Motorcycle	3527	Approx.

(DOTM, 2014)

Table 4-3: Officially registered small and medium scale industries across Bardiya district

Numbers of small and cottage industries							Total
Manufacturing	Energetic	Agro & Forestry	Mineral	Tourism	Service	Construction	
763	4	63	4	47	1,039	239	2,159
71	1	42	0	66	434	70	684
190	1	28	0	0	128	97	444
594	0	54	0	25	856	0	1,529

(CSIDB, 2014)

4.3 Energy resource/ supply assessment

Energy resources available in Bardiya are mainly classified into traditional resources which include fossil fuels, and grid electricity; and finally renewable energy resources which include solar, wind, biogas etc.

4.3.1 Traditional biomass

a) Fuelwood

The main source of energy in the district is fuelwood and is generally supply from forest area. The total area of forest land in Bardiya district is 196,164 ha, including community, government owned, and lease private forests.

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Table 4-4: Total sources of sustainable fuelwood in Bardiya district

I. Government forest	Area	II. Community forest	Area
a) Forest area (Ha)	99,364	a) Forest area (Ha)	96,800
b) Accessible forest area (Ha)	N/A	b) Sustainable fuelwood supply	N/A

(CBS, 2012)

b) Agriculture residue

Total agriculture crops production with quantity determine the wastes as residue in it and so as the following data mentioned below gives the tentative residue waste quantity from crops.

Table 4-5: Types of cereal crops types with production quantity

Crop	Description	Quantity	Energy potential
Paddy	Area (ha)	42,550	76.94 GJ
	Prod. (ton)	148,925	
	Yield (ton)	3,500	
Maize	Area (ha)	9,000	16.32 GJ
	Prod. (ton)	18,210	
	Yield (ton)	2,023	
Millet	Area (ha)	1,985	4.50 GJ
	Prod. (ton)	1,998	
	Yield (ton)	1,007	
Wheat	Area (ha)	18,890	59.58 GJ
	Prod. (ton)	528,000	
	Yield (ton)	2,795	
	Area (ha)	510	1.40 GJ
	Prod. (ton)	578	
	Yield (ton)	1,133	

(CBS, 2012)

Table 4-6: Types of cash crops with production quantity

Crop Type	Description	Quantity	Energy potential
Oilseed	Area (ha)	10,375	3.99 GJ
	Prod. (Metric ton)	9,380	
	Yield (Metric ton)	0.9	
Potato	Area (ha)	4,000	N/A
	Prod. (Metric ton)	56,000	
	Yield (Metric ton)	14,000	
Sugarcane	Area (ha)	250	0.23 GJ
	Prod. (Metric ton)	10,250	
	Yield (Metric ton)	41,000	

(CBS, 2012)

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Table 4-7: Types of pulse crops with production quantity

Crop Type	Description	Quantity	Crop Type	Description	Quantity
Lentil	Area (ha)	15,223	Grass Pea	Area (ha)	845
	Prod. (MT)	15,102		Prod. (MT)	1,195
	Yield (MT)	992		Yield (MT)	1,414
Chick Pea	Area (ha)	700	Horse Gram	Area (ha)	61
	Prod. (MT)	790		Prod. (MT)	43
	Yield (MT)			Yield (MT)	703
Pigeon Pea	Area (ha)	1,350	Soybeans	Area (ha)	51
	Prod. (MT)	1,080		Prod. (MT)	55
	Yield (MT)	800		Yield (MT)	1,079
Black Gram	Area (ha)	170	Others	Area (ha)	852
	Prod. (MT)	201		Prod. (MT)	821
	Yield (MT)			Yield (MT)	964

(CBS, 2012)

4.3.2 Commercial

a. Fossil fuel

Energy consumption from fossil fuel is mainly in transportation sector in Bardiya district. The residential fossil fuel consumption is very less i.e. below 1% in both lightening and cooking.

b. Grid electricity

Electricity is supplied by Nepal Electricity Authority in Bardiya district as commercial energy.

Table 4-8: Electricity supply in Bardiya district

Power Supply	Substation for transmission	Covered household
Nepal Electricity Authority	Bhurigaun of Bardiya 132/33/11 kVA transmission	51,932

(NEA, 2014)

4.3.3 Renewable

a. Solar

Bardiya district has good potentiality for solar energy; according to SWERA report, Bardiya district has the annual direct solar radiation and annual global solar radiations are as follows

Table 4-9: Solar potential in Bardiya district

Annual Direct Solar radiation kWh/m^2/day	Annual Global Solar radiation kWh/m^2/day
5.465	4.469

(AEPC, 2008)

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b. Wind

Average wind energy potential of wind power and average wind speed of nearly 5-6 m/s reported so far in Bardiya district.

c. Biogas

Animal dung is the main source of input for biogas digester and whose potential are mentioned in the in table below of animal dung resources and along with that vegetable wastes and other remaining are also the resources for biogas production.

Table 4-10: Potential source for biogas

Animal type	Data	Animal type	Data
Buffalo (No.)	110,800	Cattle (No.)	119,300
Dung production per animal per year (MT)	5.475	Dung production per animal per year (MT)	3.65
Annual dung production (MT)	606,630	Annual dung production (MT)	435,445

(CBS, 2012)

4.4 Technology assessment

4.4.1 Overview

Various technologies have been used in residential, commercial, and transportation sector in Bardiya district, some of them are described in brief below. In residential sector, traditional and improved cook stoves are used for cooking and water boiling. For lightening kerosene lamps, biogas lamps, CFL and tube light using electricity and finally for heating and cooling end use fans, heater and air conditioner are generally used. Description of these with fuel type is mentioned below:

Table 4-11: Residential technologies

End use	Technology	Fuel type
Cooking and water boiling	Traditional Cooking stove	Fuelwood/ agriculture residue
	Improved cooking stove	Fuelwood/ agriculture residue
	Kerosene stove	Kerosene
	Electric heater	Electricity
	Biogas	Cattle waste
	Rice cooker	Electricity
	LPG stove	LPG
Lightening	Kerosene lamp	Kerosene
	Candle light	Wax
	Biogas lamp	Cattle waste
	Tube light, CFL lamp and LED lamp	Electricity
Heating/cooling	Biomass cook stove (Traditional	Fuelwood/ agriculture residue/

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	and Improved)	cattle dung
	Kerosene heater	Kerosene
	LPG heater	LPG
	Electric heater, fan and air conditioner	Electricity

(Survey, 2014)

Similarly, in transportation sector, different vehicles have been used for carrying goods and passengers of which Tractors, Jeep, and Tempo are mainly used for carrying goods and motorcycle, Buses and Tempos are mainly used for carrying Passengers.

Table 4-12: Transportation technologies

Transportation sector		
Vehicles	End use	Fuel type
Tractors	Passengers, goods	Diesel
Motorcycles	Passengers, goods	Petrol
Jeep	Passengers, goods	Diesel
buses	Passengers, goods	Diesel
Tempoes	Passengers, goods	Diesel

(Survey, 2014)

4.4.2 RET status/trends

a. Solar

Total solar systems installed in Bardiya district is more than two thousand including small solar home system to institutional system. Solar systems are increasing in number yearly with due capacity and this trend is also increasing for commercial and institutional sector. Total number of installed system in Bardiya with capacity is describing below

Table 4-13: Total installed solar home system

Type of solar home system	Ownership		Total
	Male	Female	
Small Solar Home System	449	290	709
Solar Home System	1,013	462	1,475

(Survey, 2014)

b. Biogas

Biogas plants installation in Bardiya has also reached more than nine thousand with good increasing trend in recent years. Similarly, if we compare the plant size wise installation, 6 m^3 plants has occupied the huge market and family size of 5-6 members

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has good potential for 6 m^3 plant size. Biogas plants installation year wise with digester size are mentioned below.

Table 4-14: Total installed biogas plants

S.N.	Ownership	Number
1	Male	7,478
2	Female	1,976
Total		9,454

(Survey, 2014)

c. Improved cook stove

Cooking stoves used in Bardiya district are mostly of traditional type, and have been replacing by the improved one in recent years. The table below gives the number of households using traditional cook stoves and improved cook stoves.

Table 4-15: Different cooking stoves at Bardiya

S.N.	Type of cook stove	Number
1	Improved	328
2	Traditional	69,358
Total		69,686

(Survey, 2014)

It is clear that majority of households are still using traditional cook stove for cooking purpose and is a major source of indoor air pollution in rural houses of Bardiya. Thus a good exercise is required to disseminate the improved cook stoves in Bardiya to meet the target of clean cooking solution and GHGs emission reduction.

4.4.3 Adaptation potential

Intergovernmental Panel on Climate Change (IPCC) defines adaptation as 'adjustment in natural or human systems to a new or changing environment. Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Adaptation occurs in physical, ecological, and human systems. It involves the following.

- Changes in social and environmental processes
- Perceptions of climate risk
- Practices and functions to reduce risk
- Exploration of new opportunities to cope with the changed environment

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Table 4-16: Adaption option in energy sector

Technologies	Existing issues	Adaptation strategies	Beneficiaries
Solar Thermal/ Solar Cooker	Women drudgery and health problem with deforestation	Only the reflective plate for solar cooker is to be imported , other all manufacturing can be done locally with high scope of income generation and low carbon strategy	Rural people
Electric Stove/ Heater	Import of high cost fuel and its scarcity along with women drudgery and high GHG level	Electric stoves can be the best option considering hydroelectric power as sustainable energy in the country in near future. It will help to lessen the carbon level with climate adaptation in future	Rural women
Solar Passive Heating	Huge amount of fuel import and high value of GHG emission for heating	Method of fuel switching with efficient and zero emission for long term solution for climate issues	Rural people

4.4.4 Energy technology vulnerability due to climate change

Different technologies are available in Bardiya district among which some of them have vulnerabilities to climate change. The technologies like kerosene lamps, traditional cooking stoves, and loose biomass stoves are some of the examples of such technologies. The different types of technologies have been rank in stakeholder meeting to have less climate impact and ultimately less vulnerability.

Table 4-17: Technologies ranking according to vulnerabilities

S.N.	Technologies	Rank
1.	Biogas plant	I
2.	ICS	II
3.	Solar PV	III
4.	Solar Thermal/ Cooker	IV
5.	Electric stove/Heater	V
6.	Wind	VI
7.	Candle wax	VII
8.	LPG	VIII
9.	Kerosene *tukis*	IX
10.	Air conditioner	X
11.	TCS (fuelwood and biomass)	XI

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4.4.5 Climate proofing technologies

Main source of climate change impacts are due to use of large amount of fuelwood and loose biomass which contribute to huge amount of GHG emission. The only way to be free from such gases and impact is use of renewable energy like solar, wind, efficient biomass technology , electric stoves etc. such technologies not only decrease the production of GHG but also lessen the climate impact in future. Talking about Bardiya, the potential climate proofing technologies might be ICS, biogas, solar, ICS, briquetting techniques, etc. We can get the data from LAPA report regarding vulnerable level in household in terms of energy supply situation as mention below.

Table 4-18: Vulnerability assessment also using energy as gateway of Bardiya district

VDC	Electricity supply situation, 1-5, 1 good	Household level vulnerability			
		Low	Medium	High	Very high
Bardiya	Gola	4	100	395	309
Bardiya	Khairi Chandanpur	4	107	337	286
Bardiya	Manau	4	72	239	362
Bardiya	Patabhar	4	221	486	961
Bardiya	Shivapur	1	55	241	817

(MoSTE, 2011)

4.4.6 Mitigation potential and trends – general emissions factors

IPCC (defines mitigation as "technological change and substitution that reduce resource inputs and emissions per unit of output with respect to climate change. Mitigation means implementing policies to reduce GHG emissions and enhance sinks".

Although, Nepal‟s contribution to global GHG emission is insignificant, the government still recognizes the need to reduce GHG emissions without affecting overall economic development. Opportunities for mitigation are low, but Nepal is committed to take all possible measures to promote a low-carbon development path in order to maximize benefits from adaptation. Nepal has embarked on a mitigation strategy for two reasons. First, it must reduce its dependency on unsustainable and expensive fossil fuel, which costs Nepal a significant share of its revenue, and seek self-reliance by promoting renewable sources of energy for fuel-sustainable development. Second, the mitigation strategy has contributed to the global effort to reduce emissions by promoting renewable sources of energy, and reducing emissions from deforestation and degradation (NPC, 2011).

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Table 4-19: Mitigation option for climate impact

Technologies	Existing issues	Mitigation strategies	Beneficiaries
Solar PV	Rural part of the region relies on kerosene *tukis* for their lightening demand which is the main reason for eye problems and GHG emission.	Since the solar potential of region is very good (5.1 kw/m^2/day), so solar *tukis* and small solar home system can be option for the all region	Rural people and children
Biogas plant (for cooking)	Still many regions of rural depends on fuelwood for cooking purpose with inefficient technology and having social issues likes women drudgery and health problems	Biogas potential in term of live stocks are high in lower region and can be the best option to mitigate GHG emission level	Rural women
Electric Stove	Problems if shortage of fuel like LPG, kerosene and their health issues and GHG emission can be the main issues for people in urban and sub urban part of region	This technology can be the best option for region in urban area where people can afford it easily. Nation grid reached area can be the ultimate target for this technology for reducing GHG level and women drudgery	Men and women

4.4.7 Technology assessment parameters

Multi Criteria Decision Analysis tool is used to assess the appropriate for the district. The analysis system consists of various criteria on the basis of these different aspects of each technologies has been judged and score would be given in the format provided to experts or local stakeholders. One of the formats for mitigating and adaptive technology criteria for climate change issues has been used as below:

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Table 4-20: Technology assessment

Technology	Less vulnerable to climate change	Help in Adaptation	Help in Mitigation	User friendly	Promote social inclusion	Contribution to poverty reduction	Costs
Solar Thermal/ Solar Cooker	5	5	6	3	4	5	3
Electric Stove/ Heater	7	7	7	4	7	4	4
Wind Power	8	7	5	6	7	5	4
MHP	5	7	8	7	7	8	5
Solar PV	7	8	7	7	8	6	7
Biogas plant	9	7	8	7	8	7	6
ICS	6	7	5	7	7	9	10

(Score between 0-10)

(0- Less favorable, 10- highly favorable and others in between them)

With the help of this table, the implementation and financial plan for Bardiya has been described in further Chapters.

4.5 Institutional assessment

4.5.1 Overview

For the implementation of program, financial, management, administrative & other activities of the section, District Energy and Environment Management Committee (DEEMC) was formed with an ascent of DDC council. The 3 member committee was formed with DDC Chairperson as the chairperson, DDC Secretary as the member, and Energy Development Officer (EDO) as the member secretary.

District Energy Committee (DEC)

For the better coordination, mobilization & participation of local banks, government agencies and other concerned agencies to generate resources & inputs for the implementation of the district energy development plan or programmes, a District Energy Committee (DEC) was formed with DDC chairperson as the chairperson and EDO as the member secretary. Members are the office managers of the following government & non government agencies:

- Local Development Officer (Office of District Development Committee)
- District Water Supply Office
- District Irrigation Office
- Agriculture Development Bank
- District Forest Office
- District Cottage and Small Industry
- District Development Advisor

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Recently, District Energy Environment and Climate Change Section (DEECCS) have been established under the DDC to look after the RETs promotion in the district.

4.5.2 Stakeholder's identification and their roles

The coverage matrix tool was used to identify the involvement of various stakeholders including government, private sectors, financing institutions, NGO etc. in providing various services including subsidy support, RET promotion, dissemination, technology installation, monitoring and evaluation, etc. in renewable energy sector.

4.5.3 Stakeholder's relationship

The actor gathering mapping tool was used to identify horizontal and vertical relationship amongst various donors, government line agencies, NGOs, INGOs, private sector, finance institutions, and local organizations in terms of providing capacity development support, coordination and participation, funding support, and subcontracting.

AEPC / NRREP which in turn runs its program through DEECCS housed in the DDC office with various donors support. The DEECCS in turn acts as the central organization in the district for all activities related to renewable and alternative energy. AEPC and national NGOs like BSP and CRT/N are involved in the district in providing capacity development services to other local NGO, private sector and RET companies.

District Agriculture Development Office, District Irrigation Office and District Forest Office as well as other organizations were involved in the renewable energy sector along with DEECCS.

4.5.4 Capacity and potential assessment

Local level potential for RETs promotion has been observed by DDC/ DEECCS and different capacity of local level bodies and NGOs are noted below with due objective of works.

District Energy Environment and Climate Change Section (DEECCS)

DEECCS has been established under the DDC to look after the RETs promotion in the district. It works under DDC premises and work for RETS promotion in districts and along with that it also support the AEPC to accomplish various works at local level regarding awareness creation, training, capacity building etc.

Federation of community Forestry Users Nepal (FECOFUN)

Federation of community Forestry Users Nepal (FECOFUN) has been working for the promotion of mud ICS in the Bardiya district.

Nepal Climate Change Support Programme (NCCSP)

It has been working to enable the government to adopt climate change policies and actions that increase the benefits and sustainability of public as well as public-private development efforts. It is working for the promotion of solar, biogas and ICS.

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Municipality and Village Development Committee

Municipalities and VDCs are working for the promotion of bio gas and Mud ICS.

Association for Social Transformation and Humanitarian Assistance (ASTHA) Nepal - It is working for the promotion of RET in the coverage districts including Bardiya

Local Adaptation Plans for Action

The National Framework for Local Adaptation Plans for Action aims to integrate climate change resilience into local-to-national development planning processes and outcomes. LAPA is basically based on climate change issue regarding local adaption mainly energy, GSI, health, water resources etc.

Other institutions

- Biogas Promotion Association
- Care Nepal
- मध्यवर्ती क्षेत्र व्यवस्थापन समिति
- खाता सामुदायिक वन समन्वय समिति
- वसन्ता सामुदायिक वन समन्वय समिति
- खैरिचन्दनपुर सामुदायिक वन समन्वय समिति
- राधा कृष्ण थारु जनसेवा केन्द्र
- गेरुवा
- थारु महिला उत्थान केन्द्र

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CHAPTER FIVE: DISTRICT ENERGY SCENARIO DEVELOPMENT/ DEMAND PROJECTION

5.1 Introduction

Energy consumption data for residential sector has been collected and projected for five years with various scenarios. For the projection of various scenarios the GDP, population, population growth rate and household growth rate have been used to get approximate outcome of forecasting. Energy consumption data of Bardiya has been collected by primary survey for residential sector and secondary data for other sectors.

Table 5-1: Key assumption

Particulars	Unit	FY 2070/71
Population	People	423,611.00
Pop. gr. Rate	%	1.09
Urban pop.	%	26%
Capita/HH	Person	5.16
Households	HH	20,949.00
Rural pop.	%	74%
Capita/HH	Person	5.07
Households	HH	62,198.00
Planning for recently declared municipalities (Badalpur, Bhimpur, Daulatpur, Manpurtapara, Nayagaun and Rajapur) and previous Gulariya municipality have been done by considering urban areas. But during data collection time recently declared municipality were VDCs		

Table 5-2: Sector wise energy consumption in 2070/71

Particulars	Energy consumption in GJ
Cooking	1,484,676
Space heating	63,585
Space cooling	3,120
Lighting	14,838
Others	39,332
Total	1,605,551

Table 5-3: Fuel wise energy consumption in 2070/71

Energy resources	Energy consumption in GJ
Biomass	1,478,019
Biogas	68,069
Petroleum	7,135
LPG	4,244
Electricity	48,083
Total	1,605,551

The district as a whole also has the residential demand as the major consumption area followed by commercial and industrial as other sector of demand. Fuel wood consumption is occupied more than 77% for cooking.

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5.2 Business as Usual Scenario

Business as Usual Scenario (BAU) for residential sector uses the population growth rate of the region and GDP of that region as key assumption. This scenario gives the actual context of energy demand, supply and consumption of region in existing trend. With present BAU scenario, the main energy source is fuelwood and the trend for that has been mentioned with increasing figure year wise.

Table 5-4: Final energy trend in BAUs

Energy Type	Energy in GJ in different FY					
	2070/71	2071/72	2072/73	2073/74	2074/75	2075/76
Firewood	1,232,918	1,246,394	1,260,017	1,273,789	1,287,711	1,301,786
Agri. residue	245,101	247,780	250,489	253,227	255,994	258,792
Kerosene	7,135	7,213	7,292	7,372	7,452	7,534
LPG	4,244	4,291	4,338	4,385	4,433	4,481
Grid electricity	47,844	48,367	48,895	49,430	49,970	50,516
Solar	239	242	244	247	250	252
Biogas	68,069	68,813	69,565	70,325	71,094	71,871
Total	1,605,551	1,623,099	1,640,840	1,658,774	1,676,904	1,695,233

Energy consumption trend can be shown in graphical form as below

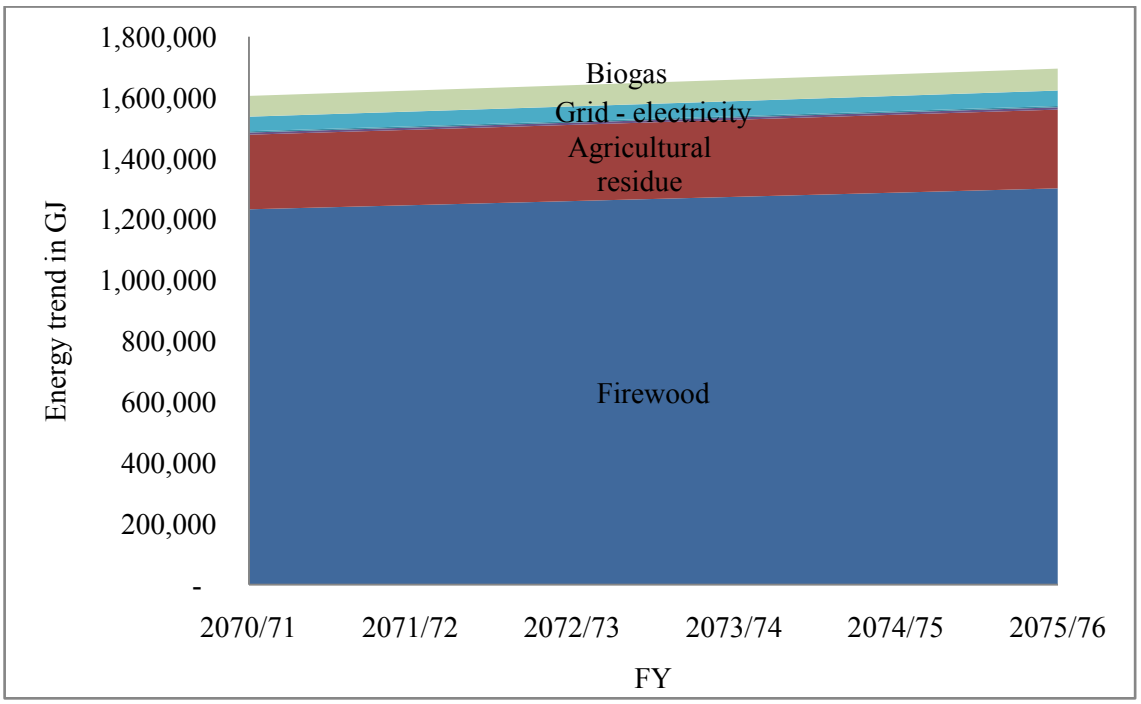

Figure 5.1: Final energy trend in BAU

The Business As Usual trend for energy consumption is extrapolated using the GDP growth rate of region, population growth rate and other assumption. The scenario shows the constant growth in consumption rate with fuelwood as main constituent for cooking

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through ICS and TCS in both rural and urban. In Bardiya district people are moving from traditional cooking stove to improved cook stove for meeting their demand.

Fuel share distribution in BAUs shows 77 % by fuelwood followed by 3% with grid electricity, 15% agro residue and 4 % from biogas.

Similarly, if we see the carbon emission from various technologies used in cooking, the figure shows the high.

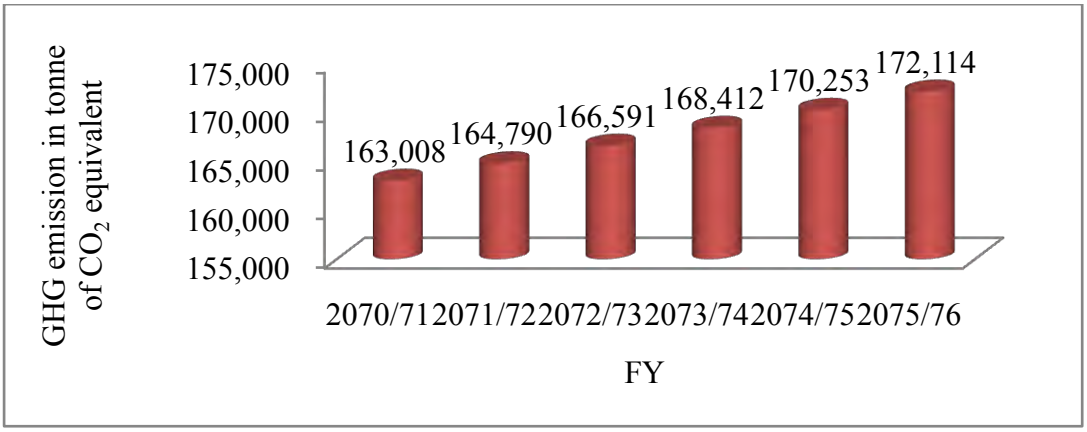

Figure 5.2: Emission from residential sector in BAU scenario

Energy demand in BAU scenario

Energy demand for various end uses has been described in detail below:

a. Cooking

The number of households using different technologies has been shown in the following table.

Table 5-5: BAU scenario of household wise cooking technologies

Technology	User HH					
	2070/71	2071/72	2072/73	2073/74	2074/75	2075/76
TCS	69,358	70,116	70,882	71,657	72,440	73,232
ICS	328	332	335	339	343	346
Biogas	9,454	9,557	9,662	9,767	9,874	9,982
Kerosene	348	352	356	360	363	367
LPG	3,643	3,683	3,723	3,764	3,805	3,846
Electricity	16	16	16	17	17	17

Energy consumption by various technologies has been presented below with maximum consumption by TCS and ICS. The table below shows the list of cooking technologies with their energy consumption data.

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Table 5-6: BAU scenario of household wise energy consumption in cooking

Techno-logy	Energy consumption in GJ					
	2070/71	2071/72	2072/73	2073/74	2074/75	2075/76
TCS	1,409,366	1,424,770	1,440,343	1,456,086	1,472,001	1,488,090
ICS	5,112	5,168	5,225	5,282	5,339	5,398
Biogas	68,069	68,813	69,565	70,325	71,094	71,871
Kerosene	906	915	925	936	946	956
LPG	1,223	1,237	1,250	1,264	1,278	1,292
Total	1,484,676	1,500,903	1,517,308	1,533,892	1,550,658	1,567,607

GHG emission from these technologies as shown that TCS technology seems to have more GHG emission with less efficiency followed by ICS. Technology wise GHG emission has been presented in the following table.

Table 5-7: BAU scenario of household wise GHG Emission in cooking

Technology	GHG emission (in tones of CO_2 equivalent)					
	2070/71	2071/72	2072/73	2073/74	2074/75	2075/76
TCS	116,742	118,018	119,308	120,612	121,930	123,263
ICS	560	566	573	579	585	591
Kerosene	42	42	42	43	43	44
LPG	28	29	29	29	29	30
Total	117,372	118,654	119,951	121,262	122,588	123,928

b. Lightening

After cooking end use lightening is also the one of main energy consuming end uses in Bardiya. In BAU scenario, energy for lightening has been supplied through grid as main constituent and then by solar and micro hydro respectively. The table below describes the number of household using different types various technologies for lighting.

Table 5-8: BAU scenario of household wise lightening technologies

Technology	User HH					
	2070/71	2071/72	2072/73	2073/74	2074/75	2075/76
Grid Electricity	51,932	52,500	53,073	53,654	54,240	54,833
SSHS	739	747	755	763	772	780
SHS	1,475	1,491	1,507	1,524	1,541	1,557
Kerosene	29,001	29,318	29,638	29,962	30,290	30,621
Total	83,147	84,056	84,975	85,903	86,842	87,791

The table below represents the technology wise energy consumption values for lightning:

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Table 5-9: BAU scenario of household wise energy consumption in lightening technology

Technology	Energy consumption in GJ					
	2070/71	2071/72	2072/73	2073/74	2074/75	2075/76
Grid Electricity	5,392	5,450	5,510	5,570	5,631	5,693
SSHS	48	48	49	49	50	51
SHS	191	193	195	197	200	202
Kerosene	5,488	5,548	5,609	5,670	5,732	5,795
Total	11,119	11,241	11,363	11,488	11,613	11,740

Emission value for different lightning technology has been mentioned in the table:

Table 5-10: BAU scenario of household wise GHGs emission in lightening technology

Technology	GHG emission (in tones of CO_2 equivalent)					
	2070/71	2071/72	2072/73	2073/74	2074/75	2075/76
Kerosene	397	401	406	410	415	419

5.3 District Climate and Energy Plan Scenario

This scenario gives the actual intervention plan for energy supply of region. With present DCEP scenario, the main energy source, fuelwood goes on decreasing trend with decreasing in energy demand and the trend for that has been mentioned with decreasing figure year wise.

Table 5-11: Final energy trend in DCEP

Energy Type	Energy consumption in GJ					
	2070/71	2071/72	2072/73	2073/74	2074/75	2075/76
Firewood	1,232,918	1,188,864	994,201	793,462	715,795	723,619
Agri. residue	245,101	237,649	204,669	170,633	157,832	159,558
Kerosene	7,135	6,595	5,841	5,069	4,280	3,473
LPG	4,244	3,999	3,656	3,305	2,946	2,579
Grid electricity	47,844	48,569	49,304	50,050	50,806	51,572
Solar	239	364	613	866	1,126	1,391
Biogas	68,069	77,128	86,378	95,820	105,459	115,297
Total	1,605,551	1,563,168	1,344,662	1,119,206	1,038,245	1,057,489

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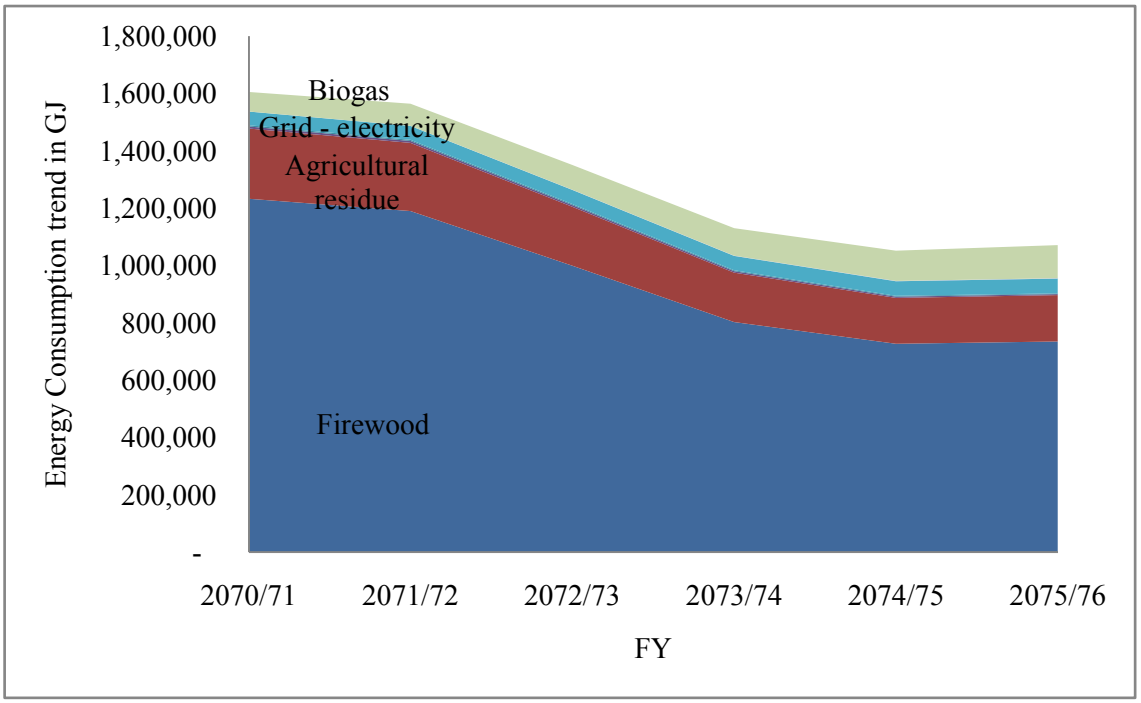

Figure 5.3: Final energy trend in DCEP

The DCEP trend for energy consumption is extrapolated using the GDP growth rate of region, population growth rate and other assumption. The scenario shows the constant decrease in consumption rate with fuel wood as main constituent for cooking through ICS and TCS in both rural and urban.

Similarly, if we see the carbon emission from various technologies used in cooking, the figure shows reduction in emission by using efficient improved cook stove based on fuel wood as main constituent for climate changes issues.

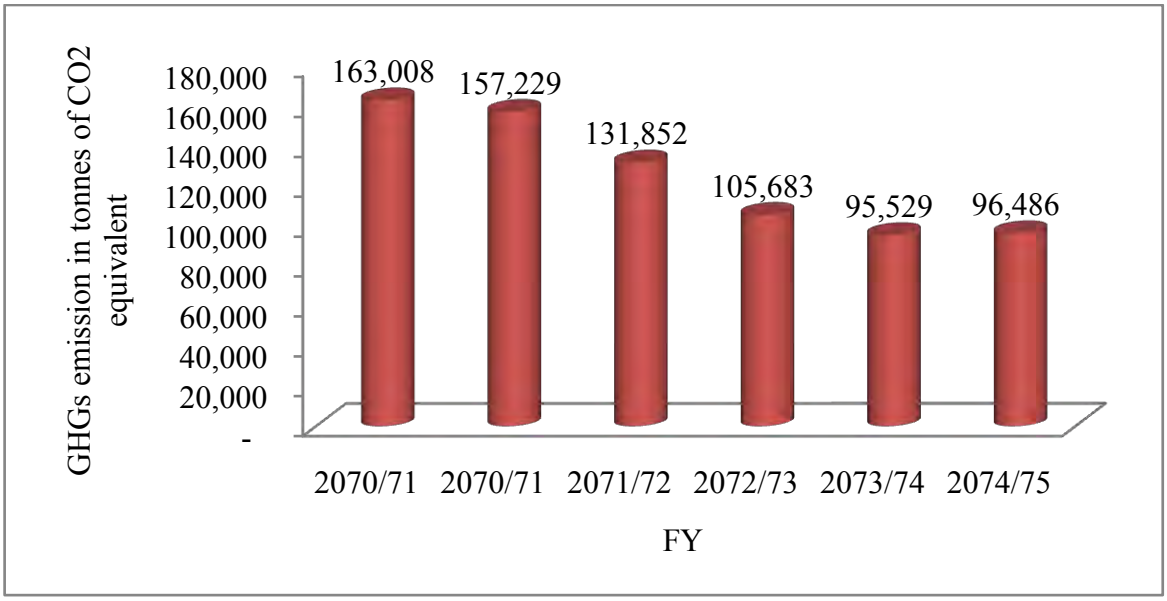

Figure 5.4: Emission from residential sector as per DCEP scenario

This gradual reduction in GHGs emission is because the share of fuel wood will be reduced from 77% in the year 2070/71 to 69% in the year 2075/76, increasing the share of biogas and grid electricity.

Energy demand for various end uses has been mentioned in detail below:

a. Cooking

TCS has been replaced by ICS to overcome the efficient use of fuel wood but still major portion of energy consumption share is occupied by fuel wood in comparison to other sources of fuel for cooking. The number of household using different cook stoves has been mentioned below:

Table 5-12: DCEP scenario of household wise cooking technologies

Technology	User HH					
	2070/71	2071/72	2072/73	2073/74	2074/75	2075/76
TCS	69,358	63,892	37,994	11,424	-	-
ICS	328	5,375	30,926	57,035	69,141	69,675
Biogas	9,454	10,712	11,997	13,308	14,647	16,013
Kerosene	348	352	356	360	363	367
LPG	3,643	3,683	3,723	3,764	3,805	3,846
Electricity	16	16	16	17	17	17

Energy consumption by various cooking technologies has been described below which shows maximum consumption by TCS and remaining share by other technologies.

The table below shows the list of cooking technologies with their energy consumption data.

Table 5-13: DCEP scenario for household wise energy consumption for cooking

Techno-logy	Energy consumption in GJ					
	2070/71	2071/72	2072/73	2073/74	2074/75	2075/76
TCS	1,409,366	1,298,309	772,049	232,144	-	-
ICS	5,112	63,969	361,884	666,304	807,263	816,086
Biogas	68,069	77,128	86,378	95,820	105,459	115,297
Kerosene	906	915	925	936	946	956
LPG	1,223	1,237	1,250	1,264	1,278	1,292
Total	1,484,676	1,441,558	1,222,487	996,468	914,945	933,631

TCS technology with less efficiency seems to have more GHG emission followed by ICS with a bit more cooking efficiency.

Technology wise GHG emission has been shown below in tones of CO_2 equivalent.

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Table 5-14: DCEP scenario for household wise GHGs emission for cooking

Technology	GHG emission (in tones of CO_2 equivalent)					
	2070/71	2071/72	2072/73	2073/74	2074/75	2075/76
TCS	116,742	107,503	64,012	19,270	-	-
ICS	560	7,010	39,656	73,015	88,462	89,429
Kerosene	42	42	42	43	43	44
LPG	28	29	29	29	29	30
Total	117,372	114,583	103,739	92,357	88,535	89,503

b. Lightening

DCEP scenario for lightening as end use has been described below with solar system intervention to replace kerosene *tuki*s

Table 5-15: DCEP scenario for household wise technologies for lightening

Technology	User HH					
	2070/71	2071/72	2072/73	2073/74	2074/75	2075/76
Grid electricity	51,932	54,393	56,901	59,457	62,063	64,718
SSHS	739	957	1,341	1,732	2,133	2,541
SHS	1,475	2,332	4,057	5,819	7,620	9,459
Kerosene	29,001	26,374	22,677	18,895	15,028	11,074
Total	83,147	84,056	84,975	85,903	86,842	87,791

The decrease in energy demand has been noted below from shifting kerosene to solar system for lightening as end use.

Table 5-16: DCEP scenario for household wise energy consumption for lightening

Technology	Energy consumption in GJ					
	2070/71	2071/72	2072/73	2073/74	2074/75	2075/76
Grid electricity	5,392	5,653	5,919	6,190	6,467	6,749
SHSH	48	62	87	112	138	165
SHS	191	302	526	754	987	1,226
Kerosene	5,488	5,012	4,358	3,690	3,006	2,306
Total	11,119	11,029	10,890	10,746	10,598	10,446

GHG emission has also been decreased to some extent in DCEP scenario in lightening with the use of solar system. The GHG emission by kerosene with reducing pattern has been shown below in table:

Table 5-17: GHGs reduction in DCEP scenario in lightening end use

Technology	GHG emission (in tones of CO_2 equivalent)					
	2070/71	2071/72	2072/73	2073/74	2074/75	2075/76
Kerosene	397	363	315	267	217	167

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c. Other RET intervention

Instead of cooking and lightening technology, other Renewable Energy technologies will be promoted

Table 5-18: Other intervening technologies

Technology	2071/72	2072/73	2073/74	2074/75	2075/76
Commercial large biogas plant (m^3) (Nos.)	-	200	200	200	200
Institutional large biogas plant (m^3) (Nos.)	-	200	200	200	200
Community large biogas plant (m^3) (Nos.)	-	100	100	100	100
Institutional Solar Power System (Nos.)	2	2	2	2	2
Solar Dryer small (3 to 20sq.ft.) (Nos.)	5	2	2	2	2
Solar Dryer large (20 to 85 sq.ft.) (Nos.)	5	2	2	2	2
Institutional solar dryer > 85 sq. ft (Nos.)	2	2	2	2	2
Solar cooker (Nos.)	3	5	5	5	5
RETs traing (Nos.)	-	2	2	2	2

5.4 Comparison

Graph below indicates the GHGs emission trend in BAU and DCEP scenario. In BAU scenario existing technologies are assumed to operate continue and number of users will go on increasing. Fuel wood will be the leading source of energy in BAU scenario and because of its continuous use in traditional stoves for large number of user groups the emission will go on increasing. Apart from this in DCEP scenario, because of introduction of new and efficient technology and sustainable and cleaner source of energy the share of fuel wood in subsequent year will decrease leading to reduction in GHGs emission. While formulating DCEP scenario, a major attention has been given to the target of clean cooking solution to all by 2017. Similarly an emphasis has also given to the lightening systems. Use of conventional sources of lightening like kerosene lamps which are also a contributor for GHGs emission will be lowered in DCEP scenario. This has also supported to reduce the trend of GHG emission in coming years.

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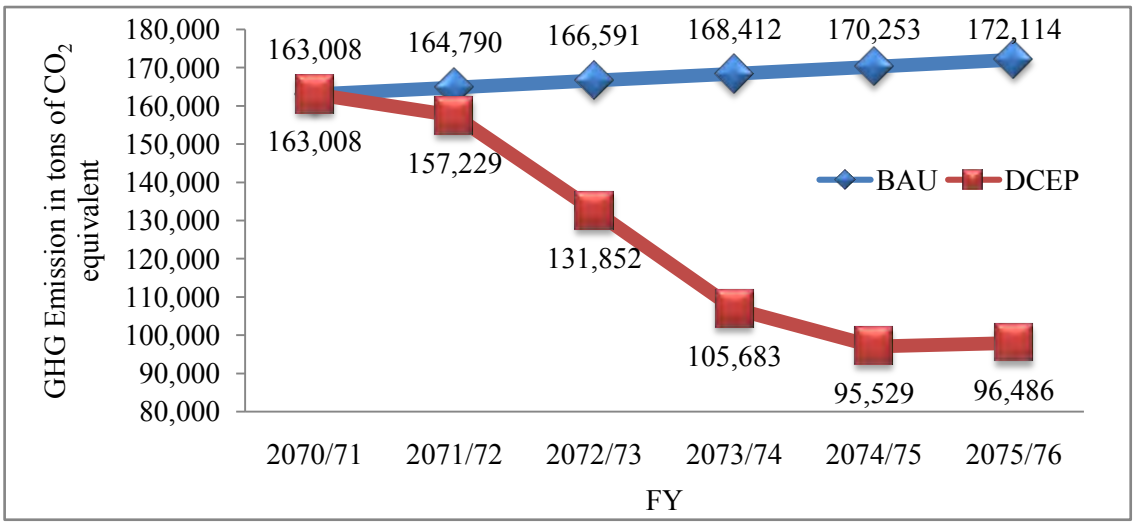

Figure 5.5: Emission comparison graph

Use of existing technologies for cooking and lightening for increasing number of user households, the energy consumption trend will be in increasing order in BAU scenario. But in the DCEP scenario the new and efficient technologies will be introduced for cooking and lightening end use. In cooking traditional cook stoves will be replaced by more efficient improved cook stoves, biogas stoves and electric stoves. Similarly in lighting, kerosene lamps will be replaced by solar systems with efficient CFL and lead lights.

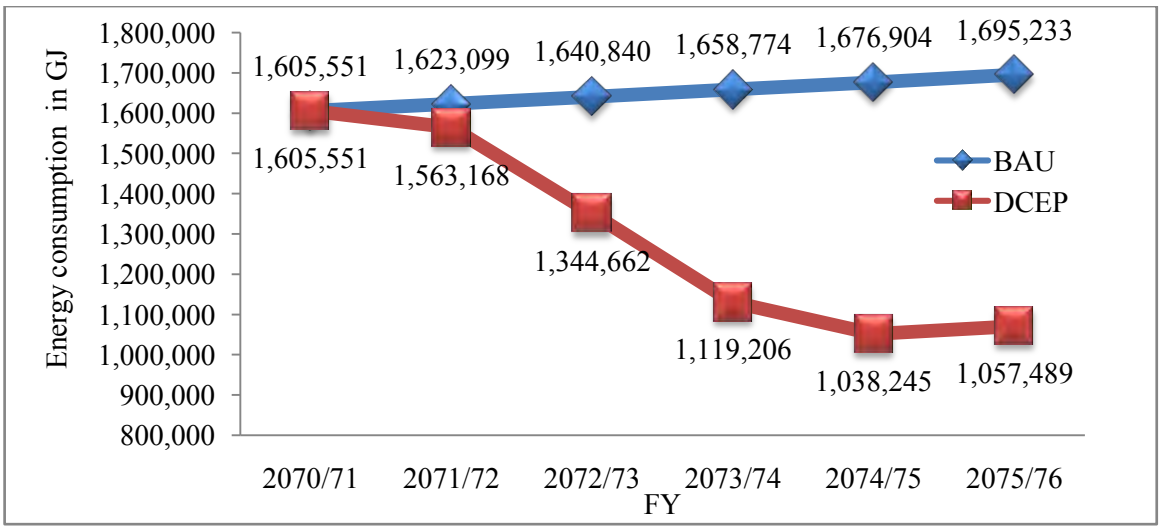

Figure 5.6: Energy consumption comparison

Thus the net result is energy consumption will be reduced in subsequent years in DCEP scenario. This indicates that energy demand will be decreased during the intervention of DCEP plan which will contribute for the promotion of local energy resources, mitigate climate change and help gender and social development.

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CHAPTER SIX: DCEP IMPLEMENTATION PLAN

6.1 Introduction

District Climate and Energy Plan is a plan for districts for the intervention of renewable energy technologies meeting the objective of reducing carbon emission and mainstreaming GSI issues. The implementation plans are generally based on government plan and policies related to renewable energy, gender and social inclusion, and carbon issues.

6.1.1 Existing policies to implement proposed plan

Subsidy policy 2013, Rural Energy Policy 2006, Smokeless kitchen by 2017, and other similar policies might be the basis for implementation and financial plan. Proposed plan for various technology options and strategy must be checked to implement through these policies and hence some of these have been discussed below.

6.1.2 Renewable energy subsidy policy 2013

More than 1.5 million households in Nepal have benefited from different renewable energy sources both for cooking, lightening and other end uses. The Government of Nepal (GoN) and various Development Partners have been providing financial and technical support to increase the access to clean renewable energy.

Renewable Energy Subsidy Policy 2013 is enforced to accelerate renewable energy service delivery with better quality, comprising various technologies, to households, communities and micro, small and medium sized enterprises in rural areas, to benefit men and women from all social groups, leading to more equitable economic growth, besides development of renewable energy industry and attracting private investment in large capacity of renewable energy projects in the country.

6.1.3 Financing ability and mechanisms for energy projects

Income situation

The proportion of households reporting their income as “inadequate” is the highest in the Far-western Development Region (69%) and the lowest in the Central Region (39%) (NLSS III). In fact, the three Development Regions comprising Western Nepal have the highest proportion of their population reporting their income as inadequate (CBS, 2011).

Financial accessibility for energy harvesting

One consequence of the above-mentioned „income inadequacy“ is the suitability of „Energy Financing“ in this region. An indicator of financial accessibility is the average number of people served by a bank branch. In Western Nepal, this figure is quite

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impressive compared to the national average. Remarkably, 74.6% of all the branches of development banks lie there.

Additionally, there is a provision that D-class licensed institutions (microcredit) which can disburse up to Rs. 100,000 per committee member to ultra-poor and people with low income, to run small enterprises or businesses against group guarantee and up to Rs. 300,000 per group member against acceptable collateral. Besides, a maximum of Rs. 60,000 per family can be made available as microcredit for the use of Solar Home Systems (SHS) and/or Biogas plant as renewable energy technologies.

The recently released budget reveals that 5.36% of the total budget allocation is related to climate while 4.98% is indirectly related. It implicates that the DDC are going to allocate climate funds equivalent to this figure even in the DDC and VDC program. In addition to this there is big chunk of money already committed to support climate change, energy and other key climate sensitive sectors. As revealed through the capacity assessment across 14 districts including Bardiya there are very few agencies, organization and private sectors which are capable of designing climate smart program and also provide support services.

Capacity development

The capacity assessment and capacity development plans should be reflected according to the delivery mechanism envisioned in the project document and the capacity of the DEECCS to implement along with the on-going program. AEPC has developed a well defined program implementation modality where by most of the energy services are contracted out to the competent parties following its own guidelines and financial norms, discipline. All human and other required resources are also included in their contractual agreement. Apart from third party monitoring and post – monitoring of the progress while the DEECCS has the mandate to facilitate implementation, technical advice, monitors progress and report back to the AEPC and DDC.

To materialize the coordination and synergy between programs and for effective implementation of the DCEP some mechanisms involving the key stakeholders have been devised at the district as well as village levels.

6.2 Summary detail implementation plan

The implementation plan for Bardiya district is made by using bottom up approach from ward level to VDCs/municipalities level and VDCs/municipalities level to district and having concrete model for planning the energy and climate plan in the coming years. The plan includes the technology option and delivery mechanism for different regions of Bardiya district. The implementation plan for Bardiya district has been mentioned below.

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Table 6-1: Implementation plan

Technology	Description	Modality	Costs Structure	Implementation Plan	Impacts on
Solar PV system	Solar PV of 10-50 Watt can be used in present context for lightening and small appliances running purpose	Short term mitigation option	Low cost with subsidy	Solar PV system for the rural household where grid connection is not available	Benefit for both urban and rural area of households
Biogas Plant	Lower land of the district can have biogas plant of 4-6 cu. m to fulfill their energy demand	Short term mitigation option	Medium cost with subsidy	Biogas plant in lower hill region of district of 6 cubic meter would be constructed	Benefit for urban and rural low hill
ICS	ICS can be the best option for cooking and heating purpose at the moment in high part of district.	Short term mitigation option	Low cost with subsidy	Promotion of ICS to all the household who are using traditional cook stove	Mitigation option for rural region
Grid Electricity	Half of the district is electrify by grid electricity and in coming three years all the demand need to be meet through grid electricity to overcome the energy crisis of the region.	Long term adaptation option	Low cost	Electricity through national grid at the region where the region is electrified and will be electrified in near future for different end uses	Benefited whole district
Gasifier	Considered as the alternative option for the efficient utilization of biomass energy.	Medium term mitigation option	Medium cost technology	Few systems can be generated for heat application	Benefited rural and urban people
Solar Dryer	They can used to dry the agro-products and industrial products	Medium term mitigation option	Low cost technology	Few systems can be used in agriculture application	Benefited rural and urban households
Solar Cooker	Solar cookers can be used for cooking/boiling	Medium term mitigation option	Low cost technology	Few systems can be installed	Benefited by rural and urban HH

The above mentioned implementation plan for each technology option lead us for solving climate related issues and move towards the low carbon path.

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6.3 Financing plan

Financial plan for Bardiya district has been made on the basis of geographical location of the district and road accessibility with purchasing power of people to insist the local RETs. The subsidy delivery provision mentioned by government of Nepal for Bardiya district is shown below with respective technologies and with this cost and subsidy mechanism it is easy to make the financial plan for the district.

Table 6-2: Subsidy provision for Bardiya

Technologies	Types	Costs (NPR)	Subsidy (NPR)	Other provision (NPR)
Biogas Plant	2 m^3	40,823	16,000 per plant	*2,000 for marginalized
	4 m^3	49,564	20,000 per plant	*2,500 for marginalized
	6 m^3	58,449	24,000 per plant	*3,000 for marginalized
	8 m^3	68,542	25,000 per plant	
	Urban HH type < 4 m^3	N/A	10,000 or 50% whichever is less	
Improved Cook Stove	Mud	1,000	350 cook stove	
	Metallic for 2 pot	7,000	3,000 but not < 50 % of total cost	*Extra 1,000 subsidy for inclusive group
	Metallic for 3 pot	8,000	4,000 but not < 50 % of total cost	
	Rocket stove		2,000 but not < 50 % of total cost	
	Metallic gasifier (thermal)		150,000 but not < 50 % of total cost	200,000 per kW electricity generation
	Metallic Institutional		20,000 but not < 50 % of total cost	*Extra 1,000 subsidy for inclusive group
Solar PV	10 Wp	1000/Wp	4,500 per HH per system	
	20-50 Wp	1000/Wp	6,000 per HH per system	
	> 50 Wp	N/A	8,000/per HH per system	
	PV pumping	N/A	75% not exceeding 15,00,000	*Additional 2,500 per

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				HH of inclusive people
	Institutional	N/A	75% not exceeding 10,00,000	
Micro hydro power	Community and Institutional use (100 kW-1 MW)	265,000/kW	16,000 per HH and 70,000 per kW but not exceeding 170,000	*Extra 1,000 subsidy for inclusive group
	10-100 kW	265,000/kW	25,000 per HH and 70,000 per kW but not exceeding 195,000 per kW	
	Pico hydro < 10 kW	265,000/kW	15,000 per HH and 60,000 per kW but not exceeding 135,000 per kW	
	Rehabilitation	N/A	Not exceeding 10,000 per kW and 200,000 per plant for minor damage and 50,000 per kW for major damage not exceeding 10, 00,000 per plant.	
IWM	IWM (Mechanical)		16,000 per short shaft type and 35,000 for long shaft type	
	IWM (Electrifying) Community based	200,000/kW	6000 per HH and 5000 per kW as transportation subsidy not exceeding 70000	
Solar Thermal	Domestic scale dryer (3-20) sq. ft.	N/A	Maximum 50% of total cont but not exceeding 15,000 per HH	
	Medium scale commercial scale dryer (20-85) sq. ft.	N/A	Maximum 50% of total cont but not exceeding 100,000	
	Institutional solar dryer (>85 sq. ft)	N/A	Maximum 50% of total cont but not exceeding 150,000 per HH	*20,000 extra if 50 % of inclusive people
	Solar cooker	N/A	Maximum 50% of total cont but not exceeding 10,000 per HH	

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Wind Turbine	Either solar wind hybrid or wind alone (<10 kW)	N/A	100,000/kW and 16,000/HH but not exceeding 50% of total cost	
	Either solar wind hybrid or wind alone (10-100 kW)	N/A	125,000/kW and 15,000/HH but not exceeding 50% of total cost	
Gasifier	For heat and agro processing		150,000 per unit but not exceeding 50% of total cost	
	For electricity		200,000 per unit but not exceeding 50% of total cost	
Productive use		N/A	30% of total cost for energy conversion and processing equipment not exceeding 100,000 for private enterprises and 50% or 300,000 for community based	

(AEPC, 2013)

*single women, victims, ethnic groups, deprived and marginalized people etc.

With the above mentioned subsidy mechanism and technology option in implementation plan, financial mechanism needs to be studied in depth. The financial plan for three categories has to be studied here. The tentative cost of all the technology with subsidy has been described above gives the cost for penetration of those technology options. So, the implementation plan would be materialized by subsidy mechanism mentioned above and financial plan which has been discussed below with implementation plan. The capital cost with subsidy amount that must be supplied has been shown below.

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Table 6-3: Capital cost, subsidy and technology intervention in different years

Technology Status	Capital Cost (NPR)	Subsidy rate (NPR)	Technology intervention during different fiscal years				
			2071/72	2072/73	2073/74	2074/75	2075/76
Improved Cook Stove (Nos.)	1,000	350	5,047	25,551	26,109	12,106	-
Small biogas plant of 6m^3 size (Nos.)	58,000	24,000	1,258	1,285	1,311	1,339	1,366
Commercial large biogas plant (m^3)	18,000	4,000	-	200	200	200	200
Institutional large biogas plant (m^3)	18,000	11,500	-	200	200	200	200
Community large biogas plant (m^3)	18,000	9,000	-	100	100	100	100
Small Solar Home System of 10 Wp (Nos.)	10,000	4,500	218	383	392	400	409
Solar Home System 20 Wp (Nos.)	20,000	6,000	857	1,725	1,762	1,800	1,839
Institutional Solar Power System (Nos.)	1,350,000	1,000,000	2	2	2	2	2
Solar dryer small (3 to 20sq.ft.) (Nos.)	30,000	15,000	5	2	2	2	2
Solar dryer large (20 to 85 sq.ft.) (Nos.)	200,000	100,000	5	2	2	2	2
Institutional solar dryer (>85 sq. ft.)(Nos.)	30,000	150,000	2	2	2	2	2
Solar cooker (Nos.)	20,000	10,000	3	5	5	5	5
RETs training (Nos.)	100,000	100,000		2	2	2	2

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Table 6-4: Total investment plan for intervention technologies

Technology	Cost of technology (NPR)				
	2071/72	2072/73	2073/74	2074/75	2075/76
A. Investment plan for cooking technology					
ICS	5,046,933	25,551,106	26,109,011	12,105,793	534,518
Biogas plants	72,980,200	74,510,041	76,064,605	77,644,251	79,249,341
Subtotal A	78,027,133	100,061,147	102,173,616	89,750,044	79,783,859
B. Investment plan for lightening technology					
Small Solar Home System	2,182,168	3,834,696	3,917,378	4,001,411	4,086,812
Solar Home System	17,133,594	34,499,516	35,248,104	36,008,935	36,782,187
Subtotal B	19,315,762	38,334,211	39,165,483	40,010,346	40,868,999
C. Investment plan for the intervention of other RE technology					
Commercial large biogas	-	3,600,000	3,600,000	3,600,000	3,600,000
Institutional large biogas	-	3,600,000	3,600,000	3,600,000	3,600,000
Community large biogas	-	1,800,000	1,800,000	1,800,000	1,800,000
Institutional Solar Power System	2,700,000	2,700,000	2,700,000	2,700,000	2,700,000
Solar dryer small (3 to 20 sq.ft.)	150,000	60,000	60,000	60,000	60,000
Solar dryer large (20 to 85 sq.ft.)	1,000,000	400,000	400,000	400,000	400,000
Institutional solar dryer (>85 sq. ft.)	60,000	60,000	60,000	60,000	60,000
Solar cooker	60,000	100,000	100,000	100,000	100,000
RETs training cost	-	200,000	200,000	200,000	200,000
Subtotal C	3,970,000	12,520,000	12,520,000	12,520,000	12,520,000
Total investment requirement (A+B+C)	101,312,895	150,915,358	153,859,099	142,280,390	133,172,858

Table 6-5: Total subsidies amount for different technologies

Technology	Subsidy amount (NPR)				
	2071/72	2072/73	2073/74	2074/75	2075/76
A. Subsidy for cooking technology					
ICS	1,766,426	8,942,887	9,138,154	4,237,028	187,081
Biogas plants	30,198,703	30,831,741	31,475,009	32,128,656	32,792,831
Subtotal A	31,965,130	39,774,628	40,613,163	36,365,683	32,979,912
B. Subsidy for lightening technology					
Small Solar Home System	981,975	1,725,613	1,762,820	1,800,635	1,839,065
Solar Home System	5,140,078	10,349,855	10,574,431	10,802,681	11,034,656
Subtotal B	6,122,054	12,075,468	12,337,252	12,603,315	12,873,721
C. Subsidy for the intervention of other RE technology					
Commercial large biogas	-	800,000	800,000	800,000	800,000
Institutional large biogas	-	2,300,000	2,300,000	2,300,000	2,300,000
Community large biogas	-	900,000	900,000	900,000	900,000
Institutional Solar Power System	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
Solar dryer small (3 to 20 sq.ft.)	75,000	30,000	30,000	30,000	30,000
Solar dryer large (20 to 85 sq.ft.)	500,000	200,000	200,000	200,000	200,000
Institutional solar dryer(>85 sq. ft.)	300,000	300,000	300,000	300,000	300,000
Solar cooker	30,000	50,000	50,000	50,000	50,000
RETs training cost	-	200,000	200,000	200,000	200,000
Subtotal C	2,905,000	6,780,000	6,780,000	6,780,000	6,780,000
Total subsidy requirement (A+B+C)	40,992,184	58,630,096	59,730,414	55,748,999	52,633,633

6.4 Monitoring and evaluation plan

Monitoring of such plan needs to be carried out by third party as per the rule of AEPC in coordination with DEECCS, RSCs and other local bodies and private companies. Evaluation of such plan would be checked by AEPC in coordination with local bodies and DEECCs. Monitoring and evaluation plan in detail has been mentioned below with penetration of various technologies.

Table 6-6: Monitoring and evaluation plan for Bardiya district

DCEP Scenario	5 years target technology	Activities	Verification Indicator	Means of Verification	Frequency	Verification by	Support
ICS	(69,675 HH) As per DCEPs	• Installation • Monitoring • Promoting	− Target number of ICS set for the time frame − Quality of installed technology	Third party Monitoring at the end of fiscal year	Annually	Consultant	AEPC/ NRREP
Biogas Plant	(16,013 HH) as per DCEPs	• Installation • Training • Promoting • Monitoring	− Target number of Biogas plant Quality of installed technology − Subsidy delivered at each HH − User training and after sales services	User survey in end of fiscal year by consultant	Annually	Consultant	AEPC/ NRREP
Solar PV and solar thermal System	(12,000 HH) As per DCEPs	• Installation • Training • Promoting • Monitoring	• Target number of solar system for the time frame • Subsidy delivered at each HH • After sales services provided	Third party Monitoring at the end of fiscal year	Annually	Consultant	AEPC/ NRREP
Other RET	PVPS, IWM, ISPS, Gasifier, dryer, solar cooker	• Installation • Training • Promoting • Monitoring	− Target number of RET installation − Subsidy delivered at each household • User training and after sales services	Third party Monitoring at the end of fiscal year	Annually	Consultant	AEPC/ NRREP

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CHAPTER SEVEN: CONCLUSION AND RECOMMENDATIONS

7.1 Conclusions

Gender and Social Inclusion

- The ownership status on technology shows that most of the RETs installed in the district (Biogas, SHS, and SSHS) are male dominant.
- While talking about the ethnicity ownership of RETs in the Bardiya district, RETs ownership by *Janajati* group is maximum followed by *Brahmin*, *Chhetree, Thakuri* group and *Dalit.*

Technology

- Current status shows that traditional cook stoves are the leading cooking technology employed in the Bardiya district followed by LPG, Mud ICS, Kerosene and Electric Cooking Utensils.
- Similarly, in the case of lightening technology, most of the households are using kerosene.
- New technologies for the district would be ICS, Biogas, Solar and Gassifier in order to meet the objective of reducing GHGs emission and energy consumption.
- Final energy scenario in BAU shows the dominance of biomass with 92% share followed by biogas 4%, electricity 3% and petroleum 1%.
- Main potential sources seem to be biogas with ICS for cooking and solar for lightening end use.

Climate change

- Average annual rainfall is above 1900 mm with fluctuating pattern has been recorded. Similarly, minimum average annual temperature of the district is in the range of 18 °C to 20 °C. In last 20 years, the yearly maximum average temperature was varied from 28 °C to 30.5 °C with increasing pattern. These results imply the effect of climate change.
- Vulnerable technologies at present seem to be TCS using most of the share of energy consumption.
- BAU shows the peak growth in GHGs emission value from 163,008 tons to 172,114 tons by 2075/76 (2019) with current technology rate.
- DCEP could reduce 163,008 tons of GHGs in base year (2070/71) to 96,486 tons 2075/76 (2019) with clean solution cooking solution.

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- The five years DCEP implementation plan shows that the energy consumption can be reduced by an amount of 637,744 GJ in the year 2075/76 (2019) as compared to BAU scenario for the same year.

Investment, subsidy and implementation plan

- To promote the RE technology as per DCEP plan has estimated the amount required NPR 101,312,895; 151,915,358; 153,859,099; 142,280,390 and 133,172,858 in FY 2071/72, 2072/73, 2073/74, 2074/75, and 2075/76 respectively.
- At the same time, subsidy requires NPR 40,922,184; 58,630,096; 59,730,414; 55,748,999 and 52,633,633 in FY 2071/72, 2072/73, 2073/74, 2074/75, and 2075/76 respectively.
- Possible financial sources for the above mentioned investment plan are INGOs, NGOs, AEPC/NRREP, MOF, etc.
- As AEPC is the leading government institution for mainstreaming the distribution of different RETs, the total amount of subsidy from AEPC required for the installation of different RETs in the Bardiya district.

7.2 Recommendations

Gender and Social Inclusion

- Gender and social inclusion based data has been lagging for different technologies. Currently, not all the data are disaggregated by gender, class, caste and ethnic group wise. So, properly segregated relevant GSI data need to be collected.
- In coming days, AEPC/NRREP and other organizations have to work for data compilation and other aggregation so that DCEP like other study would have continual and strong mechanism to represent the gender and GSI issues.
- Data collection systems used by organizations including AEPC need to be strengthened so that they are more users friendly and systematic in order to access GSI specific data.
- It should be ensured that chosen technologies are accessible and affordable to women, women headed households, poor and other marginalized groups. Since accessibility and affordability of the technologies are the key variables to measure its adoptability, appropriate measures like additional subsidies to these groups of people should be made.
- A targeted approach for women, poor, ethnic groups and Dalits is required which is not strong in current service arrangements. At present, DDC provides services as per the demand from the households who have access to information and financial resources.

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Technology

Actually, the policy based research would be the best option for decreasing the GHG emission in household sector. The appropriate technology such as ICS, Biogas, Solar PV are the energy efficient technology and are renewable in nature to address the climate change issues. Some of the recommendation for technology penetration as our product of DCEP study has been mentioned below:

- More research and study needs to be done in sector of penetration of these technologies by market mapping method.
- Climate proofing technology needs to be studied according to the region wise with prioritization method as a separate study to support DCEP study in future.
- Local diffusion of technology and market availability needs to be studied.
- But for urban region of district commercial fuel based technology, emphasizing on electricity can be the proper solution in near future.
- Similarly, feasibility of gasifier should be studied for the cooking and lightening and Solar PV can be the appropriate solution for lightening end use in the district.

Climate change

- Since, the population growth of Bardiya is in increasing rate; climate related issues will also seem to increase in BAUs but renewable technologies like ICS, solar PV, and Biogas need to be promoted in order to the people for producing low carbon.
- Fuel wood is the main energy source of the rural people for their daily energy needs. This has contributed almost total energy need nowadays and has been projected that it will occupy more than 85% of energy need in the year 2019.

There are some more recommendable points to be followed:

- Potential livestock need to be increased to make maximum use of bio energy based technology.
- Improved technology like ICS needs to be promoted in rural area to lessen the GHG emission.
- Forest area needs to be protected for CDM finance and also as carbon sink to move in neutral carbon path.
- Promotion of potential low carbon technology along with awareness campaign needs to be done frequently.
- Bardiya is one of the LAPA implemented district so coordination with LAPA program during implementation DCEP is necessary to achieve synergy effect.

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ANNEXES

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Annex-1: Ward wise energy device status

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Name of the VDC/Municipality **Badalpur** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	215	1,120																		
	Janajati								1					10	2						
	B/C/T													4							
	Others																				
2	Dalit	99	554											4							
	Janajati						1		1					22							
	B/C/T													2							
	Others																				
3	Dalit	105	518											22							
	Janajati									1				10	4						
	B/C/T																				
	Others																				
4	Dalit	175	998												2						
	Janajati								8	2				36	12						
	B/C/T								1					12							
	Others													4							
5	Dalit	183	1,132																		
	Janajati						2							64	12						
	B/C/T						2	2						6							
	Others																				
6	Dalit	67	358												2						
	Janajati									1				2							
	B/C/T													8	2						
	Others																				
7	Dalit	30	152																		
	Janajati									1				8	2						
	B/C/T																				
	Others																				
8	Dalit	161	1,048											4							
	Janajati													4	8						
	B/C/T								2	1				8	2						
	Others																				
9	Dalit	182	1,001																		
	Janajati								1					104	12						
	B/C/T													18	2						
	Others																				
Total		1,217	6,881	882	-	-	5	2	14	6	321	-	-	352	62	-	-	794	9	-	-

Name of the VDC/Municipality **Bagnaha** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	424	2,289											1							
	Janajati						2		6	4				34	10						
	B/C/T							1	1	3				7	5						
	Others																				
2	Dalit	204	1,016								1						4				
	Janajati									2				29	5						
	B/C/T								2	1				10	5						
	Others																				
3	Dalit	254	1,372														1				
	Janajati						1	5	1	6				9	1						
	B/C/T						1	3	1					7	3						
	Others																				
4	Dalit	92	455																		
	Janajati						6	2						5	1						
	B/C/T						1		1					7	5						
	Others																				
5	Dalit	163	827																		
	Janajati								1	1											
	B/C/T													2							
	Others																				
6	Dalit	418	2,242																		
	Janajati						5	5	29	39				5	5						
	B/C/T						4		5	3				4	2						
	Others																				
7	Dalit	263	1,405																		
	Janajati									1				14	2						
	B/C/T								1	1				5	2						
	Others																				
8	Dalit	303	1,624																		
	Janajati						3		1	2				16	1						
	B/C/T													3	6						
	Others																				
9	Dalit	361	1,818																		
	Janajati						1	3	1					22	6						
	B/C/T						1	3	1	2				15	6						
	Others																				
Total		2,482	13,048	1,304	-	-	25	22	51	65	313	-	-	195	65	-	5	2,189	27	-	1

Name of the VDC/Municipality **Baniyabhar** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	699	2,835								2										
	Janajati								1					30	5						
	B/C/T								2	1				7	2						
	Others																				
2	Dalit	619	3,042																		
	Janajati						1	1	9	6				59	11						
	B/C/T								1	1				4	3						
	Others																				
3	Dalit	185	1,130								4										
	Janajati								8	1				4	1						
	B/C/T																				
	Others																				
4	Dalit	370	2,059								3										
	Janajati								7	4				15	6						
	B/C/T								2	1				1	1						
	Others																				
5	Dalit	400	2,086																		
	Janajati							1	1					11	1						
	B/C/T								2	1				1							
	Others																				
6	Dalit	409	1,754																		
	Janajati													27	3						
	B/C/T													1							
	Others													2							
7	Dalit	375	1,837						1												
	Janajati								1					34	6						
	B/C/T								3					5	1						
	Others																				
8	Dalit	265	1,475																		
	Janajati								17	2				34	3						
	B/C/T								2					7	3						
	Others																				
9	Dalit	239	1,464																		
	Janajati								3					12	1						
	B/C/T													1	1						
	Others																				
Total		3,561	17,682	2,007	-	-	1	2	60	17	130	-	-	255	48	-	10	3,226	15	-	7

Name of the VDC/Municipality **Belawa** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	148	753				1	1			2										
	Janajati						5							9	1						
	B/C/T						1	3		1				4	1						
	Others																				
2	Dalit	256	1,246				5	1			3										
	Janajati						2		1					7							
	B/C/T						1	1	4					1	1						
	Others																				
3	Dalit	233	1,130					1			2										
	Janajati						1	1						14							
	B/C/T													22	5						
	Others																				
4	Dalit	309	1,508																		
	Janajati						1	2		1				12	1						
	B/C/T								2					5	8						
	Others																				
5	Dalit	312	1,595								1										
	Janajati													2							
	B/C/T																				
	Others																				
6	Dalit	349	1,723						1												
	Janajati						4	2						2	2						
	B/C/T						1							15	2						
	Others								1	1											
7	Dalit	1,189	5,430				13	10	1	5											
	Janajati						25	13	9	9				10	1						
	B/C/T						38	45	25	17				20	3						
	Others																				
8	Dalit	117	657								2										
	Janajati						1	1							1						
	B/C/T													5							
	Others																				
9	Dalit	322	1,526																		
	Janajati						3	2	1					5	1						
	B/C/T						1			2				5	1						
	Others																				
Total		3,235	15,568	1,615	-	-	103	83	45	36	629	-	-	138	28	-	-	3,032	26	-	11

Name of the VDC/Municipality **Bhimpur** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	162	1,049								2				1						
	Janajati						1							53	3						
	B/C/T													2							
	Others																				
2	Dalit	197	1,162																		
	Janajati													10	4						
	B/C/T													3	1						
	Others																				
3	Dalit	52	304								3										
	Janajati													1	1						
	B/C/T																				
	Others																				
4	Dalit	228	1,282																		
	Janajati								2					15	4						
	B/C/T																				
	Others																				
5	Dalit	173	1,156																		
	Janajati								1					7							
	B/C/T																				
	Others																				
6	Dalit	251	1,454																		
	Janajati								1												
	B/C/T																				
	Others																				
7	Dalit	259	1,427																		
	Janajati						1		3					8							
	B/C/T								1	1											
	Others																				
8	Dalit	347	1,793																		
	Janajati							1	5	3				7							
	B/C/T								4	3				2							
	Others																				
9	Dalit	68	426																		
	Janajati							1						9							
	B/C/T													1							
	Others																				
Total		1,737	10,053	795	-	-	2	2	17	7	914	-	-	118	14	-	-	1,594	5	1	5

Name of the VDC/Municipality **Daulatpur** Ward wise energy device status

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	246	1,352																7		
	Janajati								1					21	4						
	B/C/T													5							
	Others																				
2	Dalit	164	943																		
	Janajati													9	1						
	B/C/T													1							
	Others																				
3	Dalit	215	1,004								11										
	Janajati													20	5						
	B/C/T													3							
	Others																				
4	Dalit	113	699																		
	Janajati													6	2						
	B/C/T																				
	Others																				
5	Dalit	143	843																		
	Janajati													26	4						
	B/C/T													7							
	Others																				
6	Dalit	140	799																		
	Janajati													14							
	B/C/T																				
	Others																				
7	Dalit	77	350																		
	Janajati													7	3						
	B/C/T													4	2						
	Others																				
8	Dalit	89	425																		
	Janajati													22							
	B/C/T													4	2						
	Others																				
9	Dalit	229	1,109																		
	Janajati													4	1						
	B/C/T													12							
	Others																				
Total		1,416	7,524	1,098	-	-	-	-	1	-	277	-	-	165	24	-	-	1,203	13	-	11

Name of the VDC/Municipality **Deudakala** Ward wise energy device status

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	155	873								5			1							
	Janajati													13	3						
	B/C/T													11	8						
	Others																				
2	Dalit	163	859																		
	Janajati														2						
	B/C/T													4	1						
	Others																				
3	Dalit	1,215	6,057						4	3											
	Janajati								7	12				9	10						
	B/C/T								17	22				16	14						
	Others																				
4	Dalit	118	650								5										
	Janajati													22	8						
	B/C/T																				
	Others																				
5	Dalit	542	2,537								1			1							
	Janajati								1	1				2	3						
	B/C/T									1				14							
	Others																				
6	Dalit	368	1,969																		
	Janajati													18	2						
	B/C/T									1				15	3						
	Others																				
7	Dalit	396	1,972											1							
	Janajati									1				8							
	B/C/T								5	5				61	13						
	Others																				
8	Dalit	257	1,675																		
	Janajati													12	10						
	B/C/T								1												
	Others																				
9	Dalit	583	2,629																		
	Janajati													12	4						
	B/C/T													59	17						
	Others																				
Total		3,797	19,221	2,723	-	-	-	-	35	46	994	-	-	279	98	-	-	3,333	76	-	11

Name of the VDC/Municipality **Dhadwar** Ward wise energy device status

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	265	1,577											63	24						
	Janajati													5	6						
	B/C/T																				
	Others																				
2	Dalit	177	933											1	1						
	Janajati													31	8						
	B/C/T													6							
	Others																				
3	Dalit	511	2,492																		
	Janajati													48	8						
	B/C/T													20	4						
	Others																				
4	Dalit	530	2,397											1							
	Janajati													37	15						
	B/C/T													21	20						
	Others																				
5	Dalit	292	1,872																		
	Janajati													31	9						
	B/C/T														1						
	Others																				
6	Dalit	846	4,367											1	1						
	Janajati													9	2						
	B/C/T													23	9						
	Others																				
7	Dalit	373	2,008																		
	Janajati													70	11						
	B/C/T													11	6						
	Others																				
8	Dalit	734	4,096																		
	Janajati													31	14						
	B/C/T													2	1						
	Others														1						
9	Dalit	641	3,140																		
	Janajati													40	14						
	B/C/T													5							
	Others																				
Total		4,369	22,882	2,548	-	-	-	-	-	-	953	-	-	456	155	-	-	3,678	80	-	

Name of the VDC/Municipality **Dhodhari** Ward wise energy device status

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	227	1,180					1						1							
	Janajati						11	6						8							
	B/C/T						6	5						10	1						
	Others																				
2	Dalit	243	1,293											1							
	Janajati						1		1	1				23	2						
	B/C/T								1					3	2						
	Others																				
3	Dalit	125	636																		
	Janajati													3							
	B/C/T									1				3	2						
	Others																				
4	Dalit	301	1,447																		
	Janajati													42	6						
	B/C/T								1	1				1							
	Others																				
5	Dalit	188	1,095																		
	Janajati																				
	B/C/T							1						2	2						
	Others																				
6	Dalit	161	951						1	1											
	Janajati								1	1				2							
	B/C/T								3	4				1							
	Others																				
7	Dalit	94	471																		
	Janajati													4	3						
	B/C/T								1												
	Others																				
8	Dalit	53	282																		
	Janajati						6							27	4						
	B/C/T																				
	Others																				
9	Dalit	506	2,704						7	8											
	Janajati								5	10				15	3						
	B/C/T								5	2				13	2						
	Others																				
Total		1,898	10,059	715	-	-	24	13	26	29	165	-	-	159	27	-	12	1,668	26	-	6

Name of the VDC/Municipality **Gola** Ward wise energy device status

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	74	452						1												
	Janajati						2		4	1											
	B/C/T													2	1						
	Others																				
2	Dalit	104	567																		
	Janajati						3	1	4	3				1							
	B/C/T						1		1					7	2						
	Others																				
3	Dalit	97	532																		
	Janajati						5							6	1						
	B/C/T														1						
	Others																				
4	Dalit	256	1,298				1							4	1						
	Janajati						2	1	1					21	3						
	B/C/T							1	4	1				37	9						
	Others																				
5	Dalit	144	940																		
	Janajati						3		2					30	5						
	B/C/T													14	4						
	Others																				
6	Dalit	133	737				1							1							
	Janajati													6	1						
	B/C/T													12	2						
	Others																				
7	Dalit	76	440																		
	Janajati						1	2						19	1						
	B/C/T							1						8	2						
	Others																				
8	Dalit	179	1,163					1													
	Janajati						4							13							
	B/C/T							1						2	1						
	Others																				
9	Dalit	103	685																		
	Janajati						1							3	2						
	B/C/T								1					3	1						
	Others																				
Total		1,166	6,814	801	-	-	24	8	18	5	274	-	-	189	37	-	-	934	3	1	2

Name of the VDC/Municipality **Jamuni** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	278	1,184																		
	Janajati																				
	B/C/T													7	3						
	Others																				
2	Dalit	207	909					1													
	Janajati						1														
	B/C/T													4	2						
	Others																				
3	Dalit	264	1,172											1							
	Janajati													3	1						
	B/C/T													12	4						
	Others																				
4	Dalit	178	878																		
	Janajati																				
	B/C/T																				
	Others																				
5	Dalit	419	1,846				1							1	1						
	Janajati													9	4						
	B/C/T							3						34	20						
	Others																				
6	Dalit	278	1,273											1	1						
	Janajati													4	4						
	B/C/T													17	13						
	Others																				
7	Dalit	282	1,240											4							
	Janajati													3	3						
	B/C/T													15	8						
	Others														1						
8	Dalit	263	1,206											1							
	Janajati																				
	B/C/T													8	1						
	Others																				
9	Dalit	432	1,831												1						
	Janajati													11	5						
	B/C/T													36	10						
	Others																				
Total		2,601	11,539	2,113	-	-	2	4	-	-	451	-	-	171	82	-	55	2,181	102	-	10

Name of the VDC/Municipality **Kalika** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	261	1,566																		
	Janajati													15	17						
	B/C/T													3	4						
	Others													1							
2	Dalit	280	1,287											2	4						
	Janajati						1							40	9						
	B/C/T						4	2						27	19						
	Others													1							
3	Dalit	340	1,474																		
	Janajati						1							27	5						
	B/C/T													54	7						
	Others																				
4	Dalit	1,191	4,557											1							
	Janajati								1	2				8	5						
	B/C/T								1					11	12						
	Others																				
5	Dalit	322	1,510					1						6	2						
	Janajati													12	5						
	B/C/T							1						41	11						
	Others																				
6	Dalit	118	479											2	3						
	Janajati													2	1						
	B/C/T													4	5						
	Others																				
7	Dalit	183	792											4	1						
	Janajati													4							
	B/C/T						3							26	5						
	Others																				
8	Dalit	325	1,411											4	1						
	Janajati													2	1						
	B/C/T						3							64	20						
	Others																				
9	Dalit	111	477											1							
	Janajati													1							
	B/C/T													5	1						
	Others																				
Total		3,131	13,553	2,018	-	-	12	4	2	2	1,021	-	-	368	138	-	-	2,362	238	-	25

Name of the VDC/Municipality **Khairichandanpur** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	199	1,105																		
	Janajati						39	12	19	13				12	2						
	B/C/T							1	1	1				4	2						
	Others																				
2	Dalit	160	929																		
	Janajati						8	2	8	2				32	6						
	B/C/T						2		2	1				3	2						
	Others																				
3	Dalit	92	522																		
	Janajati						4	1	11	1				18	5						
	B/C/T								4					9	3						
	Others																				
4	Dalit	100	643						1					3	2						
	Janajati						2	1	4	1				29	2						
	B/C/T								3	1				10	1						
	Others																				
5	Dalit	108	588											1							
	Janajati						1	1	5					20	4						
	B/C/T								1					4							
	Others																				
6	Dalit	78	559																		
	Janajati						1		8					9	1						
	B/C/T									1				1	1						
	Others																				
7	Dalit	122	839				2	1													
	Janajati						4	9	6	2				12							
	B/C/T							1	3					3							
	Others													1							
8	Dalit	118	764																		
	Janajati						7	1	1					8	1						
	B/C/T													5							
	Others																				
9	Dalit	210	1,166				2	2						1							
	Janajati						6	3	5	1				5	1						
	B/C/T								1					4	2						
	Others													1							
Total		1,187	7,115	675	-	-	78	35	83	24	275	-	-	195	35	-	40	906	7	-	4

Name of the VDC/Municipality **Magragadi** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	389	2,006																		
	Janajati									1				12	10						
	B/C/T													14	6						
	Others																				
2	Dalit	457	1,928											1							
	Janajati													1	1						
	B/C/T								1	1				18	8						
	Others																				
3	Dalit	302	1,786																		
	Janajati													31	13						
	B/C/T																				
	Others																				
4	Dalit	787	3,893																		
	Janajati													37	7						
	B/C/T													22	9						
	Others																				
5	Dalit	205	1,053											1							
	Janajati													8	1						
	B/C/T													26	14						
	Others													1							
6	Dalit	360	1,770																		
	Janajati								1	2				9							
	B/C/T													4	5						
	Others																				
7	Dalit	252	1,186																		
	Janajati													9							
	B/C/T													9	1						
	Others																				
8	Dalit	483	2,275																		
	Janajati													5							
	B/C/T													17	2						
	Others																				
9	Dalit	634	3,036						1												
	Janajati									3				14	1						
	B/C/T								1					14	3						
	Others																				
Total		3,869	18,933	2,381	-	-	-	-	4	7	262	-	-	253	81	-	-	3,459	62	1	13

Name of the VDC/Municipality **Mahamadpur** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	99	585											1							
	Janajati																				
	B/C/T													2							
	Others																				
2	Dalit	59	323																		
	Janajati																				
	B/C/T													2							
	Others																				
3	Dalit	258	1,454																		
	Janajati																				
	B/C/T													1							
	Others																				
4	Dalit	189	1,123																		
	Janajati													1							
	B/C/T													1	4						
	Others													4							
5	Dalit	61	308																		
	Janajati																				
	B/C/T													2							
	Others																				
6	Dalit	284	1,796																		
	Janajati													2							
	B/C/T													1	4						
	Others																				
7	Dalit	280	1,972																		
	Janajati													3							
	B/C/T																				
	Others																				
8	Dalit	401	2,262																		
	Janajati													4							
	B/C/T																				
	Others																				
9	Dalit	213	1,109																		
	Janajati																				
	B/C/T																				
	Others																				
Total		1,844	10,932	961	-	-	-	-	-	-	794	-	-	24	8	-	6	1,772	20	-	14

Name of the VDC/Municipality **Manau** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	169	853				3														
	Janajati							3													
	B/C/T						4	3	3	1											
	Others																				
2	Dalit	94	463																		
	Janajati								2						1						
	B/C/T									1				6							
	Others																				
3	Dalit	144	747																		
	Janajati						1		7					30	2						
	B/C/T													13	4						
	Others																				
4	Dalit	116	633																		
	Janajati						2	3	2	1				20	5						
	B/C/T								1					11	3						
	Others																				
5	Dalit	191	1,104																		
	Janajati						1	2	8	4				18	3						
	B/C/T								3					8	3						
	Others																				
6	Dalit	97	530				2		1												
	Janajati						1		10	3				16	2						
	B/C/T								3					14							
	Others																				
7	Dalit	167	984				1														
	Janajati						1	3	19	5				51	6						
	B/C/T								1					7							
	Others																				
8	Dalit	187	1,031																		
	Janajati						4		12	2				21	3						
	B/C/T								8	2				14	3						
	Others																				
9	Dalit	3	12				2														
	Janajati						9	2	12	5											
	B/C/T								1												
	Others																				
Total		1,168	6,357	754	-	-	31	16	93	24	145	-	-	229	35	-	-	888	16	-	-

Name of the VDC/Municipality **Mainapokhara** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	252	1,189											9	1						
	Janajati						2							3	1						
	B/C/T						2														
	Others																				
2	Dalit	140	625																		
	Janajati													23	10						
	B/C/T													1	1						
	Others																				
3	Dalit	264	1,391																		
	Janajati													27	8						
	B/C/T													1							
	Others																				
4	Dalit	73	329																		
	Janajati																				
	B/C/T													13	1						
	Others																				
5	Dalit	209	1,082																		
	Janajati													21	16						
	B/C/T													26	14						
	Others																				
6	Dalit	320	1,558																		
	Janajati						1							38	10						
	B/C/T						4							4	3						
	Others																				
7	Dalit	162	794																		
	Janajati													2							
	B/C/T													20	6						
	Others																				
8	Dalit	169	868																		
	Janajati						2	1						50	7						
	B/C/T													1	1						
	Others																				
9	Dalit	178	898											2							
	Janajati						3							28	4						
	B/C/T													6	1						
	Others																				
Total		1,767	8,734	1,293	-	-	14	1	-	-	437	-	-	275	84	-	-	1,269	127	-	12

Name of the VDC/Municipality **Manpur Tapara** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	200	1,192																		
	Janajati						2		9	2				26	5						
	B/C/T						1		1					3	1						
	Others																				
2	Dalit	353	1,819											1							
	Janajati								19	5				20	3						
	B/C/T													10	6						
	Others																				
3	Dalit	153	939											2							
	Janajati						1		2					18	1						
	B/C/T						3		13	9				1							
	Others																				
4	Dalit	89	441																		
	Janajati													3	1						
	B/C/T																				
	Others																				
5	Dalit	160	825						1	1											
	Janajati									1				4	2						
	B/C/T													2							
	Others																				
6	Dalit	75	400																		
	Janajati													14	1						
	B/C/T																				
	Others																				
7	Dalit	100	642																		
	Janajati								8	3				11	5						
	B/C/T																				
	Others																				
8	Dalit	124	846																		
	Janajati								17	4				25	3						
	B/C/T													1	1						
	Others																				
9	Dalit	416	2,291						1												
	Janajati								38	9				65	11						
	B/C/T								6					26	1						
	Others																				
Total		1,670	9,395	1,006	-	-	7	-	115	34	563	-	-	232	41	-	-	1,372	21	-	4

Name of the VDC/Municipality **Motipur** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	263	1,318																		
	Janajati													20	5						
	B/C/T													16	1						
	Others																				
2	Dalit	453	2,614																		
	Janajati													20	9						
	B/C/T													3	3						
	Others																				
3	Dalit	199	1,004																		
	Janajati													83	3						
	B/C/T													2	3						
	Others													1							
4	Dalit	214	1,170																		
	Janajati													8	5						
	B/C/T													5							
	Others																				
5	Dalit	290	1,423																		
	Janajati													4							
	B/C/T													4							
	Others																				
6	Dalit	587	2,731											1							
	Janajati													14	3						
	B/C/T													54	28						
	Others																				
7	Dalit	1,050	5,961												1						
	Janajati													91	32						
	B/C/T													45	26						
	Others																				
8	Dalit	903	3,774											1							
	Janajati													26	13						
	B/C/T													69	25						
	Others																				
9	Dalit	219	1,091																		
	Janajati													33	5						
	B/C/T													6	3						
	Others																				
Total		4,178	21,086	3,382	-	-	-	-	-	-	646	-	-	506	165	-	-	3,175	322	-	10

Name of the VDC/Municipality **Nayagaun** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	283	1,416																		
	Janajati													27	3						
	B/C/T													1							
	Others																				
2	Dalit	139	833																		
	Janajati								2					20	4						
	B/C/T																				
	Others																				
3	Dalit	130	714											1							
	Janajati													15	1						
	B/C/T														1						
	Others																				
4	Dalit	95	559																		
	Janajati									2				12	1						
	B/C/T																				
	Others																				
5	Dalit	133	756																		
	Janajati								1					26	3						
	B/C/T																				
	Others																				
6	Dalit	52	305																		
	Janajati													1							
	B/C/T																				
	Others																				
7	Dalit	89	464																		
	Janajati								1	1				2							
	B/C/T																				
	Others																				
8	Dalit	63	400																		
	Janajati																				
	B/C/T																				
	Others																				
9	Dalit	48	336																		
	Janajati													9	3						
	B/C/T													1							
	Others													1							
Total		1,032	5,783	732	-	-	-	-	4	3	268	-	-	116	16	-	-	886	6	-	8

Name of the VDC/Municipality **Neulapur** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	424	2,121				2							3							
	Janajati						1	4	4	1				20	5						
	B/C/T						5	1	3	1				43	6						
	Others																				
2	Dalit	222	1,089											2							
	Janajati						3	4	2	2				34	16						
	B/C/T						4	3	1					19	2						
	Others																				
3	Dalit	204	1,111					1							2						
	Janajati							2	6	4				38	24						
	B/C/T						1	1	2	1				3	3						
	Others																				
4	Dalit	244	1,244												2						
	Janajati						2	2	3	1				5	2						
	B/C/T						4	6	1					2	2						
	Others																				
5	Dalit	779	3,833											1							
	Janajati							2	7	3				19	12						
	B/C/T						10	10	2	1				23	5						
	Others													1							
6	Dalit	116	637																		
	Janajati						1			1				11	1						
	B/C/T							2	1					3	1						
	Others																				
7	Dalit	349	1,546				1	1													
	Janajati						5	2	3					12	6						
	B/C/T							6	1					4	9						
	Others																				
8	Dalit	163	879				1														
	Janajati						1	1	4	3				6	1						
	B/C/T							2						16	4						
	Others																				
9	Dalit	469	2,330				1	1						1	1						
	Janajati						1	5	18	4				8	3						
	B/C/T						8	10	8	2				15	7						
	Others																				
Total		2,970	14,790	1,847	-	-	51	66	66	24	587	-	-	289	114	-	-	2,330	222	1	14

Name of the VDC/Municipality **Padnaha** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	125	748																		
	Janajati													11	3						
	B/C/T													1							
	Others																				
2	Dalit	229	1,298																		
	Janajati													24	9						
	B/C/T													1							
	Others																				
3	Dalit	208	1,061																		
	Janajati													6							
	B/C/T													1	1						
	Others													1							
4	Dalit	126	632																		
	Janajati													11	2						
	B/C/T													3							
	Others																				
5	Dalit	36	188																		
	Janajati																				
	B/C/T														3						
	Others																				
6	Dalit	155	849																		
	Janajati													10							
	B/C/T													2	1						
	Others																				
7	Dalit	210	1,356																		
	Janajati													8	1						
	B/C/T													5							
	Others																				
8	Dalit	192	1,174																		
	Janajati													2							
	B/C/T													8	1						
	Others																				
9	Dalit	188	1,209																		
	Janajati													7	4						
	B/C/T																				
	Others																				
Total		1,469	8,515	1,121	-	-	-	-	-	-	63	-	-	101	25	-	155	1,178	10	-	-

Name of the VDC/Municipality **Pashupatinagar** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	162	906												1						
	Janajati													10	2						
	B/C/T													16	22						
	Others																				
2	Dalit	181	1,092											1	1						
	Janajati													32	5						
	B/C/T													30	4						
	Others																				
3	Dalit	164	833																		
	Janajati													30	2						
	B/C/T													3	2						
	Others																				
4	Dalit	133	758																		
	Janajati													51	3						
	B/C/T													7							
	Others																				
5	Dalit	159	952																		
	Janajati													19	3						
	B/C/T													4	1						
	Others																				
6	Dalit	54	311																		
	Janajati													9							
	B/C/T													4	1						
	Others																				
7	Dalit	96	522																		
	Janajati													10	1						
	B/C/T													9							
	Others																				
8	Dalit	169	920											1							
	Janajati													8	1						
	B/C/T													16	5						
	Others																				
9	Dalit	118	651											1							
	Janajati													3	2						
	B/C/T													13							
	Others																				
Total		1,236	6,945	855	-	-	-	-	-	-	300	-	-	277	56	-	-	894	4	-	5

Name of the VDC/Municipality **Patabhar** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	154	845																		
	Janajati								24	4				54	3						
	B/C/T								4	5				14							
	Others								1												
2	Dalit	299	1,771												1						
	Janajati									1				18	3						
	B/C/T								1					37	12						
	Others													4							
3	Dalit	333	1,939						1												
	Janajati								17	5				25	5						
	B/C/T								2	1				17	6						
	Others																				
4	Dalit	289	1,614																		
	Janajati								16	3				36	15						
	B/C/T								11	2				4	5						
	Others													1							
5	Dalit	207	1,295						1												
	Janajati								22	2				22	3						
	B/C/T								2	1				1							
	Others													1							
6	Dalit	247	1,418						1												
	Janajati								43	13				45	9						
	B/C/T								3					2							
	Others																				
7	Dalit	281	1,583											1							
	Janajati								24	6				49	2						
	B/C/T								7	3				4	3						
	Others																				
8	Dalit	222	1,242																		
	Janajati								5	4				40	5						
	B/C/T								8	2				9	2						
	Others																				
9	Dalit	533	3,048																		
	Janajati								19	9				117	10						
	B/C/T								2	1				12	3						
	Others																				
Total		2,565	14,755	1,024	-	-	-	-	214	62	767	-	-	513	87	-	-	1,935	16	1	13

Name of the VDC/Municipality **Rajapur** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	441	2,334											1							
	Janajati													13							
	B/C/T													12	4						
	Others																				
2	Dalit	229	1,315																		
	Janajati													6							
	B/C/T													9	4						
	Others																				
3	Dalit	168	1,009											1							
	Janajati													7	2						
	B/C/T													4							
	Others																				
4	Dalit	838	2,681																		
	Janajati													27	4						
	B/C/T													11	9						
	Others																				
5	Dalit	229	1,365																		
	Janajati													9	1						
	B/C/T													2	4						
	Others																				
6	Dalit	472	2,341																		
	Janajati													6	1						
	B/C/T													12	3						
	Others																				
7	Dalit	112	657																		
	Janajati													4							
	B/C/T													1							
	Others																				
8	Dalit	42	269																		
	Janajati													3							
	B/C/T																				
	Others																				
9	Dalit	126	831																		
	Janajati													4							
	B/C/T														1						
	Others																				
Total		2,657	12,802	1,628	-	-	-	-	-	-	999	-	-	132	33	-	-	2,275	200	-	17

Name of the VDC/Municipality **Sanoshree** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	260	1,179												1						
	Janajati													1							
	B/C/T							1	1	1				1							
	Others																				
2	Dalit	553	2,573				1														
	Janajati						3														
	B/C/T						1							10	7						
	Others																				
3	Dalit	987	4,022											5							
	Janajati						1	1	1					18	1						
	B/C/T								1	1				47	11						
	Others													1							
4	Dalit	296	1,320											1	1						
	Janajati													9	1						
	B/C/T													28	9						
	Others																				
5	Dalit	568	2,520											11	1						
	Janajati							1						7	3						
	B/C/T						2	1						33	5						
	Others																				
6	Dalit	495	2,091												1						
	Janajati						2							5							
	B/C/T						2	1						19	13						
	Others																				
7	Dalit	429	1,925				1							1	3						
	Janajati													10	3						
	B/C/T													18	1						
	Others																				
8	Dalit	263	1,172																		
	Janajati													5	2						
	B/C/T						1	2						16	2						
	Others																				
9	Dalit	278	1,198																		
	Janajati																				
	B/C/T						2							10	7						
	Others																				
Total		4,129	18,000	2,902	-	-	16	7	3	2	144	-	-	256	72	-	45	3,366	383	-	7

Name of the VDC/Municipality **Shivapur** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	78	344																		
	Janajati													1							
	B/C/T								1	1				4	2						
	Others																				
2	Dalit	86	435																		
	Janajati								1												
	B/C/T								1					20	3						
	Others																				
3	Dalit	112	579											1							
	Janajati													1							
	B/C/T													6	2						
	Others																				
4	Dalit	101	557											1							
	Janajati																				
	B/C/T													6	1						
	Others																				
5	Dalit	186	988											1							
	Janajati													20	2						
	B/C/T													6	2						
	Others																				
6	Dalit	161	734											2	1						
	Janajati													1							
	B/C/T													12	11						
	Others																				
7	Dalit	59	237																		
	Janajati													3							
	B/C/T								1					8	5						
	Others																				
8	Dalit	240	1,243																		
	Janajati						2		1	7				27	13						
	B/C/T						1		1	1				3	1						
	Others																				
9	Dalit	439	2,589						1					2							
	Janajati								3	2				19	2						
	B/C/T													11	2						
	Others																				
Total		1,462	7,706	871	-	-	3	-	10	11	425	-	-	155	47	-	-	1,233	20	-	7

Name of the VDC/Municipality **Sorhawa** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	181	900											1							
	Janajati													7	1						
	B/C/T													4	1						
	Others													1							
2	Dalit	426	2,165											1	1						
	Janajati						4							17	5						
	B/C/T													12	4						
	Others																				
3	Dalit	704	3,380											2							
	Janajati													21	2						
	B/C/T													4							
	Others																				
4	Dalit	134	728																		
	Janajati													8	1						
	B/C/T																				
	Others																				
5	Dalit	168	774																		
	Janajati													4	1						
	B/C/T													2							
	Others																				
6	Dalit	330	1,807																		
	Janajati													1							
	B/C/T													4	2						
	Others																				
7	Dalit	284	1,261											1	1						
	Janajati																				
	B/C/T													26	8						
	Others																				
8	Dalit	315	1,550											1							
	Janajati																				
	B/C/T													13	2						
	Others																				
9	Dalit	292	1,477																		
	Janajati													5	2						
	B/C/T													16	4						
	Others																				
Total		2,834	14,042	2,025	-	-	4	-	-	-	791	-	-	151	35	-	-	2,561	80	1	6

Name of the VDC/Municipality **Suryapatuwa** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	90	524						3	1											
	Janajati								24	9				15							
	B/C/T								3	3											
	Others																				
2	Dalit	205	1,087											2							
	Janajati						8	2	4	3				8							
	B/C/T								6	2				4	1						
	Others																				
3	Dalit	228	1,181						1					1							
	Janajati						3	3	4	4				7	1						
	B/C/T								1					4	1						
	Others																				
4	Dalit	353	2,022							2				5							
	Janajati						29	14	25	8				64	14						
	B/C/T							2	9	1				16	3						
	Others																				
5	Dalit	97	571																		
	Janajati						1		15	1				2							
	B/C/T								5	1				1							
	Others																				
6	Dalit	250	1,512																		
	Janajati								14	7				18	1						
	B/C/T								1					5	1						
	Others																				
7	Dalit	196	1,119												1						
	Janajati								5					12	4						
	B/C/T								1	4				2	1						
	Others																				
8	Dalit	86	488																		
	Janajati								5					5	1						
	B/C/T								1												
	Others																				
9	Dalit	256	1,443																		
	Janajati								17	6				21	1						
	B/C/T								3	2				7	1						
	Others																				
Total		1,761	9,947	941	-	-	41	21	147	54	49	-	-	199	31	-	-	1,524	4	-	3

Name of the VDC/Municipality **Taratal** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	302	1,389												2						
	Janajati													6	1						
	B/C/T													10	3						
	Others																				
2	Dalit	142	697																		
	Janajati													2	1						
	B/C/T													8	1						
	Others																				
3	Dalit	192	893																		
	Janajati													5	4						
	B/C/T													11	3						
	Others																				
4	Dalit	171	780																		
	Janajati													8							
	B/C/T													7	3						
	Others																				
5	Dalit	174	669											1							
	Janajati													2							
	B/C/T													12	4						
	Others													1							
6	Dalit	286	1,325											1	3						
	Janajati													2	2						
	B/C/T													25	4						
	Others																				
7	Dalit	159	867																		
	Janajati																				
	B/C/T													3							
	Others																				
8	Dalit	64	317												1						
	Janajati																				
	B/C/T													12	4						
	Others																				
9	Dalit	291	1,494																		
	Janajati																				
	B/C/T													8	1						
	Others																				
Total		1,781	8,431	1,332	-	-	-	-	-	-	273	-	-	124	37	-	-	1,577	37	-	6

Name of the VDC/Municipality **Thakurdwara** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn.	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	135	943																		
	Janajati								1	2				18	6						
	B/C/T								1					4	1						
	Others																				
2	Dalit	168	898																		
	Janajati						3		1					6	2						
	B/C/T						3	4	2	2				10	6						
	Others																				
3	Dalit	198	943																		
	Janajati													10	1						
	B/C/T													10	9						
	Others																				
4	Dalit	200	983											1							
	Janajati													7	1						
	B/C/T													5	5						
	Others																				
5	Dalit	199	897											1							
	Janajati													4							
	B/C/T													3	2						
	Others																				
6	Dalit	309	1,348																		
	Janajati													14	8						
	B/C/T													6	3						
	Others																				
7	Dalit	270	1,344																		
	Janajati													18	10						
	B/C/T													9	2						
	Others																				
8	Dalit	98	488																		
	Janajati																				
	B/C/T													1							
	Others																				
9	Dalit	161	928																		
	Janajati													10							
	B/C/T													11	1						
	Others																				
Total		1,738	8,772	1,073	-	-	6	4	5	4	293	-	-	148	57	-	-	1,497	31	-	5

Name of the VDC/Municipality **Gulariya NP** **Ward wise energy device status**

Ward no	Ethnic Group	Total		Grid conn. HH	MHP		SSHS		SHS		Kerosene lamp	Water Mill		Biogas plants		..... Cookstove user households (HH)					
		HH	Pop.		HH	kW	Male		Male			Trad.		Male	Female	MICS	Mud ICS	Trad.	LPG	Electric	Kerosene
1	Dalit	759	3,747	759											1						
	Janajati													17	5						
	B/C/T													34	5						
	Others													1							
2	Dalit	1,027	4,605	1,027																	
	Janajati													3							
	B/C/T													9	2						
	Others																				
3	Dalit	412	2,343	412																	
	Janajati																				
	B/C/T													9							
	Others													4	1						
4	Dalit	889	4,877	889																	
	Janajati																				
	B/C/T													22	9						
	Others																				
5	Dalit	851	4,280	851																	
	Janajati													7							
	B/C/T													30	10						
	Others													1							
6	Dalit	1,043	4,860	1,043										2	1						
	Janajati													66	20						
	B/C/T													73	24						
	Others																				
7	Dalit	846	3,516											1							
	Janajati													9	4						
	B/C/T													61	27						
	Others																				
8	Dalit	1,118	5,030											1							
	Janajati													3	1						
	B/C/T													47	18						
	Others																				
9	Dalit	924	4,418																		
	Janajati													4							
	B/C/T													2	1						
	Others																				

10	Dalit	382	2,042	282																		
	Janajati													34	3							
	B/C/T													1	3							
	Others																					
11	Dalit	637	3,395																			
	Janajati													4	1							
	B/C/T													1								
	Others																					
12	Dalit	1,247	6,426	1,247																		
	Janajati														2							
	B/C/T																					
	Others																					
13	Dalit	614	3,506																			
	Janajati													1	1							
	B/C/T																					
	Others													1								
14	Dalit	471	2,702																			
	Janajati													10								
	B/C/T																					
	Others																					
Total		11,220	55,747	6,510	-	-	-	-	-	-	4,346	-	-	458	139	-	-	9,067	1,435	10	111	

Annex-2: VDC/Municipality level energy consumption trend

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VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Badalpur** NP/VDC : NP

Average family member	5.65	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
3.76	84.67	0.15	1.16	9.86	0.4

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	905,160	kg of fuelwood	20	190,560	kg of residue
ICS	72	-	kg of fuelwood	14	-	kg of residue
MICS		-	kg of fuelwood	14	-	kg of residue
Biogas	30	149,040	Cubic meter			
Petroleum fuel	0.5	4.50	Cyliner of LPG		-	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp			0.007	-		kL
Candle	200	2	0.005	0.72		MT
Solar	62	5	8-SSHS,16-SHS	126.00	720	kWh
Tube light			36	-	-	kWh
CFL	314	2	9	2,034.72	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp			4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove		-	kg of fuelwood		-	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device,capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan			40	-	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	383	2	100	27,576.00	-
Computer	26	1	200	1,872.00	-
Laptop	10	2	65	468.00	-
Mobile charger	1,914	2	5	6,890.40	-
Refrigerator	75	10	300	20,250.00	-
Water pump	100	1	500	18,000.00	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Bagnaha** NP/VDC : VDC

Average family member	5.26	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
17	60	0.5	3	18	1.5

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	2,495,460.00	kg of fuelwood		-	kg of residue
ICS	72	4,320.00	kg of fuelwood		-	kg of residue
MICS			kg of fuelwood		-	kg of residue
Biogas	30	93,600.00	Cubic meter			
Petroleum fuel	0.5	13.50	Cyliner of LPG		-	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	313	1	0.007	0.79		kL
Candle	13	1	0.005	0.02		MT
Solar	65	5	8-SSHS,16-SHS	846.00	4,176.00	kWh
Tube light	749	2.5	36	24,267.60	-	kWh
CFL	100	3	9	972.00	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp		2	4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove		-	kg of fuelwood		-	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan			40	-	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	900	2	100	64,800	-
Computer	30	3	200	6,480	-
Laptop	5	5	65	585	-
Mobile charger	2,000	2	5	7,200	-
Refrigerator	10	10	300	2,700	-
Water pump	50	1	500	9,000	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Baniyabhar** NP/VDC : VDC

Average family member	4.97	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
9.12	83.59		0.07	7.22	

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	3,677,640.00	kg of fuelwood	20	774,240.0	kg of residue
ICS	72	8,640.00	kg of fuelwood	15	1,800.0	kg of residue
MICS		-	kg of fuelwood	15	-	kg of residue
Biogas	30	109,080.00	Cubic meter			
Petroleum fuel	0.5	7.50	Cyliner of LPG	15	1,260.0	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	8,586	2	0.007	43.27		kL
Candle	200	1	0.005	0.36		MT
Solar	48	5	8-SSHS,16-SHS	54.00	2,772.00	kWh
Tube light	200	2	36	5,184.00	-	kWh
CFL	800	2	9	5,184.00	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp		2	4	-	-	kWh

Space heating

Cook stove		Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove		-	kg of fuelwood		-	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan			40	-	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	150	3	100	16,200	-
Computer	16	4	200	4,608	-
Laptop	5	3	65	351	-
Mobile charger	800	3	5	4,320	-
Refrigerator	20	8	300	4,320	-
Water pump	35	1	500	6,300	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Belawa** NP/VDC : VDC

Average family member	4.81	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
16.18	42.11	0.01		41.69	0.01

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	3,456,480.00	kg of fuelwood		-	kg of residue
ICS	72	-	kg of fuelwood		-	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	59,760.00	Cubic meter			
Petroleum fuel	0.5	13.00	Cyliner of LPG		-	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	1,125	5	0.007	14.18		kL
Candle	1,344	3	0.005	7.26		MT
Solar	28	5	8-SSHS,16-SHS	3,348.00	2,916	kWh
Tube light	891	4	36	46,189.44	-	kWh
CFL	1,344	6	9	26,127.36	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp			4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove		-	kg of fuelwood		-	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan			40	-	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	840	4	100	120,960	-
Computer	34	3	200	7,344	-
Laptop	36	6	65	5,054	-
Mobile charger	319	2	5	1,148	-
Refrigerator	101	8	300	21,816	-
Water pump	2,525	1	500	454,500	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Bhimpur** NP/VDC : NP

Average family member	5.79	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
10	55	0.3	2.7	30	2

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	1,817,160	kg of fuelwood	20	382,560	kg of residue
ICS	72	-	kg of fuelwood	10	-	kg of residue
MICS		-	kg of fuelwood	10	-	kg of residue
Biogas	30	47,520	Cubic meter			
Petroleum fuel	0.5	2.50	Cyliner of LPG	17	1,020	Liter of kerosene
Electric device	80	960	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	90	1	0.007	0.23		kL
Candle	30	1	0.005	0.05		MT
Solar	14	5	8-SSHS,16-SHS	72.00	864.0	kWh
Tube light	300		36	-	-	kWh
CFL	1,000	3	9	9,720.00	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp			4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove		-	kg of fuelwood		-	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan			40	-	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	90	2	100	6,480	-
Computer	15	3	200	3,240	-
Laptop	5	4	65	468	-
Mobile charger	3,000	2	5	10,800	-
Refrigerator	10	5	300	1,350	-
Water pump	40	1	500	7,200	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Daulatpur** NP/VDC : NP

Average family member	5.31	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
2.12	84.52			13.36	

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	1,371,420.00	kg of fuelwood		-	kg of residue
ICS	72	-	kg of fuelwood		-	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	68,040.00	Cubic meter			
Petroleum fuel	0.5	6.50	Cyliner of LPG		-	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	76	2	0.007	0.38		kL
Candle			0.005	-		MT
Solar	24	5	8-SSHS,16-SHS	-	36.00	kWh
Tube light			36	-	-	kWh
CFL			9	-	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp			4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove		-	kg of fuelwood		-	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan			40	-	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	1,242	2	100	89,424.00	-
Computer	12	3	200	2,592.00	-
Laptop	9	6	65	1,263.60	-
Mobile charger	1,448	2	5	5,212.80	-
Refrigerator	32	10	300	8,640.00	-
Water pump	719	1	500	129,420.00	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Deudakala** NP/VDC : VDC

Average family member	5.06	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
2	55	2	1	40	

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	3,799,620.00	kg of fuelwood	20	799,920.00	kg of residue
ICS	72	-	kg of fuelwood	10	-	kg of residue
MICS		-	kg of fuelwood	10	-	kg of residue
Biogas	30	135,720.00	Cubic meter			
Petroleum fuel	0.5	38.00	Cyliner of LPG	-	-	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	750	3	0.007	6		kL
Candle	510	1	0.005	1		MT
Solar	98	5	8-SSHS,16-SHS	-	2,916	kWh
Tube light	17,504	3	36	680,556	-	kWh
CFL	2,041	5	9	33,064	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp		5	4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove	175.18	583,874.94	kg of fuelwood		-	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan			40	-	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV			100	-	-
Computer			200	-	-
Laptop			65	-	-
Mobile charger			5	-	-
Refrigerator			300	-	-
Water pump			500	-	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Dhadwar** NP/VDC : VDC

Average family member	5.24	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
6.58	79.29	0.01	0.9	13.22	

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	4,192,920.00	kg of fuelwood	20	882,720.00	kg of residue
ICS	72	-	kg of fuelwood	10	-	kg of residue
MICS		-	kg of fuelwood	10	-	kg of residue
Biogas	30	219,960.00	Cubic meter			
Petroleum fuel	0.5	40.00	Cyliner of LPG	19	-	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	2110	2	0.007	10.63		kL
Candle	500	1	0.005	0.90		MT
Solar	155	5	8-SSHS,16-SHS	-	-	kWh
Tube light			36	-	-	kWh
CFL			9	-	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp			4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove	72.57	266,912.46	kg of fuelwood		-	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan			40	-	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV			100	-	-
Computer			200	-	-
Laptop			65	-	-
Mobile charger			5	-	-
Refrigerator			300	-	-
Water pump			500	-	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Dhodhari** NP/VDC : VDC

Average family member	5.30	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
2	87		1	9	1

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	1,901,520.00	kg of fuelwood	20	400,320.00	kg of residue
ICS	72	10,368.00	kg of fuelwood	10	1,440.00	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	66,960.00	Cubic meter			
Petroleum fuel	0.5	13.00	Cyliner of LPG	12.5	900.00	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	65	2	0.007	0.33		kL
Candle	35	1	0.005	0.06		MT
Solar	27	5	8-SSHS,16-SHS	666.00	1,980	kWh
Tube light	485	3	36	18,856.80	-	kWh
CFL	375	2	9	2,430.00	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp		3	4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove	133.33	222,394.44	kg of fuelwood	110.94	185,047.92	kg of residue
ICS	99.99	14,398.56	kg of fuelwood	83.2	11,980.80	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan	537	4	40	7,732.80	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	605	2	100	43,560.00	-
Computer	150	2	200	21,600.00	-
Laptop	15	5	65	1,755.00	-
Mobile charger	3,400	2	5	12,240.00	-
Refrigerator			300	-	-
Water pump	1,105	2	500	397,800.00	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Gola** NP/VDC : VDC

Average family member	5.8	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
10.09	57.7	0.1		32.11	

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	1,064,760.00	kg of fuelwood	20	224,160.00	kg of residue
ICS	72	-	kg of fuelwood	15	-	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	81,360.00	Cubic meter			
Petroleum fuel	0.5	1.50	Cyliner of LPG		-	Liter of kerosene
Electric device	80	960.00	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	100	3	0.007	1		kL
Candle			0.005	-		MT
Solar	37	5	8-SSHS,16-SHS	576	828.00	kWh
Tube light	500	4	36	25,920	-	kWh
CFL	600	4	9	7,776	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp			4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove	99.08	92,540.72	kg of fuelwood	65.3	60,990.20	kg of residue
ICS	74.31	-	kg of fuelwood	48.975	-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan	50	6	40	1,080	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	600	4	100	86,400.00	-
Computer	40	6	200	17,280.00	-
Laptop			65	-	-
Mobile charger	1,268	3	5	6,847.20	-
Refrigerator	50	5	300	6,750.00	-
Water pump	100	3	500	54,000.00	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Jamuni** NP/VDC : VDC

Average family member	4.4	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
13	33	0.5	2.5	46	5

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	2,486,340.00	kg of fuelwood	20	523,440.00	kg of residue
ICS	72	47,520.00	kg of fuelwood	15	9,900.00	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	91,080.00	Cubic meter			
Petroleum fuel	0.5	51.00	Cyliner of LPG	5	600.00	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	15	1	0.007	0.04		kL
Candle	130	1	0.005	0.23		MT
Solar	82	5	8-SSHS,16-SHS	108.00	-	kWh
Tube light			36	-	-	kWh
CFL	1,000	2	9	6,480.00	-	kWh
Incandecent lamp		2	40	-	-	kWh
LED lamp		3	4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove		-	kg of fuelwood		-	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan			40	-	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	45	2	100	3,240.00	-
Computer	17	4	200	4,896.00	-
Laptop	3	3	65	210.60	-
Mobile charger	5,000	2	5	18,000.00	-
Refrigerator	8	8	300	1,728.00	-
Water pump	3	1	500	540.00	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Kalika** NP/VDC : VDC

Average family member	4.33	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
14	16	6	2	41	21

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	2,692,680.00	kg of fuelwood	20	566,880.00	kg of residue
ICS	72	-	kg of fuelwood		-	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	182,160.00	Cubic meter			
Petroleum fuel	0.5	119.00	Cyliner of LPG	5	1,500.00	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp			0.007	-		kL
Candle	100	1	0.005	0.18		MT
Solar	138	5	8-SSHS,16-SHS	288.00	144	kWh
Tube light			36	-	-	kWh
CFL	150	3	9	1,458.00	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp		2	4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove		-	kg of fuelwood		-	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan			40	-	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	469	3	100	50,652.00	-
Computer	70	5	200	25,200.00	-
Laptop	5	4	65	468.00	-
Mobile charger	7,000	1	5	12,600.00	-
Refrigerator	8	8	300	1,728.00	-
Water pump	40	1	500	7,200.00	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Khairichandanpur** NP/VDC : VDC

Average family member	6.0	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
9	77	1		13	

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	1,032,840.00	kg of fuelwood	20	217,440.00	kg of residue
ICS	72	34,560.00	kg of fuelwood	15	7,200.00	kg of residue
MICS		-	kg of fuelwood	15	-	kg of residue
Biogas	30	82,800.00	Cubic meter			
Petroleum fuel	0.5	3.50	Cyliner of LPG		-	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	200	3	0.007	1.51		kL
Candle	3,600	3	0.005	19.44		MT
Solar	35	5	8-SSHS,16-SHS	2,034.00	3,852	kWh
Tube light			36	-	-	kWh
CFL	3,600	4	9	46,656.00	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp		4	4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove		-	kg of fuelwood		-	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan	2400	12	40	103,680	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	400	5	100	72,000.00	-
Computer	20	6	200	8,640.00	-
Laptop	5	8	65	936.00	-
Mobile charger	5,000	1	5	9,000.00	-
Refrigerator	20	16	300	8,640.00	-
Water pump	200	4	500	144,000.00	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Magragadi** NP/VDC : VDC

Average family member	4.89	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
5.68	67.99	0.1	0.25	22	3.98

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	3,943,260.00	kg of fuelwood	20	830,160.00	kg of residue
ICS	72	-	kg of fuelwood		-	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	120,240.00	Cubic meter			
Petroleum fuel	0.5	31.00	Cyliner of LPG	10	1,560.00	Liter of kerosene
Electric device	80	960.00	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp			0.007	-		kL
Candle	365	2	0.005	1.31		MT
Solar	81	5	8-SSHS,16-SHS	-	396	kWh
Tube light	3,943	3	36	153,303.84	-	kWh
CFL			9	-	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp		5	4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove		-	kg of fuelwood		-	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan	3,000	12	40	129,600	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	3,000	2	100	216,000.00	-
Computer	10	2	200	1,440.00	-
Laptop	5	5	65	585.00	-
Mobile charger	3,943	2	5	14,194.80	-
Refrigerator			300	-	-
Water pump	12	2	500	4,320.00	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Mahamadpur** NP/VDC : VDC

Average family member	5.93	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
16	46	26	3	9	

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	2,020,080.00	kg of fuelwood	20	425,280.00	kg of residue
ICS	72	5,184.00	kg of fuelwood	15	1,080.00	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	11,520.00	Cubic meter			
Petroleum fuel	0.5	10.00	Cyliner of LPG		-	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	155	2	0.007	0.78		kL
Candle	51	2	0.005	0.18		MT
Solar	8	5	8-SSHS,16-SHS	-	-	kWh
Tube light	65	6	36	5,054.40	-	kWh
CFL	1250	6	9	24,300.00	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp			4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove		-	kg of fuelwood		-	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan			40	-	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV			100	-	-
Computer			200	-	-
Laptop			65	-	-
Mobile charger	1521	2	5	5,475.60	-
Refrigerator			300	-	-
Water pump			500	-	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Manau** NP/VDC : VDC

Average family member	5.44	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
10	65	5	5	15	

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	1,012,320.00	kg of fuelwood	20	213,120.00	kg of residue
ICS	72	-	kg of fuelwood	15	-	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	95,040.00	Cubic meter			
Petroleum fuel	0.5	8.00	Cyliner of LPG	11.11	-	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	400	3	0.007	3.02		kL
Candle	300	3	0.005	1.62		MT
Solar	35	5	8-SSHS,16-SHS	846.00	4,212	kWh
Tube light	200	3	36	7,776.00	-	kWh
CFL	1,000	18	9	58,320.00	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp			4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove	337.83	299,993.04	kg of fuelwood	135.2	120,013.20	kg of residue
ICS	67.56	-	kg of fuelwood		-	kg of residue
Petroleum fuel	4.16	-	Liter of kerosene	1.6	25.73	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling Grid Off-Grid

Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan	230	10	40	8,280	-
Air conditioning			950	-	-

Other electric devices Grid Off-Grid

Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	200	6	100	43,200	-
Computer	15	6	200	6,480	-
Laptop	10	4	65	936	-
Mobile charger	800	6	5	8,640	-
Refrigerator	15	18	300	7,290	-
Water pump	50	3	500	27,000	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Mainapokhara** NP/VDC : VDC

Average family member	4.94	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
10	50	2	5	27	6

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	1,446,660.00	kg of fuelwood	20	304,560.00	kg of residue
ICS	72	-	kg of fuelwood	15	-	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	129,240.00	Cubic meter			
Petroleum fuel	0.5	63.50	Cyliner of LPG		-	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	1,050	1.5	0.007	3.97		kL
Candle	100	1.5	0.005	0.27		MT
Solar	84	5	8-SSHS,16-SHS	270.00	-	kWh
Tube light	855	2.5	36	27,702.00	-	kWh
CFL	100	2.5	9	810.00	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp			4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove	22.93	29,098.17	kg of fuelwood	22.93	29,098.17	kg of residue
ICS	17.19	-	kg of fuelwood	17.2	-	kg of residue
Petroleum fuel	3	36.00	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan	400	12	40	17,280.00	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	800	2	100	57,600.00	-
Computer	80	2	200	11,520.00	-
Laptop	70	5	65	8,190.00	-
Mobile charger	900	2	5	3,240.00	-
Refrigerator	100	10	300	27,000.00	-
Water pump	45	1	500	8,100.00	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Manpur Tapara** NP/VDC : NP

Average family member	5.63	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
10	67.27	10	10	2.6	0.13

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	1,564,080.00	kg of fuelwood	20	329,280.00	kg of residue
ICS	72	-	kg of fuelwood	15	-	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	98,280.00	Cubic meter			
Petroleum fuel	0.5	10.50	Cyliner of LPG	12.5	600.00	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	1,600	2	0.007	8.06		kL
Candle	100	1	0.005	0.18		MT
Solar	41	5	8-SSHS,16-SHS	126.00	5,364	kWh
Tube light	200	2	36	5,184.00	-	kWh
CFL	1,200	2	9	7,776.00	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp		2	4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove	142	194,824.00	kg of fuelwood	126	172,872.00	kg of residue
ICS	120	-	kg of fuelwood	30	-	kg of residue
Petroleum fuel	1	4.00	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity	0	-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan	1474	4	40	21,225.60	-
Air conditioning	50	1	950	4,275.00	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	476	4	100	68,544	-
Computer	20	6	200	8,640	-
Laptop	30	12	65	8,424	-
Mobile charger	2,015	1	5	3,627	-
Refrigerator	15	2	300	810	-
Water pump	200	1	500	36,000	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Motipur** NP/VDC : VDC

Average family member	5.05	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
11	52	2	2	29	4

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	3,619,500.00	kg of fuelwood	20	762,000.00	kg of residue
ICS	72	-	kg of fuelwood		-	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	241,560.00	Cubic meter			
Petroleum fuel	0.5	161.00	Cyliner of LPG	13	1,560.00	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	3,000	1.5	0.007	11.34		kL
Candle	1,000	1.5	0.005	2.70		MT
Solar	165	5	8-SSHS,16-SHS	-	-	kWh
Tube light	3,943	3	36	153,303.84	-	kWh
CFL			9	-	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp	3,130	5	4	22,536.00	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove		-	kg of fuelwood		-	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan	3500	12	40	151,200	-
Air conditioning	105	6	950	53,865	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	3,000	2	100	216,000.00	-
Computer	1,250	2	200	180,000.00	-
Laptop	200	4	65	18,720.00	-
Mobile charger	9,000	2	5	32,400.00	-
Refrigerator	100	10	300	27,000.00	-
Water pump	56	1	500	10,080.00	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Nayagaun** NP/VDC : NP

Average family member	5.60	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
3	93			4	

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	1,010,040.00	kg of fuelwood	20	212,640.00	kg of residue
ICS	72	-	kg of fuelwood	15	-	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	47,520.00	Cubic meter			
Petroleum fuel	0.5	3.00	Cyliner of LPG		-	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	95	3	0.007	0.72		kL
Candle			0.005	-		MT
Solar	16	5	8-SSHS,16-SHS	-	252	kWh
Tube light			36	-	-	kWh
CFL	1,031	6	9	20,042.64	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp			4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove	50	44,300.00	kg of fuelwood	36.54	32,374.44	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan	957	5	40	17,226	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	926	3	100	100,008.00	-
Computer	45	3	200	9,720.00	-
Laptop	12	4	65	1,123.20	-
Mobile charger	4,504	2	5	16,214.40	-
Refrigerator	25	8	300	5,400.00	-
Water pump	360	2	500	129,600.00	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Neulapur** NP/VDC : VDC

Average family member	4.98	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
9	58			33	

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	2,656,200.00	kg of fuelwood	20	559,200.00	kg of residue
ICS	72	-	kg of fuelwood	15	-	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	145,080.00	Cubic meter			
Petroleum fuel	0.5	111.00	Cyliner of LPG		-	Liter of kerosene
Electric device	80	960.00	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	1,061	4	0.007	10.69		kL
Candle			0.005	-		MT
Solar	114	5	8-SSHS,16-SHS	2,106.00	3,240	kWh
Tube light			36	-	-	kWh
CFL	1,239	6	9	24,086.16	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp			4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove	20.36	47,438.80	kg of fuelwood	17.3	40,309.00	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan	1000	8	40	28,800	-
Air conditioning	10	8	950	6,840	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	762	8	100	219,456.00	-
Computer	100	10	200	72,000.00	-
Laptop			65	-	-
Mobile charger	11,000	4	5	79,200.00	-
Refrigerator	50	8	300	10,800.00	-
Water pump	20	3	500	10,800.00	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Padnaha** NP/VDC : VDC

Average family member	5.80	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
3.11	87.82	1.13		7.88	0.06

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	1,342,920.00	kg of fuelwood	20	282,720	kg of residue
ICS	72	133,920.00	kg of fuelwood	15	27,900	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	45,360.00	Cubic meter			
Petroleum fuel	0.5	5.00	Cyliner of LPG	10	-	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	75	2	0.007	0.38		kL
Candle	75	2	0.005	0.27		MT
Solar	25	5	8-SSHS,16-SHS	-	-	kWh
Tube light	430	3	36	16,718.40	-	kWh
CFL	1,200	3	9	11,664.00	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp			4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove	42.3	49,829.40	kg of fuelwood	20	23,560.00	kg of residue
ICS	31.73	59,017.80	kg of fuelwood	15	27,900.00	kg of residue
Petroleum fuel	4.2	-	Liter of kerosene	-	-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan	700	6	40	15,120	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	960	3	100	103,680.00	-
Computer	25	5	200	9,000.00	-
Laptop	6	2	65	280.80	-
Mobile charger	1,200	2	5	4,320.00	-
Refrigerator	250	10	300	67,500.00	-
Water pump	700	2	500	252,000.00	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Pashupatinagar** NP/VDC : VDC

Average family member	5.6	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
6.53	55.72	0.16		37.32	0.27

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	1,019,160.00	kg of fuelwood		-	kg of residue
ICS	72	-	kg of fuelwood		-	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	119,880.00	Cubic meter			
Petroleum fuel	0.5	2.00	Cyliner of LPG		-	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	300	3	0.007	2.27		kL
Candle	85	1	0.005	0.15		MT
Solar	56	5	8-SSHS,16-SHS	-	-	kWh
Tube light			36	-	-	kWh
CFL	1,125	5	9	18,225.00	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp			4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove	83.9	75,006.60	kg of fuelwood	82.23	73,513.62	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan			40	-	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	1,058	10	100	380,880.00	-
Computer	15	9	200	9,720.00	-
Laptop	14	9	65	2,948.40	-
Mobile charger	1,195	2	5	4,302.00	-
Refrigerator			300	-	-
Water pump	20	1	500	3,600.00	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Patabhar** NP/VDC : VDC

Average family member	5.8	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
8	80			12	

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	2,205,900	kg of fuelwood	20	464,400	kg of residue
ICS	72	-	kg of fuelwood	15	-	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	216,000	Cubic meter			
Petroleum fuel	0.5	8	Cyliner of LPG		-	Liter of kerosene
Electric device	80	960	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	1,700	3	0.007	12.85		kL
Candle			0.005	-		MT
Solar	87	5	8-SSHS,16-SHS	-	9,936.00	kWh
Tube light			36	-	-	kWh
CFL	4,000	3	9	38,880.00	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp			4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove	100	193,500.00	kg of fuelwood	98	189,630.00	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan	1500	6	40	32,400	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	1,200	5	100	216,000	-
Computer	250	8	200	144,000	-
Laptop	90	8	65	16,848	-
Mobile charger	7,400	2	5	26,640	-
Refrigerator	150	10	300	40,500	-
Water pump	400	6	500	432,000	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Rajapur** NP/VDC : NP

Average family member	4.82	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
3.5	75.99	3.17		11.41	5.93

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	2,593,500	kg of fuelwood	20	546,000	kg of residue
ICS	72	-	kg of fuelwood	15	-	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	59,400	Cubic meter			
Petroleum fuel	0.5	100	Cyliner of LPG	18.2	3,713	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	1051	4	0.007	10.59		kL
Candle			0.005	-		MT
Solar	33	5	8-SSHS,16-SHS	-	-	kWh
Tube light	300	5	36	19,440.00	-	kWh
CFL			9	-	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp			4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove		-	kg of fuelwood		-	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan			40	-	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	925	5	100	166,500	-
Computer	59	6	200	25,488	-
Laptop	20	5	65	2,340	-
Mobile charger	1645	2	5	5,922	-
Refrigerator			300	-	-
Water pump	30	4	500	21,600	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Sanoshree** NP/VDC : VDC

Average family member	4.36	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
29	30		1	40	

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	3,837,240.00	kg of fuelwood	20	807,840	kg of residue
ICS	72	38,880.00	kg of fuelwood	15	8,100	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	118,080.00	Cubic meter			
Petroleum fuel	0.5	191.50	Cyliner of LPG		-	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp			0.007	-		kL
Candle	1,000	2	0.005	3.60		MT
Solar	72	5	8-SSHS,16-SHS	414.00	180.00	kWh
Tube light	100	5	36	6,480.00	-	kWh
CFL	1,000	4	9	12,960.00	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp			4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove		-	kg of fuelwood		-	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling Grid Off-Grid

Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan	4000	12	40	172,800.0	-
Air conditioning			950	-	-

Other electric devices Grid Off-Grid

Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	3,000	2	100	216,000	-
Computer	50	4	200	14,400	-
Laptop	50	5	65	5,850	-
Mobile charger	14,000	2	5	50,400	-
Refrigerator	100	10	300	27,000	-
Water pump	100	2	500	36,000	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Shivapur** NP/VDC : VDC

Average family member	5.271	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
13	46.63		0.5	39.87	

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	1,405,620	kg of fuelwood	20	295,920	kg of residue
ICS	72	-	kg of fuelwood	15	-	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	72,720	Cubic meter			
Petroleum fuel	0.5	10	Cyliner of LPG	17.22	1,446	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	399	2	0.007	2.01		kL
Candle	95	1	0.005	0.17		MT
Solar	47	5	8-SSHS,16-SHS	54.00	756	kWh
Tube light	335	6	36	26,049.60	-	kWh
CFL	1,219	8	9	31,596.48	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp			4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove	61.77	76,162.41	kg of fuelwood		-	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan			40	-	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	600	4	100	86,400.00	-
Computer	50	6	200	21,600.00	-
Laptop	35	8	65	6,552.00	-
Mobile charger	1,446	2	5	5,205.60	-
Refrigerator			300	-	-
Water pump			500	-	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Sorhawa** NP/VDC : VDC

Average family member	4.95	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
30.89	56.2	12.91			

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	2,919,540.00	kg of fuelwood	20	614,640	kg of residue
ICS	72	-	kg of fuelwood	15	-	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	66,960.00	Cubic meter			
Petroleum fuel	0.5	40.00	Cyliner of LPG		-	Liter of kerosene
Electric device	80	960.00	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	2,738	1.5	0.007	10.35		kL
Candle	70	1.5	0.005	0.19		MT
Solar	35	5	8-SSHS,16-SHS	72.00	-	kWh
Tube light			36	-	-	kWh
CFL			9	-	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp			4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove		-	kg of fuelwood		-	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan		12	40	-	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	1,100	2.5	100	99,000	-
Computer	80	2	200	11,520	-
Laptop	12	5	65	1,404	-
Mobile charger	400	2	5	1,440	-
Refrigerator	60	10	300	16,200	-
Water pump	2,700	1	500	486,000	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Suryapatuwa** NP/VDC : VDC

Average family member	5.6	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
6	80			14	

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	1,737,360	kg of fuelwood	20	365,760	kg of residue
ICS	72	-	kg of fuelwood	15	-	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	82,800	Cubic meter			
Petroleum fuel	0.5	2	Cyliner of LPG		-	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp			0.007	-		kL
Candle	1,500	2	0.005	5.40		MT
Solar	31	5	8-SSHS,16-SHS	1,116.00	7,236	kWh
Tube light	1,800	5	36	116,640.00	-	kWh
CFL	1,800	10	9	58,320.00	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp	18	10	4	259.20	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove		-	kg of fuelwood		-	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan	700	7	40	17,640	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	500	5	100	90,000.00	-
Computer	4	5	200	1,440.00	-
Laptop	10	3	65	702.00	-
Mobile charger	9,000	2	5	32,400.00	-
Refrigerator	20	10	300	5,400.00	-
Water pump	18	1	500	3,240.00	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Taratal** NP/VDC : VDC

Average family member	4.73	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
20	20	7	3	50	

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	1,797,780.00	kg of fuelwood	20	378,480	kg of residue
ICS	72	-	kg of fuelwood	15	-	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	57,960.00	Cubic meter			
Petroleum fuel	0.5	18.50	Cyliner of LPG	12	864	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	2,000	3	0.007	15.12		kL
Candle	5,000	3	0.005	27.00		MT
Solar	37	5	8-SSHS,16-SHS	-	-	kWh
Tube light			36	-	-	kWh
CFL	10,000	8	9	259,200.00	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp	300	5	4	2,160.00	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove	320	504,640.00	kg of fuelwood	270	425,790	kg of residue
ICS	80	-	kg of fuelwood	75	-	kg of residue
Petroleum fuel	1.01	6.06	Liter of kerosene	1	37	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan	700	10	40	25,200.00	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	6,000	5	100	1,080,000	-
Computer	300	10	200	216,000	-
Laptop	200	12	65	56,160	-
Mobile charger	8,000	2	5	28,800	-
Refrigerator			300	-	-
Water pump			500	-	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Thakurdwara** NP/VDC : VDC

Average family member	5.047	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
7.7	62.3	0.5	0.5	29	

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	1,706,580.00	kg of fuelwood	20	359,280	kg of residue
ICS	72	-	kg of fuelwood	15	-	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	73,800.00	Cubic meter			
Petroleum fuel	0.5	15.50	Cyliner of LPG	19	1,140	Liter of kerosene
Electric device	80	-	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	495	2	0.007	2.49		kL
Candle	150	1	0.005	0.27		MT
Solar	57	5	8-SSHS,16-SHS	180.00	324	kWh
Tube light	665	4	36	34,473.60	-	kWh
CFL	1,455	5	9	23,571.00	-	kWh
Incandecent lamp			40	-	-	kWh
LED lamp			4	-	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove	59.5	89,071.50	kg of fuelwood		-	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan	1215	12	40	52,488	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	1,100	2	100	79,200.00	-
Computer	70	4	200	20,160.00	-
Laptop	50	5	65	5,850.00	-
Mobile charger	1,742	2	5	6,271.20	-
Refrigerator	28	10	300	7,560.00	-
Water pump	1,200	1	500	216,000.00	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

VDC/Municipality level energy consumption trend

1. Name of the VDC/Municipality **Gulariya NP** NP/VDC : NP

Average family member	4.97	Family head	Male

2. Ethinicity %

Dalit	Janajati	Madhesi	Muslim	B/C/T	Others
7	15	10	3	45	20

3. Annual energy consumption per household

Cooking and water boiling

Cook stove	Cons./HH/ month	Amount	Unit of fuel type	Cons/ HH/ month	Amount	Unit of fuel type
Traditional cook stove	95	10,336,380	kg of fuelwood	20	2,176,080	kg of residue
ICS	72	-	kg of fuelwood	15	-	kg of residue
MICS		-	kg of fuelwood	-	-	kg of residue
Biogas	30	214,920	Cubic meter			
Petroleum fuel	0.5	718	Cyliner of LPG	6.75	8,991	Liter of kerosene
Electric device	80	9,600	kWh (grid)		-	

Lighting

Type of device	No/day	Hour/day	Capacity (W)	Consp./yr		Unit
Kerosene lamp	111	2	0.007	0.56		kL
Candle	350	1	0.005	0.63		MT
Solar	139	5	8-SSHS,16-SHS	-	-	kWh
Tube light	8,000	3	36	311,040.00	-	kWh
CFL	15,000	3	9	145,800.00	-	kWh
Incandecent lamp	4,000	3	40	172,800.00	-	kWh
LED lamp	4,420	3	4	19,094.40	-	kWh

Space heating

Cook stove	Cons./ HH/yr	Amount	Unit of fuel type	Cons./ HH/yr	Amount	Unit of fuel type
Traditional cook stove		-	kg of fuelwood		-	kg of residue
ICS		-	kg of fuelwood		-	kg of residue
Petroleum fuel		-	Liter of kerosene		-	Cyliner of LPG
Electric device , capacity		-	kWh (grid)		-	kWh (off grid)

Space cooling

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
Electric fan			40	-	-
Air conditioning			950	-	-

Other electric devices

				Grid	Off-Grid
Type of device	No/day	Hour/day	Capacity (W)	Total energy (kWh)	
TV	5,000	5	100	900,000	-
Computer	1,000	4	200	288,000	-
Laptop	500	4	65	46,800	-
Mobile charger	20,000	2	5	72,000	-
Refrigerator	800	10	300	216,000	-
Water pump	4,000	1	500	720,000	-

4. Solar Photovoltaic Pumping System and Institutional Solar Power System

Name	Benefited HH	Capacity (W)	Total Energy	Remarks

Annex-3: VDC/Municipality level energy resources and commercial institutions

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VDC/Municipality level resources and commercial institutions

Name of the VDC/Municipality Badalpur

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Mailati Khola		1	9
2	Tapara Khola		2	4,9
3	Ratiya Khola		1	5,6
4				

Forest area

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Rice Mill	5		Electricity	
2					
3					
4					

Name of the VDC/Municipality Bagnaha

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Babae Khola		2	4,5
2	Jabti Khola		7	2,7
3	Jundal Nala		5	1,9
4	Jutpani Jharana		3	1,3

Forest area 528 ha

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Rice mill	6	5 kW	Electricity	
2					
3					
4					
5					

Name of the VDC/Municipality Baniyabhar

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Babai Nadi	50	2	1 to 9
2	Ojowa Nala	11	5	5,6,8
3				
4				

Forest area

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Rice Mill	4	5kW	Electricity	
2					
3					
4					
5					

VDC/Municipality level resources and commercial institutions

Name of the VDC/Municipality Belawa

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Dunduwa Khola			2,6,8
2	Kumpra Khola			1,7,9
3	Ghatte Khola			4,5,7

Forest area

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Rice Mill	5	1000 kW	Electricity	
2					

Name of the VDC/Municipality Bhimpur

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Geruwa Nadi			1 to 9
2				

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Rice Mill	5			
2					

Name of the VDC/Municipality Daulatpur

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Chautariya Kulo			
2	Madali Nala			1,2,5,9
3	Chakkhapur Kulo			

Forest area 2837 Bigha

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Unique Nepal	40			
2	Nirdhan Utthan Bank	35			
3	Asal Chhimaki Nepal	3			
4	Rice Mill	4			Electricity
5	Kastha Udhyog	2			Electricity

Name of the VDC/Municipality Deudakala

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Gandaela Khola			1,4,6,8
2	Chamla Nal			5,9
3	Jhagad Badhuwa Khola			1,3,6,8

Forest area 1820 ha

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1					
2					

VDC/Municipality level resources and commercial institutions

Name of the VDC/Municipality Dhadwar

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Jhurnaiya Khola			4,6,7
2	Jurpani			5,8,9
3	Pathraiya			1,3,4
4	Bhada			2,5,7

Forest area 5516 Biga

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1					
2					
3					
4					

Name of the VDC/Municipality Dhodari

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Bahgaire Tal		5	9
2	Karnali Nadi		12	9
3	Babai Nadi		10	1,2
4				

Forest area 749.69 ha

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Sanghsil Sahakari Rice Mill	1		Electricity	
2	Pioneer Sahakari Rice Mill	1			
3					
4					

Name of the VDC/Municipality Gola

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Geruwa Nadi			1,2,3,5,8,9
2	Budhi Kulo			4,6
3				
4				

Forest area 36 ha

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Rice Mill	5	100 kW	Electricity	
2					
3					
4					

VDC/Municipality level resources and commercial institutions

Name of the VDC/Municipality Jamuni

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Nkaha Nala			1,2
2	Padriya Khola			1

Forest area 65 Ha

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Rice Mill	6	5 kW	Electricity	
2					
3					

Name of the VDC/Municipality Kalika

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Dyang Nadi			4
2				

Forest area 1048 Ha

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Rice Mill	7			
2					
3					
4					

Name of the VDC/Municipality Kahiri Chandanpur

Name of the small rivers in the village

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Maila khola			

Commerical institutions in the VDC

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Annaan Sahakari	1			
2	Anjuli Sahakari	1			
3	Nabikaran Sahakari	1			
4	Akirti Sahakari	1			

Name of the VDC/Municipality Magragadi

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Jabdi Nala			1 to 9
2	Nahar			7,8,9

Forest area 2078 ha

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Barpipal Sahakari	1			
2	Bipannata mukhi Sahakari	1			
3	Saidan Sahakari	1			

VDC/Municipality level resources and commercial institutions

Name of the VDC/Municipality Mahamadpur

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Kanjadawa Nala			8
2	Bhara Nadi			8,9

Forest area

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Yadv Ita Udhyog	1	1 kW	Wood coal	
2					

Name of the VDC/Municipality Manau

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Gehuwa Bheri Nadi			1,3,5,8,9
2	Maila Nala			3,4,6,7

Forest area 40 ha

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1					
2					
3					

Name of the VDC/Municipality Mainapokhara

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Chapala Nala			1,2,8
2	Madkiya Khola			1,2,8,9
3				

Forest area

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Biswo Mill	1		electricity	
2	Jivan udhyog Mill	1		electricity	
3	Ita Udhyog	2		Fuelwood	

Name of the VDC/Municipality Manpur Tapara

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Rataiya Nala			3,4,7,8
2	Chandra Bijuwa Jharana			1,2
3	Kati Jharana			8,9

Forest area

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Puspanjali Sahakari	1		Solar	
2	Mayush	1			
3	Samjhana sahakari	1			

VDC/Municipality level resources and commercial institutions

Name of the VDC/Municipality Motipur

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Reu Khola			2,4,5
2	Chapla Khola			6,7
3	Murgiya Khola			6,7

Forest area

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1					
2					

Name of the VDC/Municipality Nayagaun

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Ratahiaya Jodhpur			6,8
2	Maila Nala			1,3,4,5
3	Budhi kulo			1,2,7,9

Forest area

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Mill	4	15 w	Electricity	
2					

Name of the VDC/Municipality Neulapur

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Ambasa Nadi			1 to 9
2	Otai Nadi			1 to 9

Forest area 1200 ha

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Suraj Rice Mill	1		Electricity	
2	Jaya Khadya Udhyog	1		Electricity	

Name of the VDC/Municipality Padnaha

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Budi Kula			1,2,5,6,7,9
2	Hada Kula			2
3	Karam Nala			1,2,4,5

Forest area 750 ha

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Mill	1			
2	Aara Mill	2			
3	Grill udhyog	1			

VDC/Municipality level resources and commercial institutions

Name of the VDC/Municipality Pasupati Nagar

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Geruwa Nadi			
2	Budi kula			

Forest area 15 ha

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Rice mill	1			
2					

Name of the VDC/Municipality Patbhar

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Karnali			3,4,7,8,9
2	Budi Kulo			1,2,3,5,7,8,9

Forest area 200 ha

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Rice mill	7			
2					

Name of the VDC/Municipality Rajapur

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Karnali nadi			1,4,5,6,8,9
2	Budi khola			2,3,4,7
3	Mukarsha Nala			1,4,5,6,7

Forest area 818 Bigha

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Mill	11		Electricity	
2	Ita Udhyog	5		Electricity	
3	Furniture udhyog	2		Electricity	

Name of the VDC/Municipality Sanoshree

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Babai Nadi			4
2				

Forest area

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Aara Mill	2		Electricity	
2	Pauroti Udhyog	3		Electricity	
3	Chiura Mill	1		Electricity	
4	Seller Mill	14		Electricity	
5	Furniture Udhyog	18		Electricity	

VDC/Municipality level resources and commercial institutions

Name of the VDC/Municipality Sivapur

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Orahi khola			1,4,6,9
2	Githe Khola			1,4,6,9

Forest area

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1					
2					
3					

Name of the VDC/Municipality Sorhawa

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Man Khola			
2	Duduwa Khola			

Forest area 1250 ha

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Himal Masala Udhyog				
2	Skchyam Udhyog				
3	Ita Udhyog				

Name of the VDC/Municipality Surya patuwa

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Orai Nadi			2,4,5,6,8,9
2	Karnali Nadi			1,3
3	Dunda Nadi			2,3,4,5

Forest area 259 Bigha

Commerical institutions

S.N.	Name	Type	Number	Capacity	Fuel use	Technology
1	Rice mill	Kutani pisani	7		Electricity	
2						

Name of the VDC/Municipality Taratal

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1				
2				

Forest area

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1	Furniture Udhyog	3		Electricity	
2	Rice mill	5		Electricity	
3	Grill	1		Electricity	

VDC/Municipality level resources and commercial institutions

Name of the VDC/Municipality Thakurdwara

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Orahi khola		3	1,4,7
2	Geruwa nadi		2	2,5,6,9
3	Bhansariya khola		1	5,6,9

Forest area

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1					

Name of the VDC/Municipality Gulariya NP

Name of the small rivers

SN	Name	Average flow rate (lit/s)	Head (m)	Covered ward
1	Babai Nadi			7,8
2	Sarju Nadi			2

Forest area 1211 Bigha

Commerical institutions

S.N.	Name	Number	Capacity	Fuel use	Technology
1					
2					
3					
4					

Annex-4: Attendance of workshop

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आज मिति २०७१-८-२६ गतेका दिन जिल्ल जलवायु तथा उर्जा योजना तर्जुमा गोष्ठी स्था.वि.अ डिल्लीराम सिग्देलको सभापतित्वमा तपशीलको उपस्थितिमा सम्पन्न भयो।

उपस्थिति

१ श्री डिल्लीराम सिग्देल स्था.वि.अ.
२) डिल्लीराम आचार्य प्र.का.
३) तिलकराम शर्मा हिमाल एनेकपा (माओवादी)
४. सूर्य नारायण मण्डल - नेपाल विद्युत प्राधिकरण
५. [illegible] - [illegible], बर्दिया
६ लक्ष्मी गुप्ता - सद्भावना पार्टी
७, मोत्र राज शर्मा अध्यक्ष, नेपाल पत्रकार महासंघ बर्दिया
८ [illegible] GBS [illegible] बर्दिया
९ सुजन कँडेल यो.अ. जि.वि.स. बर्दिया
१० [illegible] जि.प.अ.
११. जीतबहादुर शाह, जि.शि.अ.
१२ [illegible] रा.प्र.पा. नेपाल
१३ दिपक खड्का का.प्रमुख- इ.ना.संघ गुलरिया
१४ - [illegible] भारती - सदस्य [illegible] पार्टी (उपाध्यक्ष)
१५ राम सुरत यादव ने.क.पा. संयोजक
१६ काशी राम चौधरी मधेशी जनअधिकार फोरम नेपाल (लो.)
१७ बिष्णु [illegible] - नेपाली कांग्रेस महासमिति सदस्य
१८ मंगल प्रसाद पौडेल जि. संयोजक, NCDS
१९ केशव कुमार यादव ने.म.लो.पा.
२० [illegible] नेपाल परिवार [illegible] अध्यक्ष
२१ [illegible] कुमार कर्माचार्य [illegible] [illegible] बर्दिया
२२ नरहरि तिवारी उपनिर्वाचन कार्यालय, बर्दिया
२३ ज्ञानप्रसाद [illegible] जि.प्र.का. जि. को [illegible]
२४ [illegible] कुमार [illegible] - [illegible] प्रतिनिधि
२५ टंक प्रसाद अधिकारी [illegible]
२६ खड्गबहादुर पौडेल रा.ज.मो. जिल्ला सदस्य

२८)	हौसला शाक्य	आस्था नेपाल, कुपन्डोल
२८)	कमला खवाली	" " जेकोपुन
२९)	रेखा कुमार शाह	नं.पा. नाला
३०)	हरि खनाल	ने.क.पा (एमाले)
३१)	कृष्ण प्रसाद पाण्डेय	
३२	उत्सवश्री ज्ञानप्रजापति	MCPL, Kathmandu
33)	उमेश शर्मा	MCPL, Kathmandu
३४ ४०	ओम प्रसाद नेवाली	त्रि.वि.से
३५ ४१)	अशोक बलेन	JJMS USIDI साझेदारी
३६ ४२)	विष्णु प्र. पौडेल	विकास परियोजना
३७ ४३)	तेज बहादुर भाट - सहायक	
३८ ४४)	सम्झना घर्तिमगर	
३९ ४५)	सुनिल पोखरेल	जिविस कार्यालय (OA)
४० ४६)	संजय थापा	गुलरिया बर्दिया
४१ ४७)	लोकराज उपाध्याय	स्थानिय, गुलरिया
४२ ४८)	प्रदिप रिजाल	गुलरिया बर्दिया
४३ ४९)	जगदिश चौधरी	स्थानिय, गुलरिया
४४ ५०)	धर्म परियार	स्थानिय, बर्दिया
४५ ५१)	रेखा खत्री	गुलरिया बर्दिया
४६ ५२)	नरेन्द्र बडुवाल	बर्दिया, गुलरिया
४७ ५३)	लाल ब. चौधरी	बर्दिया गुलरिया
४८ ५४)	पूर्ण शर्मा	गुलरिया, बर्दिया
४९ ५५)	विजय थापा	कालिका बर्दिया
५० ५६)	हरी रोका	गुलरिया, बर्दिया
५१ ५७)	रिता कुवाँर	बर्दिया गुलरिया
५२ ५८)	केशव मगर	जिविस बर्दिया
५३)	नहाके कामदार	जिविस बर्दिया
५४)	प्रेम राज बाल	बर्दिया
५५)	देवराज गिरी	जि.वि.स. बर्दिया
५६)	रमेश घर्ती	"
५७)	ममकान्त कांडेल	जिविस बर्दिया
५८)	यज्ञ ब. पौडेल	जिविस बर्दिया

५९)	मित्र प्रकाश गिरी	जिविस बर्दिया	[signature]
६०)	मञ्जु थापा	गुलरिया बर्दिया	[signature]
६१	विश्व विवेक पाण्डे	जिविस बर्दिया	[signature]