Government of Nepal
Ministry of Environment
Alternative Energy Promotion Centre (AEPC)

DISTRICT CLIMATE AND ENERGY PLAN (DCEP) PREPARATION GUIDELINE

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Acronyms and Abbreviations

AEPC	Alternative Energy Promotion Centre
ASS	After Sales Service
BSP-N	Biogas Sector Partnership Nepal
BSP	Biogas Support Program
DCEP	District Climate and Energy Plan
DDC	District Development Committee
DEECC	District Energy and Environment Committee
DEEU	District Energy and Environment Unit
DEMP	District Energy Master Plan
DESR	District Energy Situation Report
DEPP	District Energy Perspective Plan
DFID	Department for International Development
DPP	District Periodic Plan
ESAP	Energy Sector Assistance Programme
EU	European commission
GSI	Gender and Social Inclusion
IWM	Improved Water Mill Programme
LAPA	Local Adaptation Plan of Action
LDO	Local development Officer
LSGA	local self governance act
MHP	Micro Hydro programme
MoE	Ministry of Environment
NAPA	National Adaptation Programme of Action
REDP	Rural Energy Development Programme
REP	Renewable Energy Programme
RET	Renewable Energy Technology

SNV	Netherlands Development Organisation
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
VDC	Village Development Committee

Section 1: Introduction

1.1 District Climate and Energy Plans (DCEP)

1.1.1 Background

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 development of renewable energy technologies, which contributes to energy supply and environmental protection at local level.

Energy has a correlation with climate change issues in terms of energy production and high dependence on natural resources. The impacts of climate change are most serious in developing countries where biomass is a major traditional source of energy for daily life. Due to a lack of fossil fuel reserves and low capacity for purchasing imported fuels, about 90 percent of Nepal's energy consumption depends on biomass fuels.

The responsible body for renewable energy in Nepal is the Ministry of Environment (MoE), which, established the Alternative Energy Promotion Centre (AEPC) as a state owned organisation in 1996 to lead renewable energy sub-sector. Different Renewable Energy programmes are operated by AEPC with support from Danish and Norwegian Governments, UNDP, World Bank, European commission (EU) and Netherlands Development Organisation (SNV).

Energy provision is being implemented at district level through a wide variety of actors including private companies, government and non government organizations and microfinance institutions. The District Development Committees (DDCs) are taking initiatives and consolidating to establish District Energy and Environment Section/Unit and to form District Energy and Environment Committees (DEECC) in order to coordinate and operationalise Renewable Energy Technologies (RETs) in the districts.

There have been a number of attempts by different organisations to create energy plans at district and village levels that have attempted to map the supply and demand of renewable energy through development of District Energy Situation Reports (DESRs), District/Village Energy plans, District Energy Perspective Plans (DEPPs) and District Energy Master Plans (DEMPs), which, attempt to further map RET supply and potential demand in districts outside the DESR districts. However, there is still a need to have concrete energy planning for RE in the majority of districts, there is no long term visionary plan for energy to guide and direct development.

District energy planning should cover more than just mapping RETs. They should also be set within a broader framework that encapsulates national energy plans for coordination and consistency. AEPC is ideally positioned to provide an integrated approach for clean energy and climate change by developing local, on-the-ground adaptation and mitigation practices that can be linked to wider climate change frameworks including National Adaptation Programme of Action (NAPA) and Local Adaptation Plans of Actions (LAPA).

AEPC with the technical assistance of SNV Nepal and financial support from the UK's Department for International Development (DFID) is now proceeding in the development of District Climate and Energy Plans (DCEPS), which will improve the implementation of district energy plans and develop methods for coordinating plans with integrating national and local climate mitigation and adaptation activities as well as assuring that the planning process addresses gender and social inclusion issues.

DCEP is a key document that shows how the District Development Committees (DDCs) should address district climate issues in relation to energy development at district level whilst incorporating the mainstreaming of gender and social inclusion issues. They will provide an inventory of district energy resources to identify the most appropriate actions and opportunities and interventions for increasing access to RETs and therefore promoting low carbon development as well as how RET's will contribute to climate change adaptation measures. In addition to vulnerabilities caused by climate change and potential resilience created through energy measures, gender and social inclusion can also affect resilience and if ignored can lead to inappropriate policy measures (PA, 2010). GSI is therefore a key component of DCEPs and will be addressed throughout the process.

DCEP Defined
The overall goal of the DCEP is to create an implementation plan that increases appropriate RET dissemination and construction in each district of Nepal and contributes to Nepal's national and local climate change mitigation and adaptation plans. DCEPs will act as a systematic roadmap, which serves as a periodic rolling plan of the district in the sector of renewable energy development and climate change preparation. Strategies for development and dissemination of the RETs in the district will be mapped out and climate adaptation and mitigation and gender and social inclusion linkages identified.

The goal of DCEPs is to both expand coordination and service provision at district level but also to map out opportunities that renewable energy can contribute to climate change mitigation and adaptation.

DCEP specifically focus on identifying links between energy planning process Climate Change vulnerability and contribution to adaptation measures and creating access and participation of women and excluded groups.

Climate Change and the Energy Planning Process

In order to make energy planning climate change sensitive, all components of energy planning will need to systematically address climate change aspects at each step of planning.

Climate change definitions:

Adaptation to climate change is defined as:

'*Adjustments to actual or expected climatic stimuli to moderate harm or exploit benefits*' (IPCC, 2001).

Ability to adapt at country, community or household level is characterized as adaptive capacity and is related to the assets that one has access to (financial, natural resource, human and social capital) and how well these are used (Denton, O'Neill et al., 2008).

Climate change in relation to energy systems will relate to three elements:

1. Vulnerability to climate change: DCEPs should identify and prioritise societal, resource and technology related vulnerability to climate change.
2. Adaptation to climate Change: How can energy systems contribute to adaptation measures? – This will likely be through creation of livelihoods, income diversification and conservation of natural resources.
3. Contribution to Mitigation of climate change. Many renewable energy systems have a strong contribution to reducing greenhouse gasses that cause climate change

One of the priorities of this pilot planning process is that DCEPs are coordinated with other national and local energy and climate change planning processes. This is especially relevant to the implementation of National Adaptation Plans of Action (NAPA) and Local Adaptation Plans of Action (LAPA) and other climate change initiatives. It is anticipated that DCEP will directly contribute to these processes and that DCEPs will contribute to energy and adaptation measures of LAPAs.

GSI in the Energy and Climate Planning Process

There is a growing need for addressing not only climate concerns but also the human rights to energy facilities. This warrants planners and facilitators to have a basic understanding of climate change and its potential impacts as well as knowledge of how to address gender and social inclusion aspects in the planning process. Factors needed to integrate Gender and Social Inclusion issues into energy planning should also be systematically considered at each step of energy planning, rather than dealt with separately as is seen in many planning documents. GSI refers to the interaction of society with resources and technology in relation to gender and social discrimination and other aspects of inclusion.

GSI definitions

Gender refers to the socially constructed roles and responsibilities of women and men which include the expectations held about the characteristics, aptitude, and likely behaviour of both women and men (femininity and masculinity). These roles and expectations are learned, changeable over time, and variable within and between cultures.

Social inclusion is removal of the institutional obstacles that prevent socially excluded and marginalized groups as well the enhancement of incentives to exercise their rights and increase access and benefit from economic, social and political resources. It is also a process of creating an environment that gives every individual equal opportunities to access the resources, whatever social group she or he belongs to**.**

In order to promote and support the socio-economic empowerment of women and socially excluded groups through energy and climate change planning, a number of issues need to be addressed including:

- Recognising the diversity of women and different ethnic groups – Identification of differences and specifically targeting women and disadvantaged Socially excluded groups
- Increasing Access to RE services for different groups and how access is balanced by gender and ethnic diversity

- **Increasing** Participation of Women and socially excluded groups in decision making and sector employment
- Differentiated vulnerability to climate change for Women and socially excluded groups
- Varying adaptation mechanism for women and socially excluded groups

In order to ensure that women and socially excluded groups are equally addressed in the energy and climate planning process these issues need will need to be considered throughout the planning process.

A DCEP should not be regarded as a fixed and rigid document as circumstances change and ongoing actions provide different results and experiences, it may be useful and necessary to revise the plan on a regular basis depending on ongoing developments.

1.1.2 Objectives

Overall objectives
The overall objective of a DCEP is to prepare a climate change adaptive, decentralised renewable energy plan that presents a detailed implementation plan which can contribute to carbon mitigation and also ensures Gender and Social Inclusion issues are mainstreamed within the plan.

Specific objectives
Some of the specific objectives of the DCEP are;

- To outline energy needs of the respective districts,
- To carry out resource, technology and institutional assessments
- To carry out assessments of climate change, gender and social situations in the chosen districts
- To recommend interventions of renewable energy technologies based on incorporation of influencing factors of climate change and GSI and contribution to climate sensitivity and GSI mainstreaming.
- To assess the institutional arrangements of the district and identify adjustments and recommend improvements
- 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

1.1.3 Scope of DCEP

The focus of DCEPs is to both expand coordination and service provision of renewable energy at district level, identifying opportunities where energy can contribute to climate change mitigation and adaptation. The plans also intend to mainstream gender and social inclusion into energy planning and processes.

Some of the specific scopes of the DCEP are;

- Assess and analyse energy supply and consumption patterns in specific districts. supported by data disaggregated by gender and caste/ethnicity
- Identify potential of renewable/rural energy sources and associated technologies (Micro/Mini hydro, Solar PV, Improved Water Mills, Peltric sets, Wind, Biomass etc.

Targets and recommendations should identify appropriate technology based on climatic, geographical and socio-economic variations.

- Prepare a broad climate change assessment of the district – (based on existing data)
- Prepare a gender and social inclusion overview/assessment of the district
- 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, analyse capacity in terms of ability to implement RE strategy developed taking into consideration climate change and GSI issues including capacities for outreach, awareness of rights and access to information in languages they understand.
- Prepare an integrated, GSI inclusive climate change adaptive district energy plan supporting potential mitigation actions
- Provide tentative financial requirements for identified/proposed plan and suggest ways of finance (grant/ credit), funding mechanisms. This should include the costs of necessary support activities for addressing climate change and GSI issues
- Ensure that gender and social inclusion planning and processes are mainstreamed into the DCEP plans and recommendations provided for GSI strategies during implementation of the DCEP.
- Provide a monitoring and evaluation plan for the implementation of DCEP fully taking into account climate and GSI issues.

These should be followed in the preparation of DCEPs, however, considering the changing circumstances and variations between districts, the guidelines should be regarded as dynamic and plans should be revised on a regular basis.

1.1.4 Parameters and boundaries of DCEPs

There will be certain limitation to how much a DCEP can address. The topics of Renewable Energy, Climate change and Gender and Social Inclusion are very broad and it is not possible to address all aspects of these topics within a DCEP document.

It is expected that a DCEP will make clear linkages and recommendations for issues that cannot be addresses in a DCEP and identify who potentially can be responsible for further exploring these issues. In order for consultants to have a clear understanding of what is expected from them, this section aims at identifying the boundaries and parameters of a DCEP.

DCEPS should focus on forms of alternative and renewable energy, however where other forms of energy are relevant these should both be acknowledged and recommendations given.

Where other technologies are identified as both appropriate (in terms of climate and GSI) or as a supporting mechanism for renewable or alternative energy technologies they should be explicitly mentioned and recommended. Climate change is cross sectoral issue and will potentially affect many different sectors, whilst it is not advisable to look at specific sectors in isolation, it should be clear what the focus of a DCEP is. The focus of a DCEP is to identify appropriate energy technologies in a district in relation to climate and GSI and to design a detailed implementation plan in order to disseminate these technologies. There will be many cross cutting issues and linkages with other sectors including agriculture, water resources, health etc. A DCEP should highlight these linkages and make recommendations where further data about another sector is required. This will help provide linkages and support to wider climate change process.

1.2 DCEP Guideline

1.2.1 Guideline Rationale

The Rapid development of renewable energy systems that address climate change issues can only be achieved through careful planning. Thus, a systematic approach needs to be developed towards district climate and energy planning at all levels but particularly at the district levels.

The DCEP process will look at the institutional set up of the district in relation to dissemination of RE and make recommendations about what systems, processes and organisational arrangements need to be adjusted to improve RE dissemination and provide strong links to climate change activities and to mainstream gender and social inclusion into the process.

Through design of DCEPs, it has been recognised that a harmonised approach for planning is necessary. The guideline is aimed at supporting planners for integrating renewable energy with the climate change issues in preparing DCEPs. Specifically, the guideline will support energy planning in the context of climate change and GSI by:

1 Providing a systematic process, steps and tools to create District Climate and Energy plans that integrate climate change and GSI into energy planning

2 Providing ideas on assessing vulnerabilities of energy resources, sources and consumption and opportunities created by climate change

3 Enabling planners to make appropriate decisions on sustainable and clean energy development/adoption in the districts.

The DCEP preparation guideline intends to support the DDCs and consultants for preparing the DCEP of the respective districts in Nepal. The Guideline is expected to support the relevant institutions/organisations and individuals to carry out climate change adaptive renewable energy planning and its implementation.

1.2.2 Guideline Objectives

This guideline serves as a tool for the preparation of DCEPs and will guide not only in preparing DCEPs but also in identifying linkages with other sectoral plans and programmes. It highlights what the expected process for DCEP preparation is, what information and data is required, where that data is available and how it should be analysed and used to produce energy and climate change planning that can be replicated in any district across Nepal.

The guidelines are not meant to be rigid and it is expected that consultants will have space to revise existing tools and frameworks or design new ones that better suit the specifics of each district. The guidelines does however, aim to provide a certain level of standardisation amongst DCEP in different districts. In order to reduce the level of background data collection and research consultant organisations are required to undertake, this guideline will provide a detailed process on how a DCEP should be prepared. This will include:

- A chapter wise description of required data/analysis and requirements (**Section 3**)

- Required tools, methodologies and processes (**Annex A-C**)
- Links to data sources and appropriate reference materials (**Reference section and Annex C**)

1.2.3 Target Users

This guideline is designed to be used by organisations responsible for preparing DCEP in order to guide the DCEP preparation process. It can also assist AEPC and other responsible bodies to monitor the process. It should also be accessible to DDCs and District Energy and Environment Units (DEEUs) and District DCEP Task Forces to understand and coordinate DCEP preparation.

1.2.4 How to use Guidelines

This document should be used in association with its sister document produced by Practical Action Consulting and submitted to AEPC and SNV ***'Integration of Climate Change and Gender and Social Inclusion into District Climate and Energy Planning'***. Whereas this document highlights the process and steps necessary to prepare a DCEP, the other document is more of a reference document that will provide more background material and understanding on the topic of climate change, gender and social inclusion and energy planning.

This guideline should be dynamic and easy to use by different stakeholders at district and national level. It is important that consultants feel that they are not confined by these guidelines and are able to design tools and frameworks necessary to account for district specifics. Consultants should present new ideas in the inception report (section 3) and discuss with AEPC in order to revise the methodology.

It is envisaged that DCEP will be coordinated by DEEU/Ss; however the objective of the plan is to produce a detailed implementation plan that should be understandable for all stakeholders involved in the sector.

It is important for the efficiency of the DCEP planning process and for the sustainability of DCEP that they are prepared by organisations with a detailed understanding of the local situation in specific districts. It is recommended that national consultants should form joint ventures with local level organisations that have deep insight into the proposed districts.

The following outlines the main sections of the guidelines:

Section 1 of the guidelines presents an overview and rational for why the guidelines have been produced and describe their purpose.

Section 2 of the guidelines takes the reader through the DCEP preparation process and highlights how a DCEP should be prepared and what information and data is required. Throughout the guidelines links to information in the annexes have been highlighted in *italics*.

Section 3 of the guidelines presents a template of a DCEP and its contents

Section 2: DCEP Preparation Process

Section 2 highlights the planning process and provides guidance on how to prepare a DCEP. Chart-I depicted in this section shows the different planning steps required for DCEP and its implementation. Further details on major planning steps are highlighted in **Table-6** of this section. The table also defines:

- What information is required for each process step,
- What reference materials are available (and where to find them)
- What tools and frameworks are available to collect and analyse the information.

The majority of reference material and tools and frameworks are available within the annexure of this document. This should be a major source of guidance in the DCEP process.

Step.1. Preparatory phase

AEPC with significant input from the relevant DDC should be responsible for hiring the consultant organisation for preparing the DCEP. Having defined the conceptual framework and identified the appropriate organisations to prepare the plans, the first step in preparing a DCEP is to collect initial information and data and orient the respective districts both on the climate and energy planning concept and about the process.

1.1 Inception Report

In order to plan and design the DCEP preparation process for each specific district an inception report should be produced. This should highlight

- Proposed methodology (where it varies from these guidelines to suit a specific district) including:
  - Secondary and primary data sources
  - Proposed tools and frameworks
  - Assessment methodology
  - Proposed analysis
- How the proposed methodology mentioned in the guideline will be utilized and developed
- Any additional/revised tools that will be used in the study that are not mentioned in the guidelines
- Activity timeline
- Sample questionnaire/survey tools (where necessary)

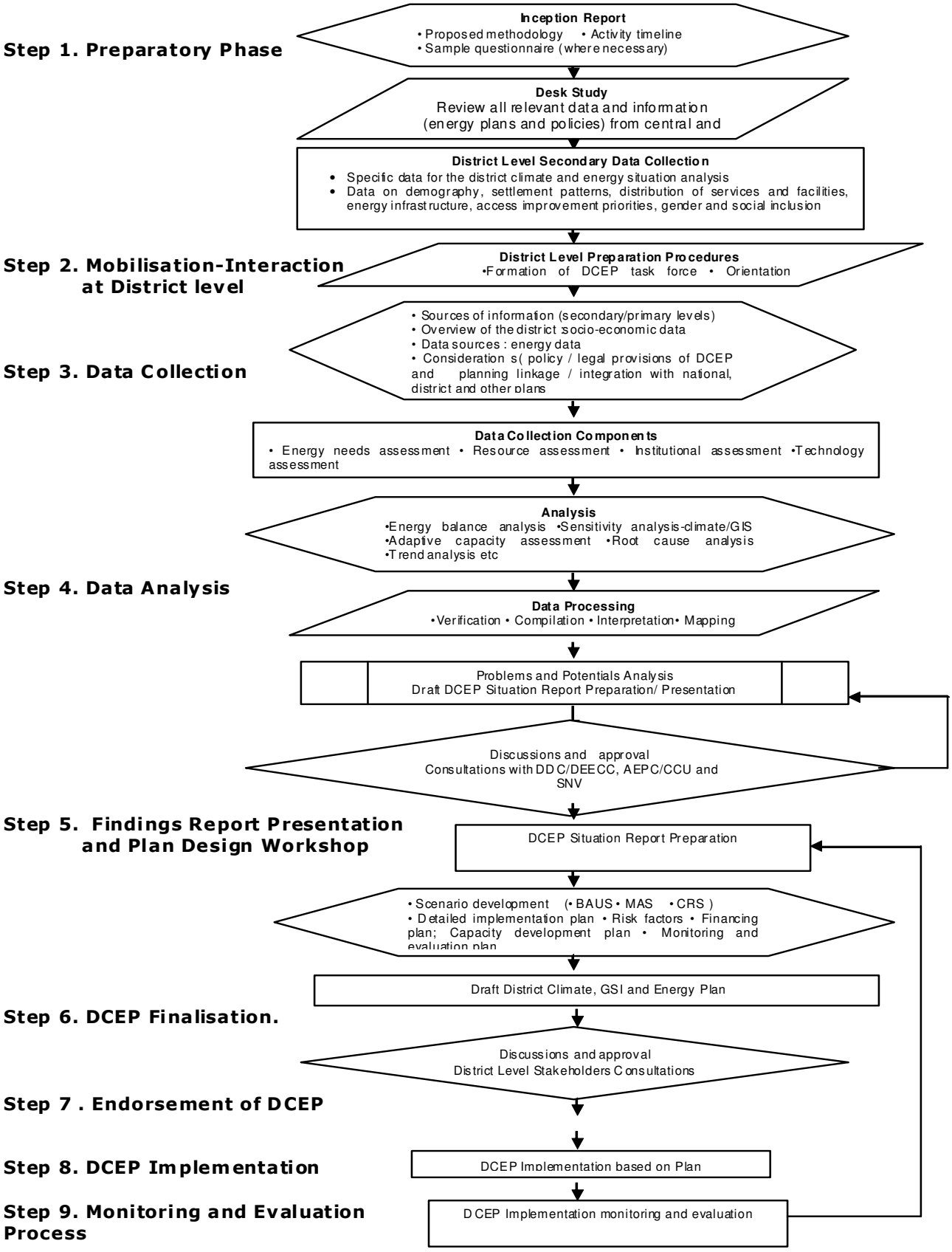
1.2 Desk study

Prior to commencing field work, a desk study should be carried out. This should review all relevant data and information available from central level and remotely. A list of potential data sources can be seen in *Annex A.3*. There is also an extensive reference and further reading section found at the end of this report.

1.3 District level secondary data collection

The desk study will highlight what kind of data is available at central level and remotely. From this study a list of required data should be complied and sources for this information identified. Specific data that is required for the district climate and energy situation analysis at a later stage includes data on demography and settlement patterns and disaggregated data from a GSI perspective, the distribution of services and facilities, energy infrastructure quality, and access improvement priorities.

Chart-1: DCEP Preparation Flow Chart



Step.2. Mobilisation -Interaction at district level

2.1 District Level Preparation Procedures

This section will highlight the process that should be followed in order to complete the preparation of a DCEP**.** The process flow diagram shows the process. This should be used to prepare the work plan**.**

Formation of DCEP Task Force

District Energy and Environment Units or Sections (DEEU/S) and District Development Committees (DDC) of the respective districts will take the leading role at the district level to assist and coordinate the DCEP process. District Energy and Environment Committee (DEECC) formed by the DDC are responsible to ensure district involvement and contributions to the planning process and the final report, to coordinate district level actors and to facilitate decision making and interacting with consultants. However, it is proposed to form a DCEP task force team with representatives from the members of DEECC for close involvement and day to day activities. The following small DCEP task force is recommended, however, the final approval of DEECC should be taken while forming the team:

- Local Development Officer
- DDC Planning Officer/programme officer
- DEEU – Energy Officer
- District Chief of District Forest Coordination Committee of District Forest Office
- District Chief of Women Development Office
- NGOs representative
- Private sector/ service providers representative
- Selected representative to ensure participation of women and ethnic groups

AEPC/CCU and SNV will assist in formulating this committee. Task force needs to be oriented to make them able to support in the planning process, executing following roles and responsibilities;

1. Serve as the focal point for DCEP consultants
   - Create linkage between local stakeholders and consultant focal persons
   - Provision/ exploration of relevant information - facilitate access to local data sources/references for consultants
   - Ensure local participation in DCEPs including the participation of women, Dalit and ethnicity

2. Serve as the link between the District Development Committee and consultants and AEPC/SNV

3. Provide feedback and support DDC for approval of DCEP documents including draft and final reports.

Orientation workshop

An initial workshop should be held for all RE stakeholders. An orientation on climate change and energy planning should be delivered. Then, a work plan should be designed and agreed and responsibilities of DDC, DEECC and task force team defined for DCEP process.

This meeting will establish a background knowledge of climate processes and measures that can be used to address climate change. The meeting should also establish a DCEP task force to encourage local ownership of the plan. This will ensure that the process is participatory and represents district interests

This process will be initiated by AEPC and supported by consultants and SNV

Step.3. Data collection

3.1 Guidance

The previous section has described the orientation and necessary steps to ensure local participation. This section focus on the methodology and data collection, which needs to be worked out carefully based on the requirements of the district. Data collection should be discussed carefully with the Climate and Carbon Unit (CCU) of AEPC and with the District Energy Officer. All data needs to be relevant to the objective and aim at contributing towards an actionable, implementation plan.

Priority should first go to secondary data collection and primary data should only be sought where secondary data is not available or requires verification. District level workshops and focus groups are preferred methods of data collection.

Methodology should be based on the step 3 of the DCEP planning process, which is shown in *Table-6 of this section*. **However, consultants are able to use/design additional or revised data collection methodologies where it is felt that it will add value to the study or be more appropriate for district specifics.**

This section will present a brief over view of the methodology that will be used to collect data for the DCEP, considerations and sources of information.

Considerations

In order to support DCEPs integration into national and local planning processes different policies and linkages with national and district level planning process and approaches, which to be considered are;

Policy and Legal Provision of DCEP

It is not necessary to detail out existing policies and legal provisions, however, it should be highlighted **where there is interlinkage** with existing policies, potentially including:

- Local Self Government Act, 1999
- Local Self Governance Regulation, 2000
- Rural Energy Policy, 2006
- Any others
- Constitution of Nepal for GSI issues

Planning Linkage and Integration with National, District and Others Plans

Again, it is not necessary to detail out existing planning processes, however, it should be highlighted where there are interlinkages. There will often be crossover and information should be available from or feed into the following:

- National Three Year Interim Plan (2011-2013)
- District Periodic Plan
- Annual District Development Plan
- District Energy Perspective/ Master Plan (only some DDCs have the plan)
- District Sustainable Development Plan (some districts have such plan i.e. in Mustang)
- District Forest Plan (Periodic ad Annual)
- Agriculture Perspective Plan
- District Tourism Development Master Plan

Details should also be given about how best to integrate the DCEPs into the District Development planning process. This will ensure district ownership of the plans and assist in getting funding allocation for the DCEP.

Sources of information (Secondary Level)

District Development Committee has a significant amount of required data/information and maps of the district. In addition, line agencies with representation in the district as well as NGO/INGOs working in specific sectors at district level will also have information and data relevant to their sectors. Demographic data and maps are also available from the Central Bureau of Statistics and the Department of Topographical Survey in Kathmandu. These sources of information need to be checked prior to data collection during the desk study.

Information on standards and policy targets in climate and energy sectors should be collected reviewing national policy documents, local policy documents and other policy studies and strategy reports. If there is a gap in standard information in some sectors, it may be necessary to develop district standards at district level meetings. A list of some of the best organizations to get data from is presented in A*nnex-A3*. The reference and further reading section of this report should also be reviewed.

Primary Sources

Information from secondary sources are not always sufficient for assessing peoples' access, needs and identifying interventions for improving them. Where it is justified that sufficient data is not available, primary data collection can be initiated. District level workshops and focus groups are preferred methods of primary data collection.

VDCs can be consulted to obtain current and realistic information. Key informants include: VDC officials, VDC Secretaries, school teachers and community leaders among them women, Dalit and ethnic groups should also be considered. Particular questionnaires need to be developed for collecting the necessary information from the VDCs and it is of particular importance that data and information that is collected is representative of the VDC. Wherever possible, information should be collected in focus groups and workshops to minimize the time and resources for household level surveys. See *Annex B.20* for VDC selection Criteria.

Where primary data is thought to be required a sample questionnaire should be submitted with the inception report.

3.2 Information Management

In order to formulate a DCEP scenario there are 3 levels of data presentation, which needs to be followed respectively:

1. **District Overview –** Broad overview to introduce the specific district
2. **District Climate Change, Energy and GSI situation report - This** effectively presents the baseline of the district. The present situation in terms of energy, climate change and GSI should be presented
3. **DCEP Scenario development –** This is where projections and recommendations for RETs are made on the basis of analysis/processing and inference of all the collected data. However, before the Plan Design workshop, it is necessary to come with the Business As Usual Scenario so that the local stakeholders may have understanding on the trend of energy development and suggest identifying the necessary

incorporation of climate change and GSI aspect in DCEP scenario development. This is discussed in the Scenario Development Section of the Guideline.

3.2.1 Overview of the district – socio-economic data

The district overview will provide a broad summery of the district; however, this does not require a detailed VDC level analysis. A number of districts have already had District Energy Situation Reports prepared and there should be secondary information available to prepare this chapter.

This should include **RELEVANT** data that gives an insight to the district, which can include:

- *Geographical location, population (including disaggregated information on gender and ethnic groups), climatic conditions, occupation, rivers, streams, lakes, land use pattern, forest situation, agriculture, livestock, irrigation, drinking water, communication, electricity and other facilities.*

The overview of the proposed district should follow (but not limited to) the template presented in *Annex A.4*

Socio economic data can be collected from the following sources but can also be accessed from other relevant and authentic publications during the period of planning:

- *CBS format for District Profile http://www.cbs.gov.np/district_profile_contents.php*

- *UN also has a district profile with a Health focus http://www.un.org.np/health/district-profiles/*

3.2.2 Overview of Energy Information Sources

Information should be explored from the various RET programme including ESAP, REDP and AEPC in relation to the potential demand and demand realised in each district. Where data is available, information relating to MHP sites in each district should be presented. It is not always necessary to give an exact target for each VDC for technologies such as biogas unless market studies have been carried out, however, priority areas for each technology should be given. Technology recommendations should be linked to data on climate variations and gender and social exclusion.

Data regarding traditional energy resources includes data on fuel wood, agricultural residue and animal dung. Thus, it is necessary to collect data on sustainable yields of fuel wood, production of various crops and their yield of residue, and the livestock population and their dung yield. The information on fuel wood can be obtained from the perspective energy plan published by WECS and the district forest office. Information on agricultural production can be got from the district agriculture office and that on livestock from the district livestock office.

Data regarding perennial streams and rivers in the district can be collected from the District Profile, District Irrigation Office, and from the water resources inventory study, micro hydro inventory report prepared by WECS (if it has been prepared for the district) and micro hydro carpet study conducted by AEPC/ESAP.

Wind and Solar radiation data are more difficult to obtain. AEPC, RECAST may have data regarding solar radiation and some of this has been quoted in the Perspective Energy Plan documents prepared by WECS or solar and wind energy resource assessment report

(SEWRA) prepared by the AEPC . NEA may have wind data obtained through wind gauging Stations it had installed in some places.

3.3.3 Climate Change and GSI assessments

In order to look at the effects of climate change on RETs and how RETs can support climate adaptation and increase access and participation of women and socially excluded groups it is necessary to undertake a broad climate change assessment and gender and social inclusion scan of each district to define what the major issues that will impact on energy systems or support energy planning are.

Climate Assessment

The Climate overview should follow but not be limited to the following

- General overview of anticipated Climate change and climate variations
  – Identify impacts, major risks, based on existing data sources which could include NAPA, Practical Actions climate assessment report for Nepal or any other available data including web based tools – GTZ climate change information for effective adaptation - IPCCC
- Mapping of energy systems e.g. Mapping of existing and planned Hydro/Micro Hydro and linked to available hydrological data – how will this impact planned existing projects.
- Natural resource/land use mapping
- Seasonal calendar of energy resource strength
- Resource and hazard mapping
- Mapping of extreme climatic events (past recall) from the focused group discussion.
- Mapping of most vulnerable sector in the respective districts

These overviews should be linked with energy development in the particular district.

The major inferences that should be made are:

1. How climate technologies will effect energy systems – vulnerability
2. How RETs can contribute towards helping people especially women, Dalit, ethnic and disadvantaged groups adapt to the impacts of climate change

Clear linkages should be made with climate change while defining technology prioritisations. Technology prioritizations can be carried out on the basis of tool kits presented in the Guideline and while developing the energy development scenarios as discussed in Section 5.2. A selection of tools that can be used to identify as information sources and toolkits that can be used to collect information on climate impacts on energy systems can be found in *Annex B*.

Gender/social Inclusion Assessment

A major focus of the DCEPs is to increase access and opportunities for participation in the energy and climate sector for women and excluded groups. In order to identify these opportunities it is necessary to understand what the major issues affecting women and to analyse the causes and barriers of having access to and control in the energy sector from GSI perspectives

It is therefore necessary to collect information on:

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

- Dalit
- Link to vulnerability mapping

It is then required to create a clear picture on the use of different energy technologies by different social groups of the districts should be available in showing the current situation of the district.

3.3 Data collection components

A comprehensive list of tools and frameworks available to assist in data collection for each DCEP components is shown in Table-6.

The data collection should be focussed to assess the energy needs as well as the available resources and institutions involved in the sectors. But all these assessments should be linked with Climate Change, GSI and institutional capacity as presented in the Figure-1 of this section.

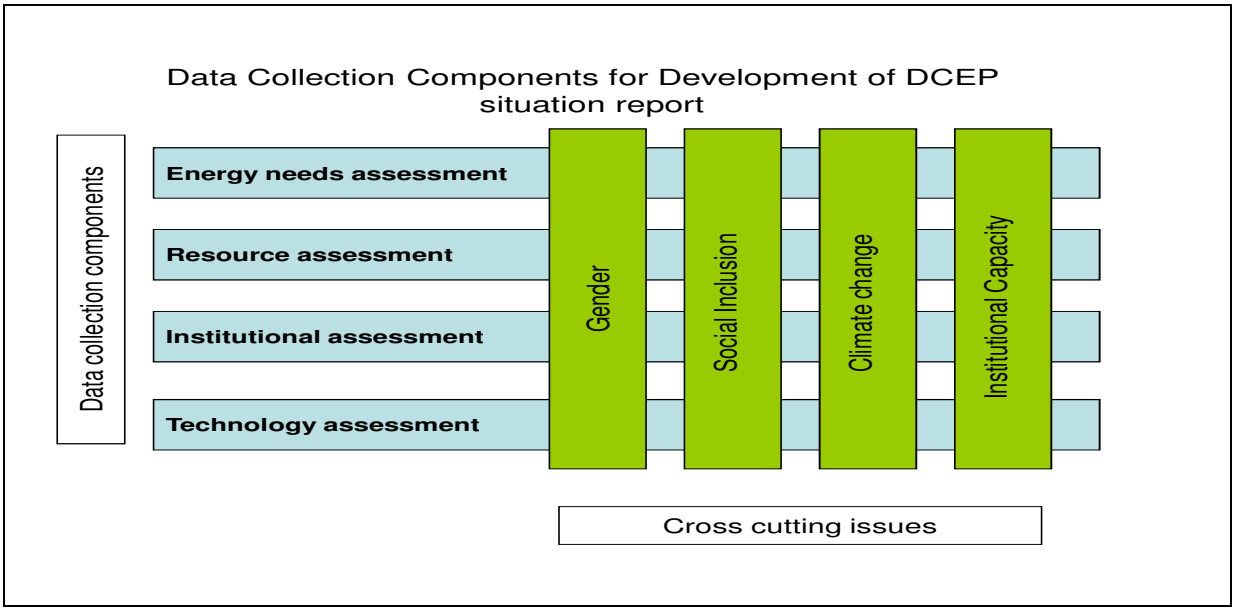


Figure 2: DCEP Components and Issues to link

3.3.1 Energy Needs assessment

The energy needs assessment is the most important step in energy planning as this shows the overall requirement for energy within the district. This requires disaggregation of energy needs into consumption and demand.

This section of the study should record the district energy balance (supply-consumption) in order to establish energy requirements for the district. This should also identify energy resources and consumption profiles of the district, including consumption-supply by fuel type, and by sectors. Energy technology development trends should be shown by year wise energy technology installation data, collected during the data/information period.

For DCEPs it is also necessary to assess energy needs through a Climate Change and GSI lens. This should identify how climate change will impact on energy planning in terms of vulnerability of energy technologies and ability for RETs to contribute to adaptation. This should also consider how the energy plan can support access and participation for women and excluded groups. This should look into practical, productive and strategic energy needs

and at how they are addressed with the objectives of reducing drudgery, improving health and enabling suitable environment for enhancing livelihood.

What this translates to in energy planning is the need to ensure that both men and women from all these classes (economic classification, ethnicity, caste, religion) have equal access to the basic energy services, sharing the benefits equitably for improving their livelihood. Technology recommendations should be based on their ability to impact on gender and social inclusion.

Gender and social equity is best achieved through proper identification of problems within the existing institutional frameworks. This can be achieved through:

- Proportional representation in sampling (male headed, female headed household by ethnicity, Dalit, age and income strata)
- Identifying gender roles and responsibilities within households and communities in management of energy resources
- Identifying social inclusion related issues and ethnic breakdowns of districts like, Dalit, landlessness, bonded labour, etc.
- Considering issues of access and control over resources – in the household and community

DCEPs should also attempt to identify gaps in the current institutional systems and areas for improvements.

The energy needs assessment requires the following stages of data collection:

1. District background information and overview to be presented in the first chapter. (See *Annex A.4* for template of district overview)

   This will provide a snapshot of the district including socio economic information and disaggregated data on GSI. See *Annex B.8-10* for information requirements and data availability.

2. User Data - Energy/climate/GSI

   This should look into
   - energy access
   - Cost and affordability of different energy technologies.
   - Ownership of renewable energy technologies by Gender, Dalit, ethnic and disadvantaged group
     - This disaggregation needs to be better used in devising the scenario. For e.g. if there is very low access to any renewable energy technologies (though it is feasible) to any ethnic group, the plan should address this aspect and identify the clusters where intervention of energy technologies needs special attention to integrate GSI issues.

   This information should be broken down by social groups and gender and look into types of technologies and end uses.

3. Energy Consumption matrix

   This includes consumption by fuel type, by end-uses and by sectors.

Sources of information are the perspective energy plan documents, the development region-wise energy resource and consumption profile or energy synopsis report 2006 prepared by WECS.

This data should be disaggregated by gender and social groupings and look at the impacts of potential climate change on energy consumption.

For data sources see *Annex B.17*

3.3.2 Resource Assessment

As many RETs are reliant on natural resources for their function, it is important to identify the availability and trends of resources in the district. The Resource assessments should focus on the linkage between supply trends and identify climate influences on future availability in order to infer the potential of RETs in the district.

Climate change influences on resources will be difficult to specify, however, community knowledge can be an important source of information to provide trends of resource status with respect to climate trends.

It is important that the planner is able to segregate the impacts of climate change and those not associated with climate change; however both should be addressed in the energy planning process. Climate change is one among many factors that govern resource availability and long term sustainability. Others include topographic, edaphic (related to soil and geology), biotic, socio-economic and policy factors. It is important to consider three aspects on both production and supply. (*Annex B.9+10 for background requirements*)

- Exposure of the energy resource to climate change
- Sensitivity to climate change – potential adverse/ favourable impacts on the individual energy resources. This is also difficult if not impossible to quantify. A qualitative grading such as high, medium, and low should be fine to let one get idea, with a likelihood of variation in different contexts.
- Existing and potential 'capacity' of the resources to contribute to adaptive capacity. (Note that less sensitive resources generally have higher adaptive capacity).

The following components should be studied

1. Energy resource and supply data (*Annex B.12*)

This should define energy resources and climate linkages

2. Access to resources (Annex B1,2,3 –GSI, B.13)

This should look into aspects of distance from resources, socio economic factors and geography. This should also assess hazard exposure of resources (*Annex C.3 hazard exposure mapping tool) and disaggregate gender and ethnic groups data.*

For tools and frameworks see Annex C

3.3.3 Technology Assessment

This assessment will look at the technologies themselves in terms of- access, cost effectiveness, impacts of climate change on technologies and mitigation and adaptation potential of technologies. Broadly the technology assessment and prioritisation should be carried out as follows,

1. Climate Change aspect
    - 1.1 Vulnerability due to climate change (focus on climate proofing technologies). Please refer *Annex B.14*.
    - 1.2 Contribution to the climate change adaptation
    - 1.3 Mitigation Potential
2. Gender and Social Inclusion aspect
    - 2.1 Gender Friendly in use
    - 2.2 Promote social inclusion
    - 2.3 Contributes to poverty reduction
3. Others and Local specific issues
    - 3.1. After sales service and technology cost
    - 3.2. Institution availability

The technology assessment should identify the major issues that could influence how appropriate certain energy technologies are in specific districts

This information will be used to develop scenarios of different energy mixes that promote technologies on the basis of specific criteria. Scenario development should be developed through multi selection criteria selected on the basis of field level data collection. Refer *Annex B.18.* The Scenario development should consider the Input variables and selection criteria as discussed in the Table 2 of the section "Scenario Development" as mentioned in the guideline.

3.3.4 Institutional assessment

Identifying technologies and activities required to implement them is only one step in the DCEP process. The next step is to have a clear picture of who is available to undertake specific activities in the district and what capacities exist or need to be built.

Identifying the major stakeholders in the district is one of the most important tools to create a detailed implementation plan. This section should identify all potential actors that could be involved in implementing an energy plan. The consultant should provide recommendations of which actors should play which role (e.g. promotion, service provision, coordination etc) in DCEP implementation. It should also involve identifying capacity needs in order to implement a DCEP.

The institutional Assessment will cover 3 main components:

1. Stakeholder Identification and Roles
2. Capacity assessment
3. Institutional set up policy, infrastructure, government ,finance, service delivery Consideration on GSI area also

This assessment will be key for identifying responsibilities for implementation of the DCEP.

Actor and institutional mapping should be done through secondary data collection and **an actor and institutional mapping workshop** within the district. Careful selection of participants should be made to ensure the full scope of actors is identified. Individuals from organisations should be identified rather than just managers.

Stakeholder identification and capacity assessment: A detailed list of actors and their areas of specialty should be presented in the annex of the DCEP report including contact details to assist coordinating bodies to facilitate implementation.

The institutional analysis should look into:

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

This section should also look into policy and infrastructure and the institutional set up for energy and climate planning.

A broad capacity assessment should be carried out for the identified actors. There are many institutional and organisational mapping tools available, however a detailed set of assessment criteria should be selected that reflect ability to implement a DCEP. Consultants should discuss with AEPC/SNV in order to select and revise the most appropriate tool for the purpose.

Step -4. Data Analysis

4.1 Guidance

From collected data first a situation analysis should be presented that shows the base line situation. Then Analysis and processing of collected data should be undertaken to make projections and inferences for future energy systems.

It is important that the analysis uses all the data and looks at how climate change and GSI will influence the energy planning process. This should link trends and identify limitations and opportunities in the energy scenario development.

Data analysis will guide the identification of priority technologies in a district in relation to:

- Energy demand,
- Cost and affordability of technologies
- Vulnerability to climate change
- Potential for climate change adaptation
- Access and participation of women and excluded groups
- Other identified criteria.

As shown in the process steps (Table 6), the final prioritisation of activities and scenario development will be done in accordance with step 5 during a plan design workshop incorporating stakeholder input. Analysis should include following aspects, but not limited to this, as presented in Table-1 of this section.

Analysis Tools	**Output**
Energy Supply/demand balance analysis	Energy Scenarios - based on scenario development steps
Sensitivity/ vulnerability analysis - climate/GSI	Sensitivity Table vulnerability tables/maps
Adaptive capacity assessment	SWOT Table
Root cause analysis	Problem tree
Trend analysis (based on user profile)	User trend report

GSI analysis	GSI report
Cost benefit analysis (CBA) of technologies	CBA report
Capacity analysis	Identification of capacity needs

Table 1: Analysis Tools and Outputs

The analysis should help identify preliminary goals for renewable energy targets for appropriate technologies and interventions that identify influences of climate change gender and social inclusion in the energy development process.

4.2 Data Processing

Following analytical steps are suggested to use for data processing

- **Verification** of data if the same data is available from more than one source. Use up-to-date data wherever possible
- **Projection of data** is necessary for future planning. All assumptions used for making projections should be clearly stated.
- **Compilation of data** is required when data from a number of sources have to be combined to get data in a useable form. For example, to estimate biogas potential we need to analyse the data on cattle population, dung production per head of cattle and temperature or altitude of potential areas.
- **Interpretation of data** is required when the required data is not available but has to be deduced from some other source. For example, the micro hydro potential of a district may have to be interpreted from the number of micro hydro plants already installed in that district.
- **Mapping of data** is needed when we need a spatial depiction of the data. It is recommended that data is visually presented wherever possible

4.3 Problems and Potentials Analysis

Based on the analysis of data/information, once the DCEP initial report is prepared initial feedback will be provided by SNV, CCU and the DEEUs/DDCs. Final approval should be given by the DDC/DEECC for which a workshop/meeting of the DEECC is organized by the respective district to review the analysis and find out the additional development issues, problems, potential and challenges. Such peer review offers an objective of achievements and future prospects. Once the feedback received on initial DCEP, participatory planning workshop is organized for formulating the DCEP implementation plan.

Step 5. Findings report presentation and plan design workshop

5.1 Guidance

This step will involve presentation of the initial findings to the stakeholders and gathering stakeholder input for developing scenarios and agreeing on an action plan based on the analysis of the collected data. This will be done in the following steps:

1. Preparation of a initial report- **draft district climate, energy and gender situation report**

2. Organisation of a planning workshop at district level over 2 days

Day 1:

- Presentation of draft district climate, energy and gender situation report to stakeholders at district level
- Presentation of preliminary DCEP scenarios (see section 5.2)
- Feedback from district task force members and stakeholders

Day 2:

- Wider stakeholder involvement
- Facilitate final scenario development and verify targets (described in section 5.2)
- Develop prioritisation of implementation activities (described in section 5.3)
- Develop Draft implementation plan through a participatory session

5.2 Scenario Development:

In order to set realistic targets for individual technologies and to create an implementation plan, scenarios must be developed on the basis of the data collected and analysis of information. The DCEP scenario will show the recommended technology mix for 10 years based on the criteria shown in Figure 3 and Figure 4.

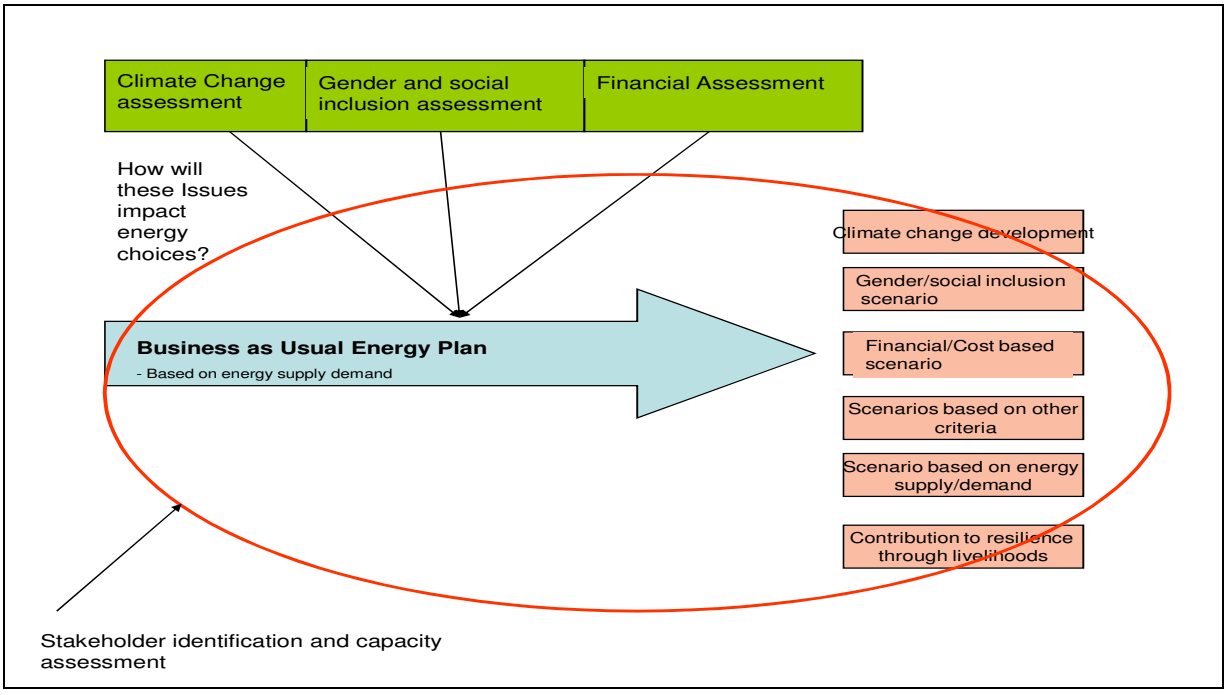


Figure 3: Criteria Selection and Scenario Development Process

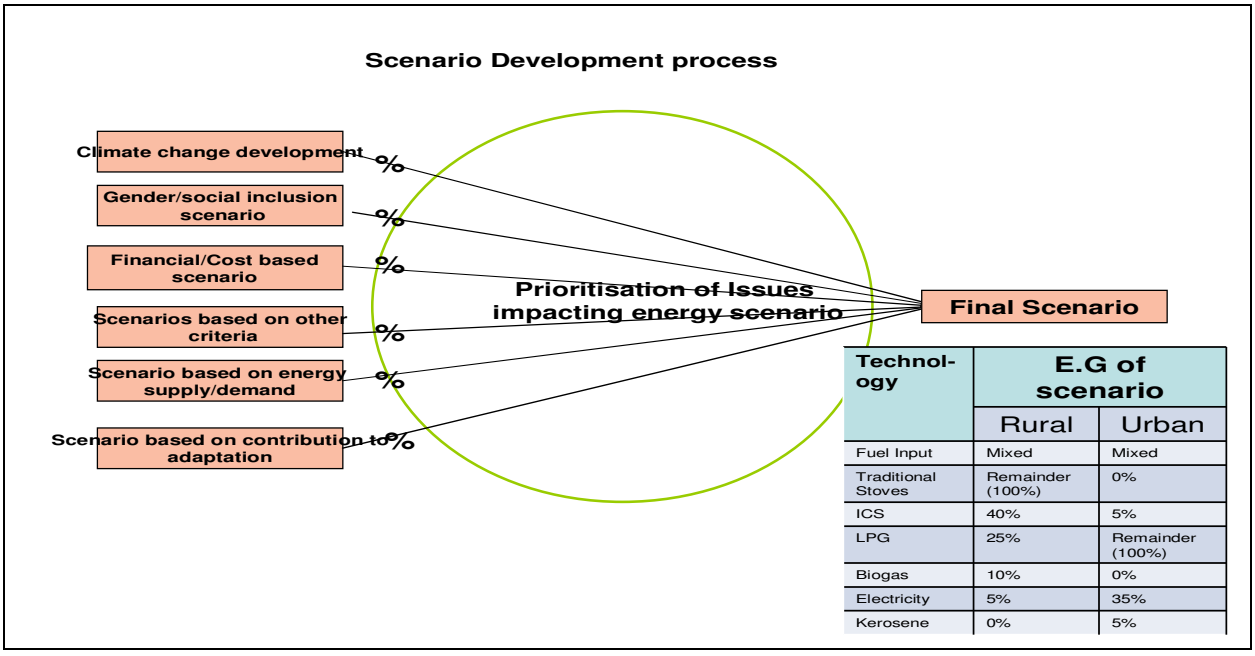


Figure 4: DCEP Scenario Development Finalisation process

For DCEPs two scenarios should be developed to guide the thinking of stakeholders in choosing the level of intervention and to develop an implementation plan.

a. **Business As Usual Scenario (BAUS)** – This scenario would continue to build on the current development trends in the district that will influence energy demand.
b. **District Climate and Energy Plan Intervention Scenario (DCEPS) –** This scenario will be based on technology interventions that address climate change, gender and social inclusion and other **prioritised criteria. The consultants need to identify the GSI and climate change influences on BAU energy planning**. These aspects should be collected during data collection and from the Planning workshop as described in this section.

The input variables and criteria for devising the technology interventions are shown in Table-2. This can be used for estimating the future energy consumption in both businesses as usual and DCEP Scenarios.

S.N	Variables	BAU Scenario	DCEP Scenario	Remarks
Input Variables				Used for demand forecasting, technology assessment for future demand
1	GDP growth rate	Use the local GDP growth rate, if available	Use the local GDP growth rate, if available	Will depend on the methods of energy demand analysis. If energy demand forecast is carried out considering the GDP growth this approach can be used
2	Population Growth	Use the population/household growth as presented by National Census of GON (CBS publications)	Use the population/household growth as presented by National Census of GON (CBS publications)	Apply for district energy planning (Sectoral energy planning)
Technology Intervention Criteria				It should depend on the Planning objectives
1	Energy Status	Based on energy needs assessment and current practices of technologies interventions	Based on energy needs assessment and energy intervention. Identifies and qualifies vulnerability of RETs to CC Identifies potential if technologies to contribute to adaptation Identifies access and participation of women and excluded groups to RETs Considers costs and access to technologies	Literature reviews required for assessment of trends and status of energy development For DCEP Scenario- the current energy status should be correlated with the climate change aspects, GSI consideration, cost and institutional capacity. This should be linked with the technology prioritisation. Why and how prioritised technologies contribute to the major components of DCEP. Where quantitative data is not available for Climate change or GSI – alternative qualification methodologies need to be designed to account for the influences on energy planning processes.
2	*End use ratio (renewable and conventional)*	Continued trend – end uses – Electrification/ cooking/ other end uses	[Increment on the basis of analysis (as required for building adaptive resiliency, GSI mainstreaming]	Should need to have Literature reviews for assessment of trends and status of energy development

			Identify and elaborate: How electricity access helps in building adaptive capacity, how they can be regarded as Gender friendly.	
3	*Status of RETs (installation rate)*	Continued trend based on market potential	[Increment on the basis of analysis (as required for building adaptive resiliency, GSI mainstreaming]. [Promotion of renewable energy technologies and energy efficiency measures in parallel. Proper mix of energy technologies and sources]. Identify and elaborate: How access to renewable energy helps in building adaptive capacity, how they can be regarded as Gender friendly.	Literature review required for assessment of trends and status of energy development
4	GHG contribution	BAU Scenario does not need to consider potential of GHG (CO_2 equivalent). However, the projected GHG emissions on the BAU situation can be shown, which will be one of the comparable basis of two scenarios.	This should look at development of a low carbon economy through reduction potential of GHG (CO_2 equivalent)	
5	Energy Requirement for Building Adaptive Capacities		This should look after the additional energy requirement for building adaptive capacity against vulnerabilities. For e.g. if there is any incidence of water shortage due to climate change, analysis should be carried out on the technology options, energy requirements for water pumping etc. Similarly, additional energy requirement for promotion of agro-processing and other end-use diversification so that it can support in livelihood promotion	During the period of initial consultation meeting with the Task Force, such areas needs to be identified and should carry out detail information collection.

Table 2: Input Variables and Criteria for Scenario Development

The business as usual scenario should focus the current trend of energy development, but the DCEP Scenario should identify the technology assessment as per the prioritisation of technologies based on the linkages with major issues like Climate Change, GSI and others as presented in Figures 3 and 4 and Table-3 of this section.

The actual scenario that will be implemented will be developed on the basis of recommendation made from data collection and analysis and through a planning workshop. Final criteria will be designed on the basis of each district. Refer to the Figure 2 and Table-3 of this section for deciding on criteria selection and scenario development.

The final scenario will be developed in a district level planning workshop, however the BAU situation needs to be discussed with technology mixes before the workshop. The stakeholders in the workshop will have clear ideas on where the energy situation lies for the particular district and what should be considered to address the climate change vulnerabilities and inclusive development of renewable energy. The consultant needs to be prepared with all the findings particularly on the technology prioritisation, climate change issues, GSI aspects, which are collected and analysed from the initial phase of the study including review of secondary and primary data.

The workshop will involve guiding the stakeholders in prioritising the issues that should be addressed for that specific district. It is suggested that the Table-3 should be used to weight the different criteria.

Sector/ End-Uses/End-Use Devices	Climate Change			Gender and social Inclusion			Other criteria		**TOTAL**
	vulnerability to climate change	Contribution to climate change	Contribution to Adaptation	gender sensitivity	social inclusion impact	Contribution to poverty reduction	Cost	Local Issues	
A. Residential									
A.1 Cooking									
Technology (T) 1									
T2									
T3									
A.2 Lighting									
T1									
T2									
T3									
B. Commercial									
etc.									
C. etc									
WEIGHTAGE	%	%	%	%	%	%	%	%	100%

Table 3: Technology Prioritisations with respect to Issues

The technology prioritisation should be carried out for all the potential sectors and end-uses defined in the DCEP process, however priority should be given to the residential sectors. The sector, end-uses and technologies (end-use devices) are shown in *Annex B.17*.

The analysis should focus on renewable energy technologies, however where vulnerabilities to other non renewable energy sectors or other non energy sectors and end-uses a proper recommendation should be given as defined in the Section 1.1.4.

After weighing the technology selection against different issues, an energy planner can define the final DCEP scenario for different end-uses and its associated technologies (end-use devices). An indicative example is shown in Figure-3.

Once the final scenario has been developed, specific RET **targets should be set for a 10 year period** and then a detailed implementation plan should be prepared for **3 years**.

5.3 Detailed Implementation Plan

This is the most important section of a DCEP. This will bring all of the data collection, analysis and stakeholder input and transforms it into and implementable action plan. All stakeholders should be able to read this section and understand and identify their role in the process. This should highlight with as much detail as possible:

- What renewable energy interventions are required for addressing the climate and GSI issues of respective districts?
- What additional activities/interventions are required for GSI mainstreaming and implementation of the DCEP
- Who will manage DCEPs?
- What specific RET promotion and demand creation activities will be done and by whom?
- Who will take the lead on coordinating the implementation?
- Where will funding come from? – Detailed credit/grant plan?
- What Capacity development, institutional re arrangement and revised process related activities are necessary to ensure implementation and monitoring of DCEP?
- Who are the related stakeholders associated with DCEP- management, implementation, service delivery etc, and what will be the roles and responsibilities? Who will assure qualitative service delivery and after sales services?
- Who will monitor and report on progress of DCEP implementation, and how

Furthermore the plan will also project out the renewable energy intervention needs for the next 10 years (long term planning). The first three years planning should be more precisely developed with required details as mentioned above.

This chapter should identify priority areas in a district for specific technologies in relation to both demand and in relation to potential for climate change adaptation.

Example
If a VDC has high incidence of reduction of water flow in rivers it could be incorrect to recommend technologies that rely on river flow such as micro hydro or IWM, it would therefore be required to evaluate what the most appropriate technology should be.

In addition to a technology based implementation plan, additional support activities and recommendations should be presented to support the implementation. These should include:

- Road map with SMART indicators and timeline (*Annex A.1*)
- Recommendations for Climate interventions (including linkages with other sectors) – based on a detailed analysis **OR** recommended strategy for follow up (by specific actors) from recommendations
- Recommendation on capacity building of district service providers for effective implementation of DCEP
- Link implementation plan to funding mechanisms – donors/government and financing (MFI/CDM etc) for RET
- Recommendations for priority activities and VDCs – if this level of information is available.
- Recommendations for institutional arrangements and adjustments
- Actor responsibility/authority identified for the following activities (this can be defined in association with AEPC/SNV):
- Management and coordination responsibilities
- Recommendations and proposals for a monitoring and evaluation system.
- Identification of After sales service and subsidy distribution mechanisms
- Recommendations and actor Identification for After Service Sales and Subsidy disbursement provision
- Suggested links to the National and Local Climate Change initiatives of government of Nepal
- Recommendations for steps in formation of planning committees
- Recommendation for integrating in the District Annual Council

It is suggested that the detailed implementation plan should be presented in a Logical Framework as presented in Table 4

Main Objective	Activities	Scope of Work	Outcome	Verifiable Indicator	Where	Who	When	How	Estimated Budget	Risk	Risk Mitigation

Table 4: Logical Framework of the DCEP Preparation

This table can be revised to suit the implementation of a specific plan for each district.

Similarly, the responsibilities of the stakeholders for the DCEP implementation can be presented as shown in Table 5.

Programme/Projects/Activities	Coordinating and facilitating agency	Implementing agency	Support organization

Table 5: Table template for DCEP implementation responsibilities

Risk Factors

On the above mentioned findings and implementation strategy risk factors needs to be analysed. Hence, the selection of actions and measures should also be based on the careful estimation of risks associated with their implementation (especially when significant investments are planned):

- How likely is it that an action fails or does not bring the expected results?
- What will be the impact on the objectives?
- What are the possible remedies?

The possible risks are:

- **Project-related risks**: cost and time overruns, poor contract management, contractual disputes, delays in tendering and selection procedures, poor communication between project parties
- **Government-related risks**: inadequate approved project budgets, delays in obtaining permissions, changes in government regulations and laws, lack of project controls, administrative interference
- **Technical risks**: inadequate design or technical specifications, technical failures, poorer than expected performance, higher than expected operation costs
- **Contractor-related risks**: inadequate estimates, financial difficulties, delays, lack of experience, poor management, difficult in controlling nominated subcontractors, poor communication with other project parties, etc.
- **Market-related risks**: increase in wages, shortages of technical personnel, materials inflation, shortage of materials or equipment, and variations in the price of the various energy carriers

5.4 Financing Plan

A DCEP will not be implemented unless necessary funding and financing opportunities are found. The consultant is not expected to undertake resource mobilization or identify external donors; however, a series of concrete sources and recommendations should be presented highlighting existing sources of funding and potential sources of financing especially identifying district level MFIs. This chapter should include:

- Financing plan
  - Detailed strategy for plan implementation, possible resource mobilization opportunities
  - Plan for increasing financing for RETs – MFIs/Carbon revenue
  - What is the cost of implementing a DCEP? – Construction/capacity building etc.
- Subsidy policy for RETs
- Identification of financing opportunities for the district. Link with MFI identification and potential for linking with Central level credit.

5.5 Monitoring and Evaluation Plan

In order to ensure that the DCEP is implemented in accordance with the plan a detailed Monitoring plan is also required with specific indicators fro GSI. For DCEPs responsibility for monitoring at district level falls on the DEES/U of the DDC. DEECC can also play an important role as it brings together all climate and energy-related agencies in the district. Thus the DDC/ REDS should ensure that the DEECC meets according to its operating guideline thoroughly review the progress made and difficulties in implementing the DCEP.

Step 6. DCEP finalisation

The last step should involve finalising the DCEP report including implementation plans, financial sections, actor identification and monitoring and evaluation plan. Based on the completed report the Conclusions and Recommendations should be developed.

An executive summary of the findings of the entire report should be presented including the major planning steps and recommendations. The final report should also present major recommendations for implementation or for further research, studies and steps necessary to fully address all of the required issues.

The first draft of the DCEP report should be submitted to respective DDC through CCU/AEPC and SNV for review and approval. Two level of stakeholder consultation workshop (district and central level) should be organized for finalizing the DCEP. The specific role of consultants to formulate the plan is defined up to this step.

Step 7. Endorsement of DCEP

DDC needs to endorse the DCEP into its annual development plan. CCU/AEPC will support the respective DEEU/S of DDCs for the endorsement. The detail process to be followed for the endorsement is shown in Annex-A.2.

Step 8. Plan Implementation process

After approval of the plan the implementation process will begin. Whilst the consultant organisations are not expected to be involved in implementing the plan, an initial **implementation workshop** will take place after the district approval of the DCEP report. Consultants will be expected to participate in this workshop to present the major findings. The plan implementation will be guided by the DCEP final report.

Step 9. Monitoring and evaluation process

The monitoring and evaluation plan will be designed and presented in the DCEP, however it will be the responsibility of CCU/AEPC to support DEEUs/DDC to coordinate and carry out this process.

Table 6: DCEP steps and information matrix

Process Step	Component	Planning/info collection step	Necessary information	Resources/References	Tools/frameworks	Output
1. Preparatory phase	Desk study		Based on Information presented in step 3. Data collection			Background data Summary Inception report
	District level secondary data collection		Based on Information presented in step 3 Data collection			Information requirements list
2. Mobilisation - Interaction at district level	Orientation/Process Planning workshop (consultant)					Process plan and activity timeline
	VDC selection criteria for Validation of secondary information (linked to data collection)	Data availability/ accessibility agree on methodology and process	VDC selection criteria		VDC selection criteria template **Annex B.20**	VDC selection criteria template
3. Data collection	Climate Change Assessment	1.District background information/ 2.Overview and situation report	Climate data – rainfall, temp changes etc	NAPA/LAPA Practical Action IPCCC	Energy and climate analysis **(Annex B)**	Broad climate change assessment of district
	Gender and Social Inclusion Assessment	1.District background information/ 2.Overview and situation report	Disaggregated data on women, Dalit, ethnic and disadvantaged groups Development status - access to resources/	See reference section	GSI tools and frameworks **(Annex B)**	Broad GSI assessment and status

			participation etc			
	Energy Needs assessment	1.District background information/ 2.Overview and situation report	GSI (disaggregated)?, purchasing capacity, Population data and micro economic data **Annex B, 8-10** presents consideration and information requirements for GSI and climate change	CBS - find reference docs material! Data sources table (**Annex A.3**))	Template of district overview (**Annex A.4**)	District overview - socio economic snapshot and climate GSI District climate change, gender and social inclusion and energy situation report
		User Data - Energy/climate/GSI	Affordability access Income/ poverty data? GSI, disaggregated cost of technology? % of pop dependant on particular energy and end uses	**Annex B, 9 and 10** presents background data and guidance % pop/energy statistics available from - CBS, WECS, AEPC	Focus group - climate and gender **Annex C2 C.1.1** - climate and **C.1.2** - GSI) Key Informant interview, Focus group discussion for general information (**Annex C)** Seasonality mapping **Annex C.2.2**	Table (**Annex B 7 and B17**) linked to energy consumption matrix - data by social group and linked to climate impacts _ narrative to describe social group breakdown - Quantification?

			Vulnerability			
		Energy consumption matrix	Energy Consumption **Annex B. 8-10**	**Annex B. 7 and 8** show energy consumption disaggregation and climate change and GSI requirements	Energy consumption tables **Annex B,17 a,b,c,**	Energy consumption matrix
	Resources assessment	Energy resource and Supply data	**Annex B.12** Defines energy resource and climate linkages	**Annex B.19** Energy resources data	Energy resource data and tables and GSI considerations **Annex B.19**	Template document
		Access to resources	GSI (**Annex B 1,2,3**), distance, social economic, geographic factors **Annex B.13**	FECOFUN, Dept forests **Annex B.1,2,3** provide background on climate impacts on resources and energy	Resource and hazard exposure mapping **Annex C.3**	Broad List of required data - simple table
	Institutional assessment	Stakeholder identification and roles	Major stakeholders - NGO, Local Gov/line agencies, CBOs, service providers,	Task force members DEEU/S	Actor constellation mapping (workshops -Task force Pre identification? Capacity assessment of major stakeholders EG DEEU/S) STILL NEED CAP ASSES TOOL	Actor constellation map and identification document
		Capacity assessment	Major stakeholders DDC, DEEU's, DEECC, service providers, CBOs/user groups, Financial institutions	Task force, DEEU/Ss	Adaptive capacity assessment (recommendations or based on broader criteria) Institutional assessment tool (SNV)- GSI component and climate and energy	Basic needs assessment report

		Institutional set up policy, infrastructure, government ,finance, Institutional set up service delivery	Infrastructure, service delivery models, Gov structure, financial mechanisms	DDC, AEPC,SNV, MOE		Institutional map of district narrative or visual
	Technology assessment	RET status/trends	Installation trend/status	AEPC		status report
		Climate proofing	vulnerability and adaptive ,measures	**Annex B.14** presents climate proofing options Indoor air pollution - AEPC CRT -CDM PDD ICS NAPA UNFCCC PA	Practical Action report - V2R vulnerability to resilience -	Technology resilience assessment
		Mitigation potential - general emissions factors	Technology assessment	AEPC (registered CDM projects and ongoing activities) NAPA	**Annex B.15** - End uses climate change mitigation potential	General emissions output based on technology/RET
		ASS, technology Cost	RET costs, efficiency of service delivery	AEPC		capacity, economic assessment
4. Data Analysis	Information analysis	Energy Supply/demand balance analysis - scenario guidance				Energy scenarios

		Sensitivity analysis - climate/GSI Adaptive capacity assessment root cause analysis Trend analysis (based on user profile, GSI analysis Cost benefit analysis of technologies Capacity analysis				Sensitivity table (**annex C.7**) SWOT table (**annex C.4**) Problem tree (**Annex C.6**) Basis for scenarios GSI report Report on CBA identification of Capacity needs
5. findings report presentation and plan design workshop	Preparation of draft district climate/energy/gender situation report					Draft DCEP report
	Presentation of Draft District energy/climate/GSI situation report at district level					
	Presentation of Draft District energy/climate/GSI situation report at district level					Feedback from District task force/stakeholders
	Planning Workshop - 1st day task force				Guidelines for scenario design and prioritisation	Develop draft thinking on Prioritisation of activities

	Second day wider stakeholder involvement					Draft Implementation plan - participatory session Draft activities
6.DCEP finalisation	Finalisation of findings, activity plans, financial section etc					Final Draft DCEP document submitted
7. Endorsement of DDC	District (Task force/DEECC)/DDC with the support of CCU/AEPC					
8. Plan Implementation Process						
9.Monitoring and evaluation process						

Table 1 DCEP planning process steps

Section 3: DCEP contents and structure

This section of the DCEP guidelines will present a template of what should be included in a DCEP. The detailed content and guidance for each chapter can be found in section 2. This section only highlights how a DCEP should be structured

Executive Summary; Acknowledgement; Well structured Table of Content; Acronyms and Abbreviations.

Chapter 1: Introduction, Background and Rationale

This chapter will give a brief background for the DCEP process by explaining the following:

1. **Background and rationale for DCEP**

The background section of a DCEP should stay focused. A **brief** description of the broader energy, climate change and GSI issues should be presented so that the reader can understand the context

2. **Limitations of DCEP process**

The DCEP process will be limited by a number of factors which should be presented in this section. This will be guided by the parameters and boundaries of DCEPs presented in Section 1.

Wherever possible the DCEP should create linkages with other sectors or issues. Whilst it can't be addressed in this report it should be stated clearly what recommendations are for further information required and potentially who should/could be responsible for collecting it.

3. **Overview of the district – socio-economic data**

Brief overview of district to set the scene for the main content of the report. See Section 2 for guidance and content

Chapter 2. DCEP Process and Methodology

See section 2 for guidance on the content and requirements for data collection of a DCEP. Methodology should be based on the step 3 of the DCEP planning process and guidance presented in section 2

This chapter should present a brief over view of the methodology that will be used to collect data for the DCEP. It should additionally highlight where the methodology presented in this guideline has been changed or revised to suit the specifics of a certain district

Data Collection

The following are major areas of data that are necessary to create a DCEP.

- **Climate Change Assessment**
- **Gender and Social Inclusion Assessment**
- **Energy Needs assessment**
- **Resource Assessment**
- **Technology Assessment**
- **Institutional Assessment**

Chapter 3. District Climate, energy and gender and social inclusion situation report

Chapter 1 has already presented an overview of the selected district, This chapter will present more specific information about the district energy, climate change and gender and social inclusion situation. This should be based on the information collected during the data collection steps presented in table 1.

This will form the baseline of the district from which scenarios can be developed and recommendations made

The situation report should present the findings from the data collection steps and desk study.

Chapter 4. Data Analysis and Scenario Development

This chapter should how data has been analysed and processed. All the data collected in the Situation analysis for Energy, Climate and GSI should be utilised when developing scenarios. The information should be integrated into one planning strategy that addresses all three components.

It is important to state all the assumptions and justifications that have been made to develop the scenarios in this chapter.

This chapter will Identifies priority technologies in relation appropriateness to each DCEP district on the basis of energy demand/resource availability and in relation to potential for climate change adaptation/mitigation and contribution to GSI. Other issues should also be considered including cost of technologies.

For example, *if a VDC has high incidence of forest loss resulting in flooding, drying out of water sources or loss of livelihoods it could be correct to recommend technologies that reduce biomass use such as biogas or ICS.*

A detailed plan needs to be produced for the short term (3 year) plan as mentioned in Section 5.2.

Chapter 5. Plan Design

This chapter should draw on all of the data collection and analysis presented in previous chapters. This chapter should consist of four main sub headings:

1. **Detailed Implementation plan**
2. **Financial Plan**
3. **Monitoring and evaluation plan**
4. **Conclusions and recommendations**

References and Data sources

Renewable Energy

SNV (2010): 'Analysis of District Energy Planning as a Preparation for development of District Climate and Energy Plans' (available from SNV)

Climate Change

Christian Aid Adaptation Tool kit, integrating adaptation to climate change into secure livelihoods

Denton, F., M. O'Neill, et al, (2008) *Adapting to climate change in Africa: The Role of Research and Capacity Development*. Washington DC, World Bank Institute.

Laura E.Williamson, Hélène Connor and Mithra Moezzi (2009), Climate-proofing Energy Systems, International Helio, 2009.

GON (2010), National Adaptation Programme of Action (NAPA), Ministry of Environment, Government of Nepal, June 2010.

GTZ (2010) Climate Proofing for Development, adapting to climate change, reducing risk'.

GTZ (2009) 'Climate Change Information for effective Adaptation'.

IPCC, (2001) *Impacts, Adaptation and Vulnerability. Contribution of working Group II to the third assessment report of IPCC*. Cambridge University Press, Cambridge.

Practical action (2010) 'Impacts of Climate Change, voices of the people'.

Practical Action (2009) TEMPORAL AND SPATIAL VARIABILITY OF CLIMATE CHANGE OVER NEPAL (1976 - 2005)

AEPC and SNV Nepal (2010) 'Guideline for Integration of Climate Change and Gender and Social Inclusion into District Energy Plan', submitted by Practical Action Consulting

Ministry of Environment, Nepal Climate Change and Development Portal http://www.climatenepal.org.np/main/?p=home

GSI

DFID/World Bank (2006): Unequal Citizens: Gender, Caste, and Ethnic Exclusion in Nepal (executive summery available at http://www.agora-parl.org/node/857 ac

UNDP (2000). "*How is gender related to sustainable energy policies*?" Karlsson, G. and Clancy, J, in Sustainable Energy Strategies: Materials for Decision-Makers, www.undp.org/energy/publications/2000/2000a.htm

References for Glossary
Climate change related

OECD. (2009) Integrating Climate Change Adaptation into Development Co-operation, POLICY GUIDANCE

OECD (2008). Climate Change Mitigation, WHAT WE DO?

IPCC, (2001) Climate Change 2001: Synthesis Report. Intergovernmental Panel on Climate Change Secretariat, Cambridge University Press, Cambridge, U.K.

UNFCCC/CCNUCC, Glossary of CDM terms, Version-05, CDM Executive Board
Extract from the CRS Directives [Annex 7], www.oecd.org/dac/stats/crs/directives

Energy and GSI Related

EIA, Energy Glossary, www.eia.doe.gov/glossary/index.html, retrieved on 2010-11-10
Glossary of Energy Terms, http://www.window.state.tx.us/specialrpt/energy/pdf/31-Glossary.pdf, retrieved on 2010-11-10

UNFCCC/CCNUCC, Glossary of CDM terms, Version-05, CDM Executive Board
Gender and Social Exclusion and Assessment (GSEA) 2005 by DFID/World Bank provided further input in its refinement, derived from Integration of Climate Change and Gender and Social Inclusion into District Climate and Energy Planning

Practical Action, 2009, Study to Determine Outline Plans for Eliminating Energy Poverty in Nepal, unpublished version, www.practicalaction.org/.../Energy%20Poverty%20Study_Unpublished%20version.pdf

http://www.nasa.gov/mission_pages/noaa-n/climate/climate_weather.html

http://www.teachmefinance.com/Scientific_Terms.html

Stockholm Environment Institute, Community for Energy, Environment and Development, http://www.energycommunity.org

Glossary of Terms Used in DCEP Guideline

Adaptation: The leading international scientific body on climate change, the Intergovernmental Panel on Climate Change (IPCC) has defined Adaptation as an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Adaptive Capacity: The potential to adjust in order to minimise negative impacts and maximise any benefits from changes in climate is known as adaptive capacity. For e.g. if any community have capacity to respond to impacts on biomass energy resources (depletion) due to climate change through adoption of improved energy technologies to optimize energy consumption or switch to another convenient source of energy, it can be termed as adaptive capacity.

Biogas: A combustible gas derived from decomposing biological waste. Biogas normally consists of 50 to 60 percent methane.

Biomass: It refers to non-fossilized and biodegradable organic material originating from plants, animals and micro-organisms. This shall also include products, by-products, residues and waste from agriculture, forestry and related industries as well as the non-fossilized and biodegradable organic fractions of industrial and municipal wastes. Biomass also includes gases and liquids recovered from the decomposition of non-fossilized and biodegradable organic material.

Calorific Value: The heat content of energy carrier usually expressed in terms of GJ per natural unit.

Climate Change: Any change in global temperatures and precipitation over time due to natural variability or to human activity. Global climate change is caused by the accumulation of greenhouse gases in the lower atmosphere. The global concentration of these gases is increasing, mainly due to human activities, such as the combustion of fossil fuels (which release carbon dioxide) and deforestation (because forests remove carbon from the atmosphere).

Efficiency: The efficiency gives the effectiveness of the energy conversion and of the energy transmission. It describes the ratio between the energy supplied and the energy input. For e.g. an improved cook stove of 20 per cent efficiency conveys that 20 per cent of the available primary energy can be converted into thermal energy.

Energy Consumption: The use of energy as a source of heat or power or as a raw material input to a manufacturing process. Energy consumption is the utilization of thermal, lighting, mechanical and processing energy needs in different energy sector (residential, industrial, commercial, agricultural, transport) with the aid of particular end-use devices and energy sources.

End-use: Any specific activity that requires energy (such as cooking, space heating/cooling, water heating)

End-use Device: Any specific devices/ technologies to pursue different energy activities (such as improved cook stoves, biogas stoves etc)

Energy Intensity: The average energy consumption of some device or end-use per unit of activity. Examples of activity measures are households, floor space, passenger-kilometres and tonne-kilometres.

Energy-mix: Combination of different energy sources.

Gender and Social Inclusion: Gender and Social Inclusion (GSI) also often termed as Gender Equality and Social Inclusion (GESI). The Interim Constitution (2007) guarantees social justice and affirmative action for women, Dalits, Adivasi Janajatis, Muslims, the Madhesi community, and other excluded or disadvantaged groups. It also proposes the future restructuring of the state to promote and institutionalise an inclusive, democratic and progressive local governance system, maximising people's participation.

Gender equity: It refers to fairness of treatment for women and men, according to their respective needs. This may include equal treatment or treatment that is different but which is considered equivalent in terms of rights, benefits, obligations and opportunities.

Gender equality: It refers that women and men have equal conditions for realizing their human rights for contributing to, and benefiting from, economic, social, cultural and political development.

Greenhouse gases: Gases that trap the heat of the sun in the Earth's atmosphere, producing a greenhouse effect. The two major greenhouse gases are water vapor and carbon dioxide. Other greenhouse gases include methane, ozone, chlorofluorocarbons and nitrous oxide.

HDI: An index used to rank countries by level of "human development", which usually also implies whether a country is a developed, developing, or underdeveloped country. The HDI combines normalized measures of life expectancy, literacy, educational attainment, and GDP per capita for countries worldwide.

Joule: One joule is equal to one watt of power radiated or dissipated for one second.
Micro-hydro Power Plant: Decentralized source of electric energy with production capacity ranging from 5 to 100 kW.

Mini-hydro Power Plant: Decentralized source of electric energy with production capacity ranging from 0.1 to 1 MW.

Mitigation: Climate change mitigation is measures or actions to decrease the intensity of factors forcing to global warming due to liberation of green house gases. It contributes to the objective of stabilisation of greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system by promoting efforts to reduce or limit GHG emissions or to enhance GHG sequestration.

Primary Energy: Energy that has not been subjected to any conversion or transformation process. Primary energy is energy contained in raw fuels and any other forms of energy received by a system as input to the system.

Renewable Energy: Any energy resource that is naturally regenerated over a short time scale and derived directly from the sun (such as thermal, photochemical, and photoelectric), indirectly from the sun (such as wind, hydropower, and photosynthetic energy stored in biomass), or from other natural movements and mechanisms of the environment (such as geothermal and tidal energy). Renewable energy does not include energy resources derived

from fossil fuels, waste products from fossil sources, or waste products from inorganic sources.

Renewable Energy Technologies: Any energy technologies that operated or functions using renewable energy sources. Solar Photovoltaic technologies-using solar energy, improved water mills, micro/mini hydro technologies- using perennial source of water, biogas- using animal and human waste etc.

Stakeholders: Stakeholders mean the public, including individuals, groups or communities affected, or likely to be affected, by the proposed DCEP activity or actions leading to the implementation of such activities.

Technology-mix: Combination of different energy end-use technologies.

Useful Energy: Energy generated from the primary energy resources through the application of respective energy technologies and devices.

Watt: The common base unit of power in the metric system. One watt equals one joule per second. One joule is the power developed in a circuit by a current of one ampere flowing through a potential difference of one volt.

Vulnerabilities: IPCC has defined vulnerability in terms of systems, as ‗the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity***.***

Annexes A: Background to steps and frameworks

Annex A.1 SMART Indicators

The concept of SMART objectives became popular in the 1980s as an efficient management concept.

To set SMART targets, the following questions should be answered:

- Specific (well-defined, focused, detailed and concrete) – What are we trying to do? Why is this important? Who is going to do what? When do we need it done? How are we going to do it?

- Measurable (kWh, time, money, %, etc.) – How will we know when this objective has been achieved? How can we make the relevant measurements?

- Achievable (feasible, actionable) – Is this possible? Can we get it done within the timeframe? Do we understand the constraints and risk factors? Has this been done (successfully) before?

- Realistic (in the context of the resources that can be made available) – Do we currently have the resources required to achieve this objective? If not, can we secure extra resources? Do we need to re-prioritise the allocation of time, budget and human resources to make this happen?

- Time-Bound (defined deadline or schedule) – When will this objective be accomplished? Is the deadline unambiguous? Is the deadline achievable and realistic?

Annex A.2. Steps of Participatory District Development Planning Process

District planning procedures

The local self governance act (LSGA) states that the DDCs should prepare District Periodic Plans (DPP) for the development of the district by comprehensively taking into consideration the situation, needs and potential of the district and aspirations of the local people. The districts are also encouraged to prepare a visionary plan generally termed the Strategic Development Plan, defines 20-year development goals in different sectors for the district.

The Annual Plan is extracted from Periodic Plans, which in turn, are extracted from the Strategic Development Plan. This practice has been promoted and adopted by the Local Self-Governance Act, 1999 and Regulation 2000 by defining a specific procedure (14 steps) for local level planning. The planning steps are presented in Annex A 2.b. During the periodic and annual planning cycle a bottom-up process of identifying demands is usually undertaken by the district authorities through a series of participatory meetings organised at different level. The District Council discusses the projects it receives from the DDC for prioritisation, co-ordination, integration and resource allocation and these result in the District Plans.

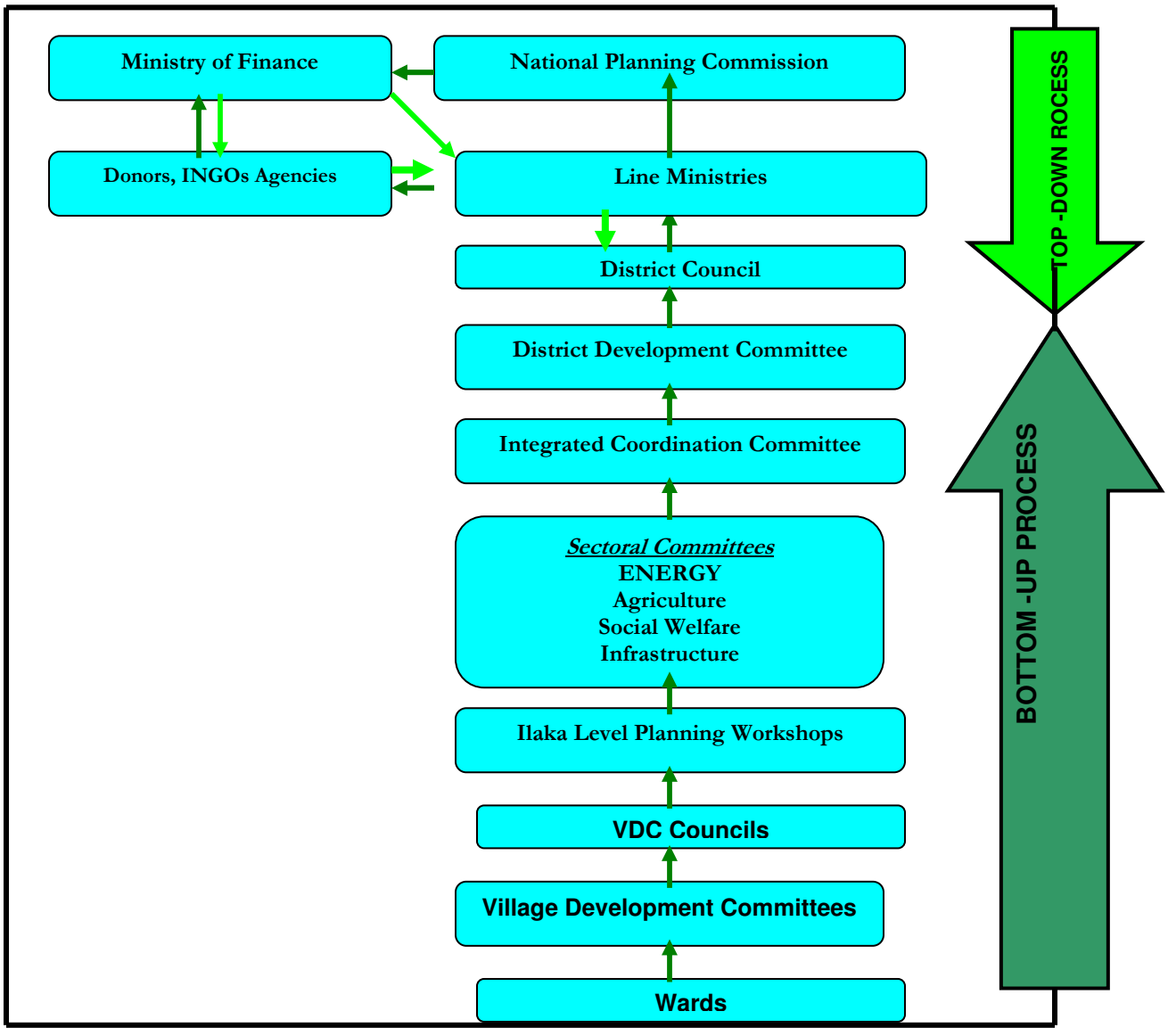
The District Plan includes individual projects and programmes, with a cost estimate and order of priority for implementation. Budgetary allocations are either made by the DDC itself from its own sources, or requests for funding are forwarded to government line agencies or donor agencies. Government line ministries send their sector plans to the National Planning

Commission which makes recommendations for budgetary allocation to the Ministry of Finance for the following fiscal year. In addition, requests for selected project funding are also forwarded from line ministries or the Ministry of Finance to donor agencies. The schematic diagram illustrates the top-down and bottom-up processes in the existing planning system is presented in Annex A.2.a.

Conceptual Framework of DCEP

The DCEP preparation process consists of four stages: assessment, planning, implementation and monitoring. The assessment consists of data collection, evaluation of the collected data and its compilation. The planning process starts with the assessment of energy needs of the district. This process moves through District Energy and Environment Coordination Committee (DEECC) workshop/meeting and participatory planning workshop as a part of the DCEP preparation process

Annex A.2.a: ***Top-Down and Bottom -Up Planning Process in Nepal***



Annex A.2.b: District Planning Steps (to be practiced by DEEU/DDC)

Steps	Theme	Activities	Who/When
Primary	Information	Data analysis and preparation of resource map	DDC information centre
Steps 1	Guidelines	Fix budget Ceiling	DDC/middle of November
Steps 2	Revision of Guidelines	Revision of guideline and budget ceiling	DDC / Third week of November
Steps 3	Planning Workshop	Discussion of plan priority and budget with DDC member and line agency heads	DDC/ End of November
Steps 4	VDC meeting	Discussion of possible priority sector and programme / projects at ward and settlement level	VDC/ Third week of December
Steps 5	Selection of Projects	Discussion of felt need of community, prioritise projects and fill-up of demand collection Compilation of community demand	Community/ Third week of December
Steps 6	Ward Meeting	Prioritisation and recommendation for VDC Compilation of ward level projects, Resource	Ward meeting/ Last week of December
Steps 7	VDC Meeting	Estimation, Prioritisation, Classification of projects as per resources need, and classify projects to be implemented by VDC and to be forwarded to Ilaka / district level	VDC/January first week
Steps 8	VDC Council Meeting	Approval, with or without alteration, of the VDC Meeting outcomes (Step 7)	VDC Council/ Second week of January
Steps 9	Ilaka Level Planning Workshop	Compilation, Prioritisation and Recommendation Of projects received from VDC Council.	Coordinated by Ilaka Member / First week of February
Steps 10	Sectoral Planning Meeting	Classification of projects recommended from Ilaka level, Prioritisation and recommendation for further processing.	Sectoral Committee of DDC/ Third week of February
Steps 11	Integrated Planning Formulation	Inclusion, exclusion and revision of priority of the projects on recommendation of Sectoral Planning Committee	Integrated Planning Committee of DDC/ End of February
Steps 12	DDC Meeting	Compilation and analysis of projects from	DDC / First week of March

		Sectoral committees and appraisal of compiled projects i.e. environmental, economic and social standpoint, Prioritisation of projects, classification of projects according to resource i.e. implementation through own resource or requires central level resources through sectoral ministry	
Steps 13	DDC Council	Approval of programmes and policies of district	Second week of March
Steps 14	Implementation	Presents the approved programmes to the central agencies. Implementation of programmes after approval of central agencies	Fourth Week of march / DDC and Line Agencies After approval generally at end of July / DDC and Line Agencies

Annex A.3: Data sources

Name of Agency	Data Source for
National Planning Commission	National plans and interim plans
Ministry of Environment	National/Local Adaptation Plan (N/LAPA)
Alternative Energy Promotion Centre (AECP)	Energy policy, energy programs/projects related study/survey reports, RETs development data
Department of Hydrology and Metrology	Rainfall and temperature data
Centre Bureau of Statistic	Population census, national/district energy data
Ministry of Finance	Economic survey reports
Department of Electricity Development	Electricity act and policies, approval of survey licenses and hydro power development data/information
District Development Committee (DDC)	District profile, district periodic plans, sectoral plans, annual plan , DEPP, DESR,
District Irrigation Office (DIO)	Water resources, irrigation systems
District Forest Office (DFO)	Forest resources, community forestry, forest plans
District Water Supply Office (DWSO)	Water resources, drinking water systems

District Agricultural Office (DAO)	Agricultural land, input and output
District Labor Office (DLO)	District work force
Agricultural Development Bank (ADBN)	Bank loan on energy sector
FNCCI District Chapter	Private sector status
District Education Office (DEO)	Education situation and education plan
Women Development Office (WDO)	Women situation and energy related activities
District Livestock Office (DLO)	Population of livestock.
District Soil Conservation Office (DSCO)	Soil conservation and natural resources management, landsides data
District Industries Office (DInO)	Enterprises, training program
Village Development Committees (VDC)	VDC profile, energy plans
International NGOs National and local NGOs Private Sector Organizations (PSOs)	Climate , energy and gender and social inclusion related actives and its reports/documents
Water and Energy Commission Secretariat (WECS)	Energy and water resources
Nepal Electricity Authority (NEA)	Electrification
Biogas Sector Partnership Nepal (BSP-N)	Biogas
ICIMOD	Energy and natural resources
United Nations Development Programmes	Energy related study reports
Association of District Development Committees of Nepal (ADDCN)	Decentralisation policy and energy planning related guidelines
National Association of Village Development Committees in Nepal (NAVIN)	Decentralisation policy and energy planning related guidelines

Annex A.4: Template for District overview and socio economic data requirements

Information Requirement	
Development Region	
Zone	
District	
Number of constituency	
Number of Ilaka	
Number of Municipalities	
Ward of Municipalities	
Number of VDC	
Political Boundary East : West : North : South	
Location	
Latitude……..	
Longitude	
Altitude Maximum Altitude: ……..m Minimum Altitude: …….m	
Climate Sub-Tropical/Alpine/Cold /Warm	
Temperature Maximum Temperature-……^{0}C Minimum Temperature-…….^{0}C	
Rainfall …….mm. Average Annual	
Soil	
Rock	
Area and Land Use Total Area : Ha (…. sq.km.) Cultivated Area…..1 Ha Non-cultivated Area…Ha. Grazing Area Forest Area Other Area	
Population	
Total Population Male : Female Ethnic groups Total Households Average Household Size : Population Density/Sq.km. Population Growth Rate :	

Ethnic/Caste groups

Use framework from **Nepal Gender and Social Exclusion Assessment** GSEA – modify where appropriate

FIGURE 4 Caste/ethnic groupings – simplified for analysis

% Total population	GSEA / NLSS II (10 groups)	2001 Census (103 groups)
Hindu caste groups (57.5%)	1. BC (Hill)	Brahman, Chhetri, Thakuri, Sanyasi,
	2. BC (Tarai)	Kayashta, Rajput, Baniya, Marwadi, Jaine, Nurang, Bengali
	3. Tarai Middle Castes	Yadev,Teli, Kalwar, Sudi, Sonar, Lohar, Koiri, Kurmi, Kanu, Haluwai, Hajam/Thakur, Badhe, Rajbhar, Kewat Mallah, Numhar, Kahar, Lodha, Bing/Banda, Bhediyar, Mali, Kamar Dhunia
	4. Dalits (Hill)	Kami, Damai, Sarki, Gaine, Badi
	5. Dalits (Tarai)	Chamar, Musahar, Tatma, Bantar, Dhusadadh/Paswan, Khatway, Dom, Chidimar, Dhobi, Halkhor, Unidentified Dalit
Janajatis (37.2%)	6. Newar	All Newari Castes
	7. Janajatis (Hill)	Magar,Tamang, Rai, Gurung, Limbu, Sherpa, Bhote, Walung, Buansi, Hyolmo, Gharti/Bhujel, Kumal, Sunuwar, Baramu, Pahari, Adivasi Janajati, Yakkha, Shantal, Jirel, Darai, Dura, Majhi, Dunuwar, Thami, Lepcha, Chepang, Bote, Raji, Hayu,Raute, Kasunda
	8. Janajatis (Tarai)	Tharu, Dhanuk, Rajbanshi, Tajpuriya, Gangai, Dhimal, Meche, Kisan, Munda, Santhal/Satar/Dhangad/Jhangad, Koche, Pattarkatta/Kusbadiya
Muslims (4.3%)	9. Muslims	Muslim, Churoute
Others (1%)	10. Others	

Source: DFID/World Bank (2006)

Magar : .....%
Chhetri : .....%
Brahman : .....%
Kami/Sunar : .....%
Others : .....%

Education	
Literacy % Male Literacy % female Literacy % Number of Campus : Number of Higher Secondary school: Number of Secondary School: Number of Lower Secondary school: Number of primary School:	

Level	Dalit		Disadvantaged Janajati		Advantaged Janajati (Newar, Thakali)		Other disadvantaged groups		BC		Total
	Male	female	Male	female	Male	female	Male	female	Male	female	
Primary											
Lower Secondary											
Secondary											
Total											

Health	
District Health Office District Hospital Primary Health Centre Health Post Sub-Health Post Ayurverdic Aushadhalaya	
Bank Nepal Bank Limited Rastriya Banijya Bank Agriculture Development Bank	
Communication	
Personal Telephone Line Office Telephone Line PCO District Post Office : Area Post Office Additional Post Office	
Irrigation	
Total Irrigated Land : …… Ha. (6.7 %) Non-Irrigated Land : ……. Ha.(93.3%)	
Natural Resources	
Hydro Power	
Hydro Power Plant : ……. Hydropower plant--12.3 MW Constructed and managed by ……..	
River System	
Forest	
Timber Tree-	
Herbal Plants	
Road KM	
Rural Road: KM	
Electricity	
Private Power Company	
Number of VDC / Nos. of HH Coverage	
Nepal Electricity Authority	

Number of VDC	Nos. of HH Coverage		
DDC(AEPC/REDP/ESAP			
Number of VDC	Nos. of HH Coverage		

Drinking Water and Sanitation

Drinking Water : Total nos. of Household Coverage - ……%
Sanitation : Total Household Coverage - …….%

Agriculture

S.N.	Crop	Area(Ha)	Product.(Mt)
1	Paddy		
2	Maize		
3	Wheat		
4	Barley		
5	Millet		
6	Oil Seed		
7	Potato		
8	Masuro		
9	Pea Nut		
10	Ginger		

Other data can be included if deemed to important for energy or climate planning E.G Geography – Rivers, topography, roads etc

Annex A.5: District Energy Resources/Supply

Energy Resources	Energy Type	Data/Information Required	Sources of Information/Reference Documents
Traditional (Biomass)	Firewood	- Forest area (Ha) - Gross/Accessible forest area (Ha) - Sustainable fuel wood supply (ADT) - Energy potentiality (GJ)	- WECS (energy resources and consumption report) - Department of Forest (LRMP report) - District forest office (district forest sector plan) - District energy situation report (if available) - Energy conversion table - Topographic map
	Agricultural residue	-Crop type (*paddy, maize, wheat*…….) - Area (Ha) -Annual production (MT) - Residue available for each crop type -Total residue supply (MT) - Energy potentiality (GJ)	- WECS (energy resource and consumption report) -District agricultural development office (annual report) - District energy situation report - Energy conversion table
	Animal dung	-Livestock type and numbers of each type -Dung production per animal per year (MT) -Annual dung production (MT) - Annual dung collected (MT) -Energy potentiality (GJ)	- WECS (energy resource and consumption report) - District livestock office (annual report) - District energy situation report - Energy conversion table
Commercial	Fossil fuel Kerosene LPG Diesel petrol Gasoline	Fossil fuel supply data Kerosene (KL) → GJ LPG (Kg) --→ GJ Diesel (KL)-→ GJ Petrol (KL) → GJ Gasoline (KL)-→GJ	- WECS (energy resource and consumption report) - District energy situation report - Energy conversion table - Fossil fuel suppliers
	Coal/Coke	Coal/coke (MT) -→ GJ	
	Charcoal	Charcoal (MT)--→ GJ	
	Grid - electricity	Electricity supply (MWH) -→ GJ	- NEA district office
Renewable	Hydro energy potential	-Name of perennial rivers/streams - Minimum flow in rivers/streams -Major lakes -Potentials beneficiary VDCs for each	-Topographic map (FINIDA project, survey department) - WECS(hydro power inventory study report, water resources inventory study report)

		rivers/streams -If hydro power inventory study done list the data *sources* *location* *potential power output* -Existing Irrigation/ drinking water systems and its potentiality for hydro power development and list data *sources* *location* *beneficiary VDCs/community*	- Department of Electricity Development (approval for hydro power development by private sector) - Irrigation/water supply sub divisional offices - AEPC/ESAP (Carpet study for micro hydro)
	Solar energy potential	-Total monthly average radiation watt/m^2 -Average annual Sunshine Hours - Area available, Sq. km - Power/Energy Output (Mwh,MW)	-WECS (energy resource and consumption report) - AEPC (SWERA Report)
	Wind energy potential	- Wind energy potentiality sites or location - Wind velocity, m/s	-WECS (energy resource and consumption report) - AEPC (SWERA Report)
	Biogas potential	-Potentiality of biogas plants (link to animal dung)	- AEPC/BSP (annual reports)
	Bio-fuel	-Potentiality of Jatropha farming	- AEPC(bio-fuel programme) -DDC -District forest office, DFCC office - District agriculture office - District levels NGOs

District Energy Consumption/Demand

Total Energy Consumption in a DCEP District (.....Year)

S.N.	Fuel Type	Residential	Sector	Industrial	Sector	Commercial	Sector	Agriculture	Sector	Transport	Sector	Overall	
		Unit	GJ	Unit	GJ	Unit	GJ	Unit	GJ	Unit	GJ	Unit	GJ
1	Fuelwood,MT												
2	Agri. Residue,MT												
3	Animal Waste,MT												
4	Biogas,'000cu.m.												
5	LPG,kg												
6	Kerosene,KL												
7	Electricity,MWH												
8	Coal/Coke,'000kg												
9	Charcoal,MT												
10	Petrol,KL												
11	Diesel,KL												
12	Others,GJ												
	Total												

Total Energy Consumption in a DCEP District (……Year)

S.N.	End Use Type	Residential	Sector	Industrial	Sector	Commercial	Sector	Agriculture	Sector	Transport	Sector	Overall	
		Unit	GJ	Unit	GJ	Unit	GJ	Unit	GJ	Unit	GJ	Unit	GJ
1	Cooking												
2	Space conditioning												
3	Lighting												
4	Process Heat.												
5	Motive power												
6	Heating application												
7	Passenger transport												
8	Goods transport												
9													
10													
11													
12													
	Total												

Energy Supply and Consumption /demand Scenario in DCEP District (GJ)

Description	**Energy type**	**Fuel wood**	**Agriculture Residue**	**Animal Waste**	**Electricity**				**Total**
Consume-on	Residential								
	Industrial								
	Commercial								
	Agricultural								
	Transport								
	Total								
Supply									
Surplus/Deficit									

Annex A.5 The Nature of climate change risks

Fig 3. Speed of onset

Extremely fast onset (days/weeks), including:	Fast onset (weeks/months), including:	Slow onset (months/years), including:
- Intense cyclones/ hurricanes and associated storm surges - Localised high wind episodes/tornados - Increased risk of river and flash flooding/ mudflows - Erratic and intense rainfall, hailstorm and/or lightning strike episodes - Landslide risks from increasingly intense rainfall events* - Extreme temperature episodes - Snow storms, instability of snowfields and avalanche risk	- Increased windspeeds - Increasingly erratic rainfall and heightened risk of flood - Increased drought risk in rainfed farm and rangelands - Increased intensity of rainfall during the monsoon/rainy season and increased erosion risks - Increased seasonal river and streamflow variability - Water table fluctuation and changing water resources for both rural and urban areas - Increased temperatures and evapotranspiration - Increased variation in snowfall and consequently increased streamflow variability - Increased melt season temperatures increasing meltwater streamflow	- Average windspeed and cyclone frequency and strength - Sea-level rise, coastal erosion - Saline intrusion into soils and aquifers - Changing rainfall patterns and seasonality - Declining average water availability and increased water stress - Declining rangeland water resources, leading to overstocking and erosion around remaining water resources - Higher temperatures/ increasing aridity - Rising average temperatures, particularly in high-altitude zones - Retreat and disappearance of mountain glaciers and glacier-based water resources - Coral bleaching - Desertification - Changes to current upwelling in large marine ecosystems, and potential threats to fisheries - Altitudinal and horizontal shift in natural and agro-ecosystem zones - Changing ecology and hydrology, affecting farmers and agro-ecosystems - Declining resilience of forest resources and habitat for native fauna

Key:
Dark blue – wind and water-related
Blue – water-related
Light blue – snow/ice-related
Red – temperature-related
Orange – acidification plus temperature
Green – ecosystem-related

* - often inter-related with earthquake-related landslides

Source: Christian Aid Adaptation Tool kit, Integrating adaptation to climate change into secure livelihoods

Annex B Tools, Tables and Frameworks

This annex contains all of the referenced tools tables and frameworks that are necessary for data collection and analysis for completion of a DCEP.

Annex B.1: Climate change impacts on biomass energy
Annex B.2: Direct and indirect impacts of changes in meteorological variables
Annex B.3: Examples of direct & indirect impacts of climate on electricity systems
Annex B.4: the Energy Planning Steps and Climate Change Aspects
Annex B.5: Energy Planning steps and Inter-linkage with Climate Change Vulnerability, Adaptation & Mitigation
Annex B.6: Energy planning steps and inter-linkages to GSI
Annex B.7: Energy Consumption Disaggregation and Feed stock
Annex B.8: Information required to address Climate Change Issues, Sources and Gaps in meeting Energy Demand
Annex B.9: GSI Considerations in Energy Needs Assessments
Annex B.10: Information required to address GSI in Energy Need Assessment
Annex B.11: Energy Supply, Type and Source Disaggregation
Annex B.12: Energy Resource and Climate Change Linkages
Annex B.13: Information required to address CC Issues, Sources and Gaps
Annex B.14: Climate Proofing of Various Technical Options
Annex B.15: End-uses Climate Change Adaptation and Mitigation Potential
Annex B.16: Adaptive Capacity & Aspects of assessment
Annex B.17: Energy Consumption Tables
Annex B.18: Multi-criteria scoring systems - Multi-criteria scoring system for climate sensitive energy technology/ resource selection
Annex B.19: Guideline for District Energy Resources/Supply Data Collection
Annex B.20: VDC selection Criteria

Annex B.1 Climate change impacts on biomass energy

Change in meteorological variable	Impact on biomass availability	Impact on power generation[1]
Increase in temperature	Increase provided that no lack of other resources constraints plant growth is not facilitated. But decrease, if plants reach threshold of biological heat tolerance or sea level rise, which reduces area where plants grow	Decrease if power plant is impacted by sea level rise – otherwise impact depends on availability of biomass
Increase in average precipitation	Increase, if increase occurs during the growing season	Increase
Decrease in average precipitation	Decrease unless decrease occurs outside the growing season	Decrease
Droughts	Decrease	Decrease
Glacier melting	Depends on situation of glaciers with regards to the current and future snow lines. If biomass is under irrigation: Increase short- to medium-term Decrease over long-term If not, none	Depends on availability
Floods	Decrease if floods affect area where biomass is sourced	Decrease with power plant flooded or biomass availability is reduced
Increase in frequency and/or strength of storms/cyclones	Decrease if storms affect area where biomass is sourced	Decrease if equipment is destroyed or biomass availability is reduced

[1] Power Generation from biomass is comparatively new phenomena in Nepal limited to adaptive research only,

Annex B.2 Direct and indirect impacts of changes in meteorological variables

Direct change	Direct impact	Indirect impact	Cross effects
Increase in temperature	Heat-wave	Increase in electricity demand	
	Glacier melting	Short term: Increase in water flow Long-term: Decrease in water flow	Droughts/ floods
		Formation of moraine lakes with subsequent overflow or bursting of containment	Floods
		Sea-level rise	Floods
	Increase in vaporation	Decrease of stream flow	Droughts
	Stronger cyclones/storms		Floods
Increase in precipitation	Floods		
Decrease in precipitation	Droughts		
Decrease in cloud cover	Increase in evaporation	Decrease of stream flow	Droughts
Increase in cloud cover	Decrease in evaporation	Increase of stream flow	Floods

Annex B.3 Examples of direct & indirect impacts of climate on electricity systems

Change in meteorological variable	Impact on electricity transmission	Impact on electricity use
Increase in temperature	Some	Increase in higher cooling needs Decrease if sea-level rise displaces population and industrial production
Decrease in cloud cover	None	Decrease in lighting needs
Increase in cloud cover	None	Increase in lighting needs
Increase in frequency and/or strength of storms/cyclones	Failure/damage of transmission lines	Decrease in demand due to the destruction of houses and factories
Floods	Failure of transmission equipment from flooded power plants	Sharp decrease in demand due to interruption of production in flooded factories/cessation of electricity consumption in flooded houses

Droughts	Risk of destruction of transmission lines due to forest fires	Slight decrease in demand due to interruption of production in factories whose supply of raw materials have been depleted/cessation of electricity consumption in houses of people abandoning the drought area

Annex B.4 Energy Planning Steps and Climate Change Aspects

Component	Step	Step in Energy Planning	Climate Change Aspects
Energy Needs Assessment	1	Identifying End User Groups – characterizing types of user disaggregated by economic sectors, e.g., households (identify women headed HH's), commercial (public services and enterprises), industrial, and agricultural	• Likely impacts of climate change with respect to energy needs and trend analysis • Energy planning being specific sectoral planning, primary analysis and research of climate situation will prove to be resources and time consuming and should not be pursued. District energy planner will have to rely on the available secondary information sources. • Where secondary information is not available, community based analyses can be done by selecting representative samples in different climatic zones in the districts considering micro-climatic areas. • The assessment involves assessment of future climate situation over the target area/community.
	2	Develop Energy Needs Matrix – plotting end uses and use requirements against user groups (Cooking, heating, motive power, lighting, etc.)	
	3	Diversity in Energy Needs – Diversity in technical and operating requirements for energy services e.g. geographic, seasonality, quality, benefits	
	4	Surveying End Uses – detailed analysis of needs and uses for gender, age, social/economic status etc.	
	5	Future Energy Needs Projection – Future energy need projections, scenarios (Business as usual, optimistic and pessimistic scenario)	
Resources Assessment	6	Resource Evaluation – availability, location, potential and access to energy resources in the district	• Assessment of energy resources, linking past supply trend vis a vis climate change trend. • Sensitivity of resources to climate change • Potential of community to cope with adversities or stresses imposed by the climate change on energy resources.
	7	Institutional Evaluation – capabilities of local government & other organizations for extension, publicity, credit, maintenance etc.	
Technology Assessment	8	Review Options – increasing supply, tech improvements, new equipment, more fuels, reduce or redistribute demand	• Energy efficiency of technology and its sensitivity to the changing climate • Mitigation potential • Role in enhancing communities' capacity to adaptation to climate change • Assess climate change implications on technology
	9	Screening of options – against an agreed set of criteria linked to reliability, cost efficiency, adaptation and mitigation potential, social acceptance etc	
Matching	10	Assessment of Energy Technology Systems in detail against needs	• Mitigation potential • Role in enhancing communities' capacity to

solutions to needs	11	Economic effects assessment	adaptation to climate change
	12	Assess social effects	
Planning Inputs to district development Planning	13	Feeding back into the main planning process	• Climate proofing of technologies • Prioritising technologies that increase communities resilience to climate change • GHG Emission abatement

Annex B.5 Energy Planning steps and Inter-linkage with Climate Change Vulnerability, Adaptation & Mitigation

Planning Component	Step	Step in Energy Planning	CC Vulnerability	CC Adaptation	Mitigation Options
Energy Needs Assessment	1	Identifying End User Groups	Identify vulnerable sector and cause effect relationships For example, sectors sensitive to climate change requiring more [or less] energy[2]	Identify adaptation potential	Identify mitigation potential (the usual emission and reduction potential through 'RETs')
	2	Develop Energy Needs Matrix	Identify 'total additionality' in energy needs.	Identify 'total additional energy needs for adaptation'	Identify the potential areas where emissions can be reduced.
	3	Diversity in Energy Needs	In the context of CC answer 'how much, when and to whom the additional [or less] energy will be required due to impacts of CC	Identify adaptation potential	Identify mitigation potential
	4	Surveying End Uses	Collection of vulnerability and hazards information for specific group of people	Collection of information on adaptation potentials for specific group of people	Collection of information on mitigation potentials for specific use

[2] It is not easy to quantify though. A gross estimate should be fine. Suppose agriculture is based on irrigation from pumping up underground water. Increasing drought or uptake would lower the water table. This situation may require further deepening wells (borings) to cope with the situation. More energy will need to pump up water from further depth. Here, the deepening of well is a coping measure where some additional energy is necessary. Thus energy has adaptation potential.

Planning Component	Step	Step in Energy Planning	CC Vulnerability	CC Adaptation	Mitigation Options
			within energy sector		
	5	Future Energy Needs Projection	Vulnerability projection as a result of future climate situation over the target area/community	Future adaptation scenario, Future role of technologies and climate proofing needs of technologies	
Resources Assessment	6	Resource Evaluation	Production and supply vulnerability	Resource management as adaptation potential	Assess to what extent the clean and RET can be promoted
	7	Institutional Evaluation	Awareness, attitude, resources, policy etc of different institutions	Promote their roles and responsibilities to cope with climate change	Promote mitigation
Technology Assessment	8	Review Options	Technology vulnerability due to climate change	Adaptation to climate change through new technologies	Quantify mitigation potential (how much emission could be reduced as compared to business as usual)
	9	Screening of options	Add new criteria of vulnerability	Add new criteria of adaptation	Add new criteria of mitigation potential
Matching solutions to needs	10	Technology to meet needs	Technology vulnerability	Climate proofing of technologies	GHG Mitigation assessment
	11	Economic assessment	Assess impacts of vulnerability	Assess costs of adaptation	Carbon trading
	12	Social assessment	Assess degree of vulnerability	Assess adaptation potential extent	
Planning Methods	13	Feeding back into the main planning process	Feed analytical results	Feed analytical results	Feed analytical results

Annex B.6. Energy planning steps and inter-linkages to GSI

Planning Component	Step	Step in Energy Planning	Gender	Social Inclusion	Addressing Concerns
Energy Needs Assessment	1	Identifying End User Groups	1. Identification	Identification of Socially Excluded groups in the district based on disaggregated data on energy use	Disaggregated data by GSI categories
	2	Develop Energy Needs Matrix	Disaggregated data	Identify causes of exclusion and barriers to inclusion	Social divergence in activity requiring energy
	3	Diversity in Energy Needs	How do different groups energy needs vary	Identify specific energy needs for practical and productive use by groups	Address GSI categories specific energy needs for practical and productive use
	4	Surveying End Uses		Identify key actors to promote or block social inclusion in energy development	Social divergence in activity requiring energy
	5	Future Energy Needs Projection		Project specific energy needs for GSI categories	Specific energy needs for practical and productive use by groups
Resources Assessment	6	Resource Evaluation	2. Design	Analyse sector policy mandates	Disaggregated data by GSI categories
	7	Institutional Evaluation		Analyse institutional arrangements and accountability system	Policy to address GSI issues, capacity building needs and access to credits
Technology Assessment	8	Review Options		Review impact of technology to different social groups	Assess whether the technology will increase or decrease GSI divide
	9	Screening of options		Use technology that are favourable to excluded groups	GSI specific criteria
Matching solutions to needs	10	Technology to meet needs	3 Implementation	Design programme intervention Ensure adequate budget allocation for inclusion	Assess vulnerability and potentials of adaptation with respect to GSI disaggregated information
	11	Economic			

Planning Component	Step	Step in Energy Planning	Gender	Social Inclusion	Addressing Concerns
		assessment		Ensure inclusive staff selection and decisions/funds	
	12	Social assessment			
Planning Methods	13	Feeding back into the main planning process	4. Monitor and adjust implementation	Assess input delivery to excluded Assess impact of energy development in livelihood, policies and empowerment of the excluded Adjust plan as required	Assess result of the work through disaggregated data by gender and social groups

Annex B.7: Energy Consumption Disaggregation and Feed stock

Demand Sector	End-use Type	Device	Natural Resource or Energy Input
Residential	Cooking	Traditional Cook Stove	Wood, Loose Biomass Dung Cakes
		Improved Cook Stove	
		Biogas Stove	Gas from dung and bio-wastes
		Fossil Fuel Stove	Kerosene, LPG, Coal
		Electric Stove/Oven	Electricity grid or off-grid
	Space Conditioning	Biomass Heater	Wood, Loose Biomass, Dung
		Fossil Fuel Heater	Kerosene, LPG, Coal
		Electric Heater	Electricity: i) Grid, ii) MH
		Air Conditioner/Fan	Electricity: i) Grid, ii) MH
	Lighting	Fossil Fuel Lamps	Kerosene, and LPG
		Biogas Lamp	Biogas
		Incandescent Lamp	Electricity: i) Grid, ii) MH, iii) SPV
		Fluorescent Lamp	Electricity: i) Grid, ii) MH, iii) SPV
		CFL	Electricity: i) Grid, ii) MH, iii) SPV
	Other	HH Elect. Appl, High Wattage (>100W)	Electricity: i) Grid, ii) MH
		HH Elect. Appl, High Wattage (<100W)	Electricity: i) Grid, ii) MH, iii) SPV
Commercial	Cooking	Biomass stoves	Wood, Loose Biomass, Dung
		Fossil Fuel Stove/Oven	Kerosene, LPG, Coal
		Electric Stove/Oven	Electricity: i) Grid, ii) MH, iii)
	Space Conditioning	Fossil Fuel Heater	Kerosene, LPG, Coal
		Electric Heater	Electricity: i) Grid, ii) MH
		Air Conditioner	
		Electric Fan	Electricity: i) Grid, ii) MH. iii) SPV
	Lighting	Incandescent Lamp	Electricity: i) Grid, ii) MH. iii) SPV
		Fluorescent Lamp	
		CFL	
		Arc Lamp (Sodium)	Electricity: i) Grid, ii) MH
	Other	Electrical Appliances	Electricity: i) Grid, ii) MH
Industrial	Lighting	Incandescent Lamp	Electricity: i) Grid, ii) MH. iii) SPV
		Fluorescent Lamp	
		CFL	
		Arc Lamp (Sodium)	Electricity: i) Grid, ii) MH
	Process Heat	Boilers – Biomass	Wood, Loose Biomass (Agric Residue)
		Boilers - Fossil Fuel	Diesel, Fuel Oil, Light Diesel Oil
		Direct Combustion – Biomass	Wood, Loose Biomass (Agric Residue)
		Direct Combustion - Fossil Fuel	Diesel, Fuel Oil, Light Diesel Oil

Annex B.7: Energy Consumption Disaggregation and Feed stock

Demand Sector	End-use Type	Device	Natural Resource or Energy Input
		Direct heat - Electricity	Electricity: i) Grid, ii) Micro Hydro
	Motive Power	Electrical Machines	Electricity: i) Grid, ii) Micro Hydro
		Combustion Engine	Diesel, Fuel Oil, Light Diesel Oil
Agriculture	Motive Power	Electrical Machines	Electricity: i) Grid, ii) Micro Hydro
		Combustion Engine	Diesel, Kerosene, Gasolene
	Heating Application	Direct Combustion - Biomass	Wood, Loose Biomass (Agric Residue)
		Direct Combustion - Fossil Fuel	Diesel, Fuel Oil, Light Diesel Oil
		Direct heat - Electricity	Electricity: i) Grid, ii) Micro Hydro
Transport	Passenger transport	Road transports - Bus/Minibus - Car/Suv - Motorcycle	Diesel, Gasoline
	Goods Transport	Road transports - Truck - Jeeps - Tractors - Ropeway	Diesel, Gasoline

Annex B.8. Information required to address Climate Change Issues, Sources and Gaps in meeting Energy Demand

End-Uses	Device	Information required	Sources of information	Likely Information Gaps	Information Collection Tools
Cooking	Traditional Cook Stove	• Consumption • Unit Energy Consumption (per HH) • Emission in use • Emission in transport of energy • Technology Cost • Contribution to conservation of forest resources (i.e., carbon savings potential) • Implications with regards to resilience to CC vulnerability • Opportunities of income and employment generation in the community • Possibility to use local materials and skills to manufacture device	AEPC, BSP, IFCCC default, ICIMOD, Practical Action, Various Websites,	• Technology Cost • Opportunities of income and employment generation in the community • Possibility to use local materials and skills to manufacture device • Time savings in HH chores • Other market information	• CMA: Checklist/ Multiple Attribute • EJ: Expert Judgement • FGD: Focus Group Discussion • HC PP: Hazard calendar of past and present • VMPTA: Vulnerability Mapping and Problem Tree Analysis • RMA: Resource Mapping and Assessment
	Improved Cook Stove				
	Biogas Stove				
	Fossil Fuel Stove				
	Electric Stove/Oven				
Space Conditioning	Traditional Biomass Heater				
	Fossil Fuel Heater				
	Electric Heater				
	Air Conditioner				
	Electric Fan				
Lighting	Fossil Fuel Lamps				
	Biogas Lamp				
	Incandescent Lamp				
	Fluorescent Lamp				
	CFL, WLED				
	Arc Lamp (Sodium)				
Other	HH Elect. Appliance				
Motive Power	Electrical Machines				
	Combustion Engine				
Boiler	Boilers – Biomass, Fossil fuel				
Process Heat	Direct Combustion – Biomass, Fossil fuel				
	Direct heat - Electricity				
Transportation	Combustion Engine				

Annex B.9: GSI Considerations in Energy Needs Assessments

Consumption Type			Gender and Social Issues	GSI from Climate Change Perspectives
End Use	**Technology**	**Energy Resource**		
Cooking	Traditional Cook Stove Improved Cook Stove Fossil Fuel Stove Biogas Stove Electric Stove/Oven	Wood, Agric Residue, Dung; Kerosene, LPG; Dung and bio-wastes Electricity	• Roles and Responsibilities at HH and community level • Access to the resources energy • Means of bearing the cost • Ability to move up the energy ladder • Social and financial implications of this move group • Technical skills and ability to operation • Implication on work load before and after the technology intervention • Knowledge of legalities pertaining to ownership use of resources necessary to operate the technology • Adaptation measures during low supply • Implication of sharing energy forms for multiple end uses	• Implications on the workload due to changes in the available quality and quantity of the energy forms in use • Emission of the technology used and its implication on health • Ownership and decision making role of women
Space conditioning	Fossil Fuel and Electric Heater	Kerosene, LPG, Electricity		
	Air Conditioner, Electric Fan	Electricity from grid		
Lighting	Fossil Fuel Lamps Biogas Lamp Incandescent, Fluorescent, & CFL	Kerosene, LPG Dung and bio-wastes Electricity		
Process Heat	Boilers – Biomass, Fossil Fuel Direct Combustion – Biomass, Fossil Fuel Electricity	Wood fuel, bagasse, rice-husk, briquette Kerosene, diesel, LPG, coal Electricity		
Motive Power	Electric Machines Combustion Engine	Electricity from hydro and thermal Wood Fuel, coal		
Lighting	Fossil Fuel Lamps Incandescent, Fluorescent & CFL	Kerosene, LPG Electricity from grid, MH, Solar PV		
Motive Power pre and post harvesting	Electrical Machines Combustion Engine	Electricity from grid, micro hydro Wood Fuel, coal		
Heating Application	Direct Combustion – Biomass, Fossil Fuel, Electricity Solar Drier	Wood Fuel, bagasse, rice-husk, briquette, Kerosene, diesel, LPG, coal Electricity from hydro, thermal,		

Consumption Type			Gender and Social Issues	GSI from Climate Change Perspectives
End Use	Technology	Energy Resource		
	Electric- biomass, solar hybrid Solar biomass hybrid	solar		
Irrigation	Pumps	Diesel, Electricity from grid and RET		

Annex B.10. Information required to address GSI in Energy Need Assessment

Consumption Type			Information Required from Gender and Social	Sources of Information	Gaps in Information
End Use	Technology	Energy Resource			
Cooking	Traditional Cook Stove Improved Cook Stove Fossil Fuel Stove Biogas Stove Electric Stove/Oven	Wood, Agric Residue, Dung; Kerosene, LPG; Dung and bio-wastes Electricity	• Comparative fuel consumption by this group • Ability to operation • Access to information on technology and after sales services • Impact on health, time use, and indoor air pollution, • Possibility of income generation, • Household roles and responsibilities of male and female including decision making in choice of technology within HH • Ethnicity and income levels, Decision making	• AEPC • BSP • CRT • ICIMOD • Practical Action	• Comparative fuel consumption by this group • Ability to operation • Access to information on technology and after sales services • Possibility of income generation, • Ethnicity and income levels, Decision making powers/position of various group within
Space conditioning	Fossil Fuel and Electric Heater	Kerosene, LPG, Electricity			
	Air Conditioner, Electric Fan	Electricity from grid			
Lighting	Fossil Fuel Lamps, Biogas Lamp Incandescent, Fluorescent, & CFL	Kerosene, LPG Dung and bio-wastes Electricity			
Process Heat	Boilers – Biomass, Fossil Fuel Direct Combustion – Biomass, Fossil Fuel Electricity	Wood fuel, bagasse, rice-husk, briquette Kerosene, diesel, LPG, coal Electricity			
Motive Power	Electric Machines Combustion Engine	Electricity from hydro and thermal Wood Fuel, coal			
Lighting	Fossil Fuel Lamps	Kerosene, LPG			

Consumption Type			Information Required from Gender and Social	Sources of Information	Gaps in Information
End Use	**Technology**	**Energy Resource**			
	Incandescent, Fluorescent & CFL	Electricity from grid, MH, Solar PV	powers/position of various group within community • Ability to carry out these tasks independently, • Knowledge of legalities pertaining to ownership use of resources necessary to operate the technology		community • Knowledge of legalities pertaining to ownership use of resources necessary to operate the technology
Heating Application	Direct Combustion – Biomass, Fossil Fuel, Electricity, Solar Drier Electric biomass hybrid Electric solar hybrid Solar biomass hybrid	Wood Fuel, bagasse, rice-husk, briquette, Kerosene, diesel, LPG, coal Electricity from hydro, thermal, solar			
Irrigation	Pumps	Diesel, Grid Electricity & RET			

Annex B.11. Energy Supply, Type and Source Disaggregation

Energy Resources	Energy Type	Natural Source	Market Integration
Biomass	Firewood	Forest, Farm	Partly traded
	Animal dung	Farm	Non-traded
	Agricultural residue	Farm	Non-traded
Commercial	Fossil Fuel (Kerosene, LPG, Diesel, Kerosene and Gasoline)	Mines/Oil wells	Fully traded
	Grid-electricity	Hydro/ thermal	Fully traded
Renewable	Hydro	Hydro	Fully traded
	Micro-hydro		Fully traded
	Improved Water Mill		Partly traded
	Solar Electricity (Photovoltaic)	Solar	Non-traded
	Solar thermal (Cooker, Drier, Water Heater)		
	Wind (Mechanical and Electricity)	Wind	Not practiced
	Biogas	Biomass	Non-traded

Annex B.12. Energy Resource and Climate Change Linkages

Resources assessments should focus on the inter-linkage between supply trend and climate trend of the past. This together with vulnerability and risks associated with climate change are important information for energy planning.

Climate change is one among many factors that govern resource availability and long term sustainability. Others include topographic, edaphic (related to soil and geology), biotic, socio-economic and policy factors.

It is important to consider three aspects on both production and supply.

(1) Exposure of the energy resource to climate change which is almost similar to all resources,

(2) Sensitivity – potential adverse/ favourable impacts on the individual energy resources. This is also difficult if not impossible to quantify. A qualitative grading such as high, medium, low should be fine to let one get idea, with a likelihood of variation in different contexts. The 'low' or insignificant sensitivity in Tarai may be more than 'high' in the high mountain.

(3) Existing and potential 'capacity' of the resources to sustain the impacts. Note that less sensitive resources generally have higher adaptive capacity.

The following table summarises climate change vulnerability and adaptation linkages of the energy resources of Nepal from district energy planning perspective.

Resource Type	Vulnerability to climate change	Climate Change Adaptation (Potential and risks)	Gender Issues	Social Inclusion Issues
Wood Fuel	A well managed resource base adds to resilience whereas dwindling resource base adds to vulnerability Drought, Forest fire, Change in tree Species Change	Reconfiguration of tree species Other forest management techniques Agro-forestry Introducing efficient devices Substitution by other renewable energy resources Awareness activities	Gender roles and responsibilities in collection, management & use of wood fuel Health & drudgery for women Ownership of stoves/device	Implications of forest use norms on access and Income generation activities, Health and drudgery Ownership of stoves/device
Animal dung	Current practice to use it as fuel increases vulnerability as it results in soil degradation due to reduced fertilizer (compost) in field and reduced agricultural productivity; Livestock health Animal husbandry practice, i.e., precipitation pattern Animal feedstock -- grazing land, fodder from forest	Improvement in livestock health care services Improvements in livestock rearing practices Use of biogas technology & subsequent application of compost (energy and fertiliser)	Gender roles and responsibilities in animal husbandry and maintaining biogas and use of produces?	Animal ownership by DG Affordability to use biogas
Agricultural residue	Current practice of use as fuel increases vulnerability as it results in soil degradation in field and reduced agricultural productivity; Agricultural practice, i.e., precipitation pattern Crop composition Crop characteristics	Competing productive uses must be analysed Diversification of agriculture (crop diversification, Improved seed, farming techniques Efficient technology)	Gender roles and responsibilities in Agric practice and use and control of produces? Here also applicable about the land ownership by women	Land ownership by DG Affordability to use improved seeds and fertiliser Access to finance

Resource Type	Vulnerability to climate change	Climate Change Adaptation (Potential and risks)	Gender Issues	Social Inclusion Issues
Fossil Fuel	The local impact may not be visible but national and global impacts are tremendous; Landslides and Flood/GLOF and other natural calamity may affect access and supply	Efficiency (both service provisioning and end use device) Substitution by renewable energy sources Environmental and climate change awareness	Gender roles in acquisition and use of fossil fuel Gender Implications of cost and scarcity of fuel (switching to inferior fuel with cost rise) Awareness and knowledge to operation and maintain devices	Access to finance Awareness and knowledge to operation and maintain devices
Grid-electricity	Reliability of the supply due to climatic and non climatic hazard Landslides and Flood/GLOF and other natural calamity may affect access and supply Other hazards may affect production and supply, e.g., transmission infrastructure disintegration by flood, cyclone	Improvement supply chain Adds to resilience of local community by reducing pressure on dwindling traditional resource (forest) Efficient technology Awareness and Legislative measures (carbon tax)	Gender roles related to payment of tariff and use of electricity Gender Implications of cost and scarcity (switching to inferior fuel with cost rise) Awareness and knowledge to operation and maintain devices and also about finance	House ownership (required for subscription) Access to finance Awareness and knowledge to operation and maintain devices
Hydro Micro-hydro	Large hydropower may add to vulnerability and/or reducing resilience. They haves multiple implication at local level, Landslides & Flood/GLOF may affect production, access &	Hydropower of smaller sizes enables community and systems to adaptation to climate change Additional financial resource generated can help reduce vulnerability and/or increase	Gender roles in the use of MHP and IWM for agro-processing Gender roles in acquisition and use	Participation in the decision making process during project formulation Cost , affordability, willingness to pay

Resource Type	Vulnerability to climate change	Climate Change Adaptation (Potential and risks)	Gender Issues	Social Inclusion Issues
Improved Water Mill	supply Storms on transmission infrastructure, Negative - Rehabilitation, Forestation, Aggravated erosion and deforestation specially in case of storage projects;	resilience by investing in adaptation interventions Plan to neutralize negative impacts Supportive policy and legislative measures	Comparative implication on health, time, drudgery (before and after the plants' service) Access to finance	and access to finance Awareness and knowledge to operation and maintain devices
Solar (Photovoltaic)	Weather, i.e., fog, cold wave, cloud (sunshine time variability) Climate related hazards, i.e., storm, hailstone (efficient operation of energy device such as PV and thermal panel)	Solar energy enables community and systems to adapt to climate change through various ways.	Gender roles in acquisition and use Comparative implication on health, time, drudgery (before and after the plants' service)	Cost , affordability, willingness to pay and access to finance Awareness and knowledge to operation and maintain devices
Solar thermal*				
Wind#	Variability of wind flow magnitude, frequency and direction	Wind energy enables community and systems to adapt to climate change through various ways.		
Biogas	Forest, agriculture and livestock related vulnerabilities	Biomass, if renewable, enables community and systems to adaptation to climate change through various ways.	Gender roles in acquisition and use Comparative implication on health, time, drudgery (before and after the plants' service)	Cost , affordability, willingness to pay and access to finance Awareness and knowledge to operation and maintain devices

Annex B.13: Information required to address CC Issues, Sources and Gaps

This table lists important information/data that will be necessary to understand the energy resource-base and their vulnerability with respect to climate change. The currently available and possible information sources are also listed in this table.

Resource Type	Data/Information Requirement	Sources of information	Likely Information Gaps	Tools to acquire the Information (See annex C for details on tools)
Firewood	Historical Information on Climate (Drought, Flood, storm and Rainfall) Forest Data (Stock, Area, Yield, and Species: (current status and trend)) Forest management practices Farm wood-stock Data (barely available)	Related communities NDFSR LCD	Updates on forest data, recent changes in forest management, stock, yield and area of forest Device efficiency and intervention status such as ICS, Gassifier, etc. Device costs Community and stakeholder perceptions and plan for future	CMA: Checklist/ Multiple Attribute EJ: Expert Judgement FGD: Focus Group Discussion VMPTA: Vulnerability Mapping and Problem Tree Analysis RMA: Resource Mapping and Assessment
Animal dung	Livestock Data from Agricultural Statistics (Animal Population, Type, Species (if available): status and trend) Future projections and perceptions Market trends affecting choice of fuel Livestock management practices Device efficiency and status of biogas programme	Related communities LCD; NDFSR; AS	Updates and local livestock information mainly species, up keeping practice (stall fed or grazed) Anaerobic biogas production vis a vis direct use as fertiliser or energy Weather induced (climate related) diseases and other adversities/privileges in relation to dung production; such as availability of fodder/feed.	CMA: Checklist/ Multiple Attribute FGD: Focus Group Discussion VMPTA: Vulnerability Mapping and Problem Tree Analysis
Agri-residue	Agricultural Statistics Historical Information on Climate (Drought, Flood, and Rainfall)	Communities LCD NDFSR	Cropping pattern and trend (species, varieties etc) and possible implication in	CMA: Checklist/ Multiple Attribute FGD: Focus Group

Resource Type	Data/Information Requirement	Sources of information	Likely Information Gaps	Tools to acquire the Information (See annex C for details on tools)
	Trend and status analysis of resource Market trends that affect the use of residue Device efficiency and intervention status such as ICS, Gassifier, briquetting, etc. Projection of impacts on agriculture sector	AS District Agriculture Office	agricultural residue yield Changing practice vis a vis competing uses in the context of climate change Vulnerability analysis Relation between crop failure and residue production	Discussion VMPTA: Vulnerability Mapping and Problem Tree Analysis
Fossil Fuel	Trend and projections on landslides, floods, GLOFs etc by using published records, Import Data (quantity, quality, access) and its trend Dependability of supply system (availability, cost, affordability, sustainability)	National trade statistics	Trend and future projection of hazards (climate related, but to be mainstreamed to other hazards and context changes) that may affect availability and accessibility of the fossil fuel	EJ: Expert Judgement VMPTA: Vulnerability Mapping and Problem Tree Analysis
Grid-electricity	Historical Information on Climate (Drought, Flood, storm and Rainfall) Reliability of resource (seasonality and yearly trend) Demand and supply trend analysis. Future trend of demand, supply and use efficiency Dependability of supply system (availability, cost, affordability)	Communities DHM NEA MH Communities	Trend and projections of hazards that may affect resource, power plant and transmission.	EJ: Expert Judgement VMPTA: Vulnerability Mapping and Problem Tree Analysis RMA: Resource Mapping and Assessment CMA: Checklist/ Multiple Attribute
Hydro	Historical information on climate	Communities	"Precipitation trend across the	EJ: Expert Judgement

Resource Type	Data/Information Requirement	Sources of information	Likely Information Gaps	Tools to acquire the Information (See annex C for details on tools)
	(Drought, flood, and rainfall) Long term river flow trend (hydrological history) Dependability of supply system (availability, cost, affordability) Short to medium term precipitation data Vegetation, snow coverage in the water-shade	DHM Published past weather and hazard data and projections Feasibility analysis	watershed and future projections Trend and projections of hazards that may affect resource, power plant and transmission."	VMPTA: Vulnerability Mapping and Problem Tree Analysis RMA: Resource Mapping and Assessment CMA: Checklist/ Multiple Attribute
Solar	Meteorological data (Trend of fog, cold wave, cloud, storm, hailstone in the area) Solar irradiation data Dependability of supply system (availability, cost, affordability)	AEPC, CES, DHM	Sunshine record Trend and projection of hazards (storm, hail, snow, fog, cold wave) that may affect the 'energy generation'	EJ: Expert Judgement VMPTA: Vulnerability Mapping and Problem Tree Analysis RMA: Resource Mapping and Assessment
Wind	Wind data (Technically analysed data (if available)	AEPC, CES, DHM	Wind data. Trend and projection of hazards (storm, hail, snow) that may affect the energy production	EJ: Expert Judgement VMPTA: Vulnerability Mapping and Problem Tree Analysis RMA: Resource Mapping and Assessment
Biogas	Livestock Data from Agricultural Statistics	AS AEPC, BSP	As that of animal dung, forest resources and farm resources.	VMPTA: Vulnerability Mapping and Problem Tree Analysis RMA: Resource Mapping and Assessment

Annex B.14. Climate Proofing of Various Technical Options

Climate Proofing of Energy Technologies

Climate proofing of energy technologies or adoption measures can be categorised into infrastructural/technical and behavioural/social responses (Laura E. Williamson et al., 2009):
Technical adaptation tries to make infrastructures invulnerable against long-term changes in meteorological variables and extreme events. The energy planner is required to consider measures which would make the structure and/or the system physically robust enough to withstand changes in climate parameters, including extremes, so that the operation of the system isn't adversely affected due to climate change.

The choice of modalities must respond to potential economic performance between more than one comparable adaptation modalities. A highly suitable technical fix to a given climatic perturbation may not be chosen just because of high initial capital costs involved, whereas for the same problem, a low-cost fix with slightly higher risk factor to the same climate perturbation may eventually be selected as the adaptation modality. In such cases the term 'better' appears to be relative. It also reflects financial capability at the time of calculating relative risks for comparable solutions.

Behavioural adaptation adjusts the operation of the infrastructure (both existing and new) and the locating of new infrastructures to minimise damages.
Occasionally adaptation measures of different energy forms can impact each other. For example, an improved operation schedule of a hydropower plant may conflict with an improved irrigation schedule of a downstream irrigation system. Likewise, de-silting reservoirs may negatively impact the water supply used for downstream irrigation. The rush of power plant developers to claim sites with limited flood risk may result in a decrease in the number of suitable sites in the future.
Efforts must be made by energy planners to discuss each technology being introduced and/or promoted and to assess their social acceptance in the processes of operation and maintenance.

Energy System	Technical Adaptation	Behavioural Adaptation
Biomass	Use of crops that have higher biological heat tolerance and tolerate higher water stresses than current crops	Implement early warning systems to alert for rainfall and temperature anomalies
	Expand irrigation systems or improve efficiency of existing irrigation to counteract drought impacts[3]	Follow agro-meteorological advisory services (if available) and support for emergency harvesting of biomass in the case of an imminent extreme event
	Protect against floods by building dykes and improving drainage	Provision of crop insurance schemes
	For biogas digesters: increase the robustness of the construction if they are located in storm-prone areas	Site biogas digesters in less flood and storm-prone areas
Fossil-fuel resources	Improve the robustness of supply system for: Storage bunkers, transportation Supply outlets	Sitting of storage bunkers to have a limited exposure to climate hazards
		Site sales outlets with an ample precautionary measures against climate hazards
Hydropower	Build de-silting gates to "flush" silted reservoirs	Implement changes in plant operation to account for changes in river flow patterns
	Increase dam height and enlarge floodgates to accommodate increased river flow extremes and variability	
	Upstream land management to reduce erosion and siltation	
	Expand installed capacity to address increase in flow regime[4]	
Wind	Construct turbines that can operate at and physically withstand higher wind speeds	Locating of turbine procedure to take into account expected changes in wind speeds during the lifetime of the turbines
		Develop insurance schemes for long-term wind power yields and damage from storms with investment in wind data acquisition
		Availability of rapid emergency repair teams to quickly repair damages
Solar	Technical adaptation is limited as solar panels cannot be	Site panels based on expected changes in cloud cover

[3] Provided that sufficient water is available from sources outside the drought-hit area or fossil water resources are used.

[4] This is for areas experiencing increased flows from glacier melting and if increased levels are likely to persist over the technical lifetime.

	more robust than the building on which they are located	Ensure that the design of large concentrating solar power (CSP) plants are robust enough to withstand most storms
		For distributed solar systems: availability of mobile repair teams to ensure functioning of systems after damage from extreme events

Annex B.15. End-uses Climate Change Adaptation and Mitigation Potential

End-Use	Device	Energy Input	Characteristics of the Device in relation to Adaptation to Climate Change vulnerabilities	Climate Change Mitigation Possibilities
Cooking	Traditional Cook Stove	Wood Loose Biomass (Agric Residue) Dung Cakes	Sectors affected : Forests, Health Aspects relating to biomass resources	Potential for fuel wood consumption reduction and emission
	Improved Cook Stove		Above + Less health hazardous, Saves time & fuels Technology Costs	Substantial mitigation possibility: - Increase in use efficiency - Reduction in emission - Use of local resources
	Biogas Stove	Gas produced from dung and bio-wastes	Less health hazardous, Saves time, Adds resilience against fuel wood & fossil fuel supply More efficient as compared to traditional & fossil fuel.	
	Fossil Fuel Stove	Kerosene LPG	Complimentary use to traditional cook stove? Supply vulnerability Substantial positive health implication potential May add to resilience of local community to dwindling traditional resource	Emission per year with respect to family size and population Global impact should be considered Negative mitigation possibility
	Electric Stove/Oven	Electricity supplied by grid or off-grid	Complimentary use to traditional cook stove Other aspects relate to Electricity Supply	Use of clean hydropower has substantial mitigation possibility: - Increase in use efficiency - Elimination of emission - Use of local resources
Space	Biomass	Wood, Loose Biomass	Forests, Health and other aspects relate to biomass	Potential for fuel wood

End-Use	Device	Energy Input	Characteristics of the Device in relation to Adaptation to Climate Change vulnerabilities	Climate Change Mitigation Possibilities
Conditioning	Heater	Dung Cakes		consumption reduction and emission
	Fossil Fuel Heater	Kerosene, LPG, Coal	Complimentary use to traditional fire wood stove Supply vulnerability Substantial positive health implication potential Resilience of local community to dwindling traditional resource	Emission per year
	Electric Heater, Fan & Air Conditioner	Electricity from: - Grid, Micro Hydro	Complimentary use to traditional cook stove Other aspects relate to Electricity Supply	Use of clean hydropower has substantial mitigation possibility
Lighting	Fossil Fuel Lamps	Kerosene, LPG	Complimentary use to traditional cook stove Supply vulnerability Substantial positive health implication potential Resilience of local community to dwindling traditional resource	Emission per year
	Biogas Lamp	Biogas	Adds resilience against fuel wood & fossil fuel supply More efficient as compared to traditional & fossil fuel.	Same as biogas stove for cooking
	Incandescent Lamp	Electricity from: - Grid, Micro Hydro - Solar PV	CFL and WLED lights are highly efficient and contributes to adaptation to vulnerability Technology is quite robust but comparatively more expensive on capital cost but low on operating cost compared to other options of lighting	Use of clean hydropower has substantial mitigation possibility
	Fluorescent Lamp			
	CFL			
	WLED			
	Arc Lamp (Sodium)	Electricity from: - Grid & Micro Hydro	Complimentary use to traditional lighting device like kerosene light Other aspects relate to Electricity Supply	Use of clean hydropower has substantial mitigation possibility
Other	HH Elect. Appliances, (>100W)	Electricity from: - Grid, Micro Hydro	Complimentary use to traditional device Other aspects relate to Electricity Supply	Use of clean hydropower has substantial mitigation possibility
	HH Elect. Appliances	Electricity from: - Grid, Micro Hydro		

End-Use	Device	Energy Input	Characteristics of the Device in relation to Adaptation to Climate Change vulnerabilities	Climate Change Mitigation Possibilities
	(<100W)	- Solar PV		
Motive Power	Electrical Machines	Electricity from: - Grid, Micro Hydro		
	Combustion Engine	Fossil Fuel	Supply vulnerability Mean for resilience of local community to dwindling traditional resource	Mitigation option attractive through substitution by electric motors
Boiler	Boilers – Biomass	Wood, Loose Biomass	Forests, Health and other aspects relate to biomass	Potential for fuel wood consumption reduction and emission
	Boilers - Fossil Fuel	Fossil Fuel	Supply vulnerability Mean for resilience of local community to dwindling traditional resource	Emission per year
Process Heat	Direct Combustion – Biomass	Wood & Loose Biomass (Agric Residue)	Forests, Health and other aspects relate to biomass	Potential for fuel wood consumption reduction and emission
	Direct Combustion - Fossil Fuel	Fossil Fuel	Supply vulnerability Mean for resilience of local community to dwindling traditional resource	Emission per year
	Direct heat - Electricity	Electricity from: - Grid, Micro Hydro	Complimentary use to traditional device Other aspects relate to Electricity Supply	Use of clean hydropower has substantial mitigation possibility
Transpo rtation	Combustion Engine	Diesel, Fuel Oil, Light Diesel Oil	Supply vulnerability Mean for resilience of local community to dwindling traditional resource	Emission per year

Annex B.16. Adaptive Capacity & Aspects of assessment

Adaptive capacity area with respect to energy	Assessment aspects
Resources (natural assets)	Diversity, Quality, Quantity, Access (disaggregated in terms of gender, ethnicity, religion, age etc.), Alternatives, Technology (disaggregated in terms of feed/end use energy, efficiency, etc.)
Infrastructures (physical assets)	Access, strength, sensitivity to hazards (analysis of return period, probability distribution function, threshold, extremes, etc.)
Economy (financial assets)	Investment environment (comparative analysis of cost-benefit performance for each alternative option in a given time scale/scenario)
Institutions (social assets)	Strength, sustainability, governance, policy, norms, enabling environment including culture and traditions etc
Human resources	Awareness, skills (disaggregated in terms of gender, ethnicity, religion, age etc.),
Technology	Access (disaggregated in terms of gender, ethnicity, religion, age etc.),, alternatives

Annex B.17. Energy Consumption Tables

Consumption/Demand Sector	Types of End-Uses	Type of End-Use Devices	Total Energy Consumption (GJ)
			0
Residential	Cooking and water boiling	Traditional Cook Stoves	0
		Improved Cook Stove	0
		Biogas Stoves	0
		Kerosene Stoves	0
		LPG Stoves	0
		Electric Heater	0
		Electric Cooker	0
		Briquette Stoves	0
	Space-Conditioning		**0**
		Traditional Cookstoves	0
		Improved Cookstoves (metallic)	0
		Kerosene Heater	0
		LPG Heater	0
		Electric Heater	0
		Fan	0
		Air-Conditioner	0
	Lighting and others		**0**
		Kerosene Wick	0
		Biogas Lamp	0
		Incandescent Lamp	0
		Fluorescent Lamp	0

		Compact Fluorescent Lamp	0
		TV and Radio	0
		Telephone	0
	Livestock Feeding		**0**
		Traditional Cook Stoves	0
		Improved Cook Stove	0
	Other (rituals and local needs)		**0**
		Traditional Cook Stoves	0
		Improved Cook Stove	0
		Biogas Stoves	0
		Kerosene Stoves	0
		LPG Stoves	0
		Electric Heater	0
		Electric Cooker	0
	Cooking and water boiling		**0**
Commercial		Traditional Cook Stoves	0
		Improved Cook Stove	0
		Biogas Stoves	0
		Kerosene Stoves	0
		LPG Stoves	0
		Electric Heater	0
		Electric Cooker	0
	Space-Conditioning		**0**
		Traditional Cookstoves	0
		Improved Cookstoves (metallic)	0

		Kerosene Heater	0
		LPG Heater	0
		Electric Heater	0
		Fan	0
		Air-Conditioner	0
	Lighting		**0**
		Incandescent Lamp	0
		Fluorescent Lamp	0
		Compact Fluorescent Lamp	0
		Arc Lamp (Sodium)	0
	Others		**0**
		TV	0
		Radio	0
		Telephone and Fax	0
		Electric appliances	0
Industrial	Lighting		**0**
		Incandescent Lamps	0
		Fluorescent Lamps	0
		Compact Fluorescent Lamps	0
		Arc Lamps (Sodium)	0
	Process Heat		**0**
		Boiler_Biomass	0
		Boiler_Diesel	0
		Direct Combustion Biomass	0
		Direct Heat_Electricity	0

	Motive Power	Electric Machines	0
		Combustion Engines	0
			0
Agriculture	Motive Power	Tractors	0
		Power triller	0
		Tubewells	
		Diesel Operated	0
		Electricity Operated	0
Transport	Passenger transport		**0**
		Bus/Minibus	0
		Car/Jeep	0
		Motorcycle	0
	Goods Transport	Trucks	0
		Jeep	0
		Tractors	0
		Ropeways	0

Energy Units should be made uniform (for eg, either all should be converted to GJ, kWh, ToE etc) Study team can play with convenient energy unit during the time of analysis but the final energy consumption should be converted into single universal energy unit.

For energy Consumption for fuel use Annex B.17 (b) please request excel spreadsheet from SNV/AEPC

Annex B.17(c) Information required for energy consumption data

Needs (for all sectors)	Information required	Source (but not limited to these only)
Thermal Energy Needs	Population depending on particular devices	Secondary Information [WECS Publications, District Profile, AEPC (ICS status), CBS data base; Primary Source (FGD, KII)]
	Specific Energy Consumption	Secondary Information (WECS publications, biogas Survey Reports, ICS publications, etc); Primary Source (FGD, KII)]
	Calorific Values	Secondary Information [Calorific Values determination by TERI, Stockholm University (LEAP), and othe energy planning documents]
	Price of Fuel	KII, FGD, Retailer Survey, NEA, MHP Committee, etc
Electric/Lighting Energy Needs	Average number of rooms	Secondary Information [District Profile, NEA publications, CBS data base; Primary Source (FGD, KII)]
	Average no of different lighting devices	Secondary Information [District Profile, NEA publications, CBS data base; Primary Source (FGD, KII)]
	Electricity/Fuel Consumption	Secondary Information [District Profile, NEA publications, CBS data base; Primary Source (FGD, KII)]
	Total Power ratings of electric appliances	Secondary Information [District Profile, NEA publications, CBS data base; Primary Source (FGD, KII)]
	Operation hour	Secondary Information [District Profile, NEA publications, CBS data base; Primary Source (FGD, KII)]
Agriculture specific	No of diesel and electricity operated tubewells	Secondary Information [District Profile, NEA publications, CBS data base, Irrigation department; Primary Source (FGD, KII)]
	Operation Hour/year	Secondary Information [District Profile, NEA publications, CBS data base, Irrigation department; Primary Source (FGD, KII)]
	Specific fuel consumption	Secondary Information [District Profile, NEA publications, CBS data base, Irrigation department; Primary Source (FGD, KII)]
Transport Sector Specific	No of vehicle registered	Secondary Information [District Profile, NEA publications, CBS data base,Transport department; Primary Source (FGD, KII)]
	kilometers/year	Secondary Information [District Profile, NEA publications, CBS data base,Transport department; Primary Source (FGD, KII)]
	Specific fuel consumption	Secondary Information [District Profile, NEA publications, CBS data base,Transport department; Primary Source (FGD, KII)]

Annex B.18. Multi-criteria scoring systems - Multi-criteria scoring system for climate sensitive energy technology/ resource selection

Multiple criteria analysis (MCA) is a logical analysis of different options within given implementation environment. This lets the planner to choose more than one option or their combinations to achieve best performance. In the energy planning all resources could be utilised to fulfil the energy demand considering their seasonality. Less sensitive resources to climate change could be given priority. Similarly, another criterion could be putting less polluting sources and devices in priority and so forth. All these are affected by culture, availability of the resources and devices, livelihoods of the community and other locality factors. In a way, these scoring system will also put requirements during needs, technology and resource assessment.

A recently published, National Adaptation Programme of Action (NAPA) set a guideline or criteria and qualifiers in selecting intervention to ensure adaption to climate change.

The 7 criteria specified/identified to adapt to climate change are:

- Potential to reduce adverse impact of CC
- Potential to support local livelihood
- Synergy with national priorities (poverty reduction, economic growth, etc.)
- People's participation
- Cross-sectoral benefits
- Cost-effectiveness
- Ease of implementation

From the energy planning perspective, additional criteria, apart from above 7 would be:

- Potential to reduce supply-demand gap in energy equation.
- Potential to reduce carbon emission.

Therefore, altogether it is suggested that 9 criteria as tabulated in the Table 14 may be considered in selecting demand and supply side interventions in energy sector. All of these nine criteria are further described by their qualifiers.

Being an energy-sectoral plan unless the criteria "Potential to reduce supply-demand gap" is fulfilled the intervention may not be tagged as an energy intervention. Regarding, rest 8 criteria, district energy planning interaction meeting should decide on weightage to each of these criteria. Nonetheless, planning process facilitator should explain the importance of each of these criteria. Since the district perspective and situation can be different based on their geographical and socio-economic situation, it should not be surprising that weightage agreed upon in one district is contradictory in another district. The criteria and their qualifiers are listed in the annex B.14.

Criteria and Qualifiers for selecting Intervention to Adapt to Climate Change

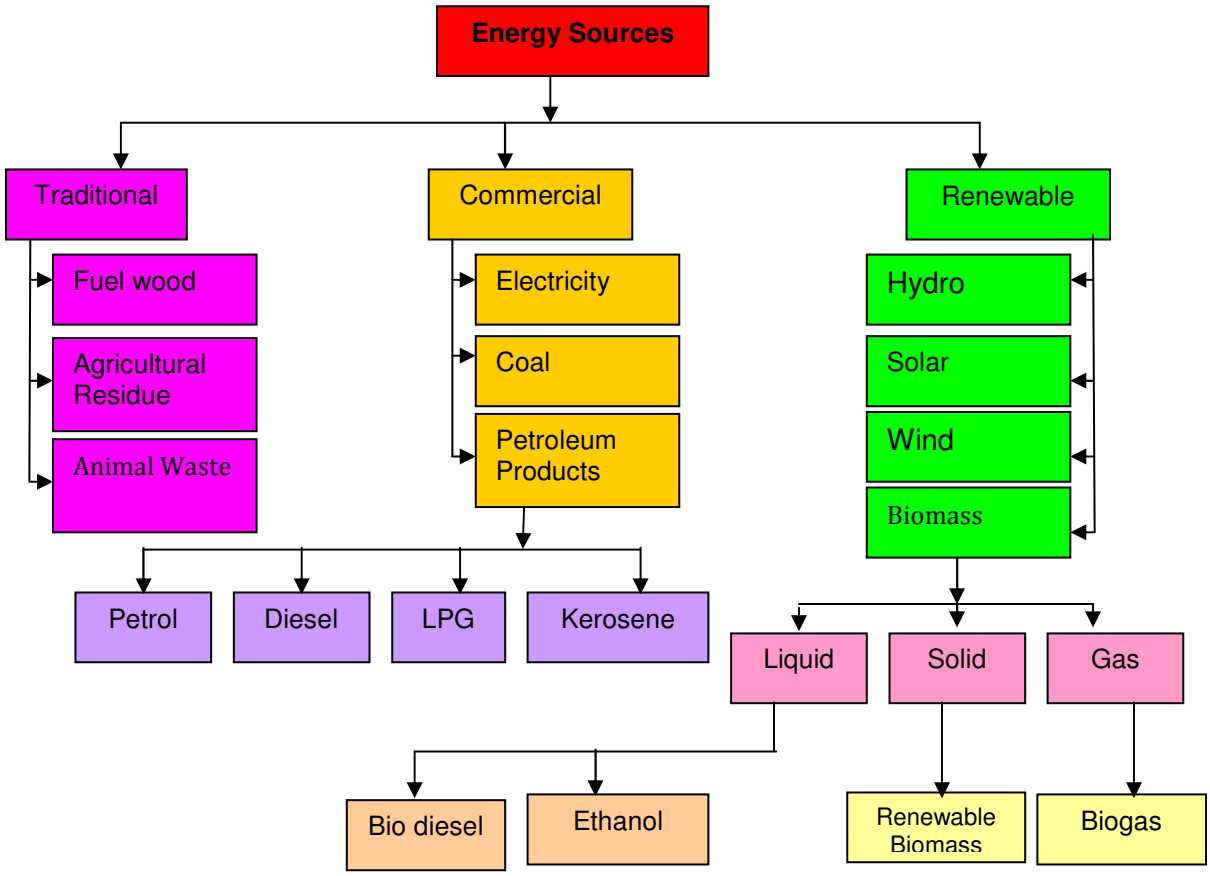
SN	Criteria	Qualifiers
1	Potential to reduce supply-demand gap	Efficient use of existing resource Resource management to increase supply Identification and use of new resources
2	Potential to reduce carbon emission	Efficient technology – Improved cooking stove, biogas, etc. Non-carbon emitting technology – Renewable resource based electricity and thermal technology
3	Potential to reduce adverse impact of CC	Potential to reduce direct exposure to CC Potential to help plan to reduce immediate impacts of CC for climate change Potential to secure/enhance ecosystem services Potential to reduce climate vulnerabilities
4	Potential to support local livelihood	Potential to create local employment & income generation avenues Potential to ensure equity in access Potential to secure and develop alternative livelihood assets Potential to strengthen existing livelihoods
5	Synergy with national priorities	Synergy with multilateral environmental agreements Synergy with national and sectoral development plans In line with institutional capacity to implement priorities Potential to co-finance
6	People's participation	Involvement in design and implementation Local ownership and local capacity building (i.e. country driven and community led) Social and cultural acceptance Inclusiveness (GSI)
7	Cross-sectoral benefits	Multi-sectoral involvement Co-benefits (i.e. mitigation) Multi-partnership in implementation and Ease of governance Geo-graphical and ecological coverage
8	Cost-effectiveness	Higher output/input ratio Multiplier effects of investment Potential to mobilize local and generate additional resources Sustainability (expansion potential)
9	Ease of implementation	Potential to use of local knowledge, skill and technology Potential to develop appropriate technology Coherence with local urgent and immediate needs Address existing or potential resource conflicts

Annex B.19. Guideline for District Energy Resources/Supply Data Collection

District Energy Resources

Energy sources have been categorized into three broad categories viz. traditional energy sources, commercial energy sources and renewable energy sources. This categorization is based upon the modality of use of the resources in abstracting the inherent energy contents. Traditional energy resources include data on fuel wood, agricultural residue and animal dung Commercial sources of energy are fossil fuels (coal and petroleum fuels) and electricity. Renewable energy sources include mini/micro hydro, solar power, wind power, biogas, briquettes etc. The classification of district energy resources is presented in figure 1.

Figure 1. Classifications of Energy Resources



Fuel wood Resources

Data regarding for fuel wood resources, it is required to collect data on the district forest area (Hectare, Ha) with forest type (hardwood, coniferous, protected forest, shrub, non-cultivated land and grassland) and its sustainable yield of fuel wood. Once these data will be available, the sustainable fuel wood of the district can be calculated in ADT (air dried ton) and after then the energy production potentiality in GJ (gaga joule). The following table 1 is suggested to highlight the fuel wood supply potentiality in a DCEP district.

Table 1. Fuel Wood Supply Potentiality in a DCEP District

Fuel wood potential land (Ha)				Fuel wood Supply (ADT)		Energy production potentiality (GJ)
Type	**Gross**	**Accessed**	**Yield/Ha**	**Gross**	**Accessed**	
Hardwood – 2						
Hardwood- 3						
Coniferous-2						
Coniferous-3						
Coniferous-4						
Miscellaneous-2						
Miscellaneous-3						
Total of forest						
Shrub						
Non-cultivated land						
Grass land						
Cultivated						
Total						

Note: Crown Density – 2: 10-40%, 3:40-70 % and 4 : >70 %

The fuel wood resources data/information can be obtained from the following sources of information/reference documents.

- WECS (district energy supply report)
- Department of Forest (forest sector master plan, LRMP report)
- District forest office (district forest sector plan)
- District energy situation report (if available)
- Energy conversion table
- Topographic map

Agriculture Residue Resources

For agriculture residue resources, it is required to collect data on cultivated land area (Hectare-Ha), annual production of various crop types (Metric ton-MT) and their yield of residue. The following table 2 is suggested to highlight the agriculture residue supply potentiality in a DCEP district.

Table 2. Agricultural Residue Supply Potential in a DCEP District

Crop Type	Area (Ha)	Production (MT)	Residue Ratio	Residue Supply for Energy Use Supply (MT)	Energy Production Potentiality (GJ)
Total					

The agriculture residue resources data/information can be obtained from the following sources of information/reference documents.

- WECS (district energy supply report)
- District agricultural development office (annual report)
- District energy situation report (if available)
- Energy conversion table

Animal Waste Resources

For animal waste resources, it is required to collect data on the livestock type and its number and their dung yield. The following table 3 is suggested to highlight the animal waste resource/ supply potentiality in a DCEP district.

Table 3: Animal Waste Supply Potentiality in a DCEP District

Livestock Type	Number	Dung Production per Animal	Dung Production (MT)	Dung Collection/Ratio Available for Energy Use (MT)	Energy Production (GJ)
Total					

The animal waste resources data/information can be obtained from the following sources of information/reference documents.

- WECS (district energy resource and consumption report)
- WECS (energy synopsis report)
- District livestock office (annual report)
- District energy situation report (if available)
- Biogas sector programme (annual report)
- Energy conversion table

Commercial Energy Resources/Supply

For commercial energy resources, it is required to collect data on fossils fuel supply like kerosene, diesel, petrol, and LPG, gasoline, coal/coke and grid electricity. Like in traditional energy resources, necessary data/information on type of commercial energy recourse/supply are collected in a specific energy unit for example kerosene in KL, coal in MT and electricity in MWH and cumulative energy supply is calculated in a uniform unit GJ (giga joule). The commercial energy resources/supply data/information can be obtained from the following sources of information/reference documents

- WECS (energy resource and consumption report)
- District energy situation report
- Energy conversion table
- Fossil fuel suppliers/dealers
- Nepal electricity authority (annual reports)

Renewable Energy Resources

Hydro Energy Potential

One of the most potential renewable energy resources in a DCEP district could be hydro energy potential and following data/information are required to assess the hydro energy potentiality.

-Name of perennial rivers/streams
- Minimum flow in rivers/streams
-Major lakes
-Potentials beneficiary VDCs for each rivers/streams
-If hydro power inventory/ feasibility study done list the data
Sources
location
potential power output
-Existing Irrigation/ drinking water systems and its potentiality for hydro power development and list data
sources
location
Beneficiary VDCs/community

The hydro energy resources data/information can be obtained from the following sources of information/reference documents.

-Topographic map (FINIDA project, survey department)
- WECS (hydro power inventory study report, water resources inventory study report)
- Department of Electricity Development (approval for hydro power development by private sector)
- Irrigation/water supply sub divisional offices
- AEPC/ESAP (Carpet study for mini/micro hydro)

Solar Energy Resources Potential

For solar energy resources, it is required to collect data on total monthly average radiation (W/m^2), average annual sunshine hours and area available Km^2 . The following table 4 is suggested to highlight the solar energy resource/ supply potentiality in a DCEP district

Table 4. Solar Energy Potential in a DCEP district

District	**Total monthly average radiation W/m^2**	**Average annual sunshine hours**	**Area available Km^2**	**Power /Energy output**	
				MWh	GJ

Solar radiation data are more difficult to obtain. AEPC, RECAST may have data regarding solar radiation and some of this has been quoted in the Perspective Energy Plan documents prepared by WECS or solar and wind energy resource assessment report (SEWRA) prepared by the AEPC.

Wind Energy Resource Potential

Like in solar energy resources, it is also difficult to obtain wind energy resources data/information in a DCEP district. A detail wind survey has not yet to be carried out for a DCEP district. The wind power potential is dependent on the cube of the speed of wind (V3). The average value of wind speed (V3) measured once a period of time will not be a true data for design purposes. For the correct measurement of wind power potential, it has to be monitor and measured V3 continuously. Wind energy could be one of the alternative energy source exploitable to ease the increasing energy constrains. In areas where wind speeds are high enough, lack of water resources to install micro- hydro stations, this energy could be utilized. Wind energy can be harnessed to generate electricity, pump water. NEA may have wind data obtained through wind gauging stations it had installed in some places. Some WECS reports and AEPC's SWERA (solar and wind energy resources assessment) report would the useful sources of information/references documents to gain the knowledge on the wind energy resources potential in a DCEP district.

Biomass Energy Resources Potential

Data/ information on biogas potentiality, liquid bio fuel potential, bio-briquette, etc are required to assess the biomass energy resources potential in a DCEP district. For biogas potentiality assessment, number of livestock type and its dung collection, livestock rearing practice, altitude, temperature, water availability would be the major parameters for data collection. Similarly, existing farming system of sugar cane , jatropha and other sources of bio fuel production and its potentiality can be the major parameters for the bio fuel production potentiality. AEPC's biomass/biogas programme/projects, district forest office, district level NGOs and related reports would be the sources of information for data collection.

Annex B.20 VDC selection Criteria

The following criteria should be used to select VDC's if it is required to undertake primary data collection during preparation of a DCEP. This could be necessary if it is required to validate secondary data or in the event that the necessary data is not available from secondary data.

VDC Selection Criteria:

- Geographical Representation (representing varied topography and climate)
- VDC constituted with different percentage of Ethnic groups (e.g VDCs with more ethnic population, normal VDCs etc)
- VDC accessible to normal/seasonal/absence of transport facilities
- VDCs having different status of RETs promotion (high, medium and low- compared to the total installation of the respective districts)
- VDCs, if reported of having adverse impact of climate change
- Necessary Consultation with local actors (DCEP task force) is necessary to prioritize the indicators for selecting the VDCs

Annex C: Tools and methodologies for acquiring DCEP information

Annex C.1 Focus Group Discussion (FGD)

C.1.1 Checklist for collection of information on climate change and energy

1) Are sources of feed stock sensitive to climate change and variability?

2) Is the availability and access sustainable/affordable?

3) What are vulnerabilities and other climate related issues

4) Will the demand increase/decrease in the future climate scenario?

5) If yes, see the Energy resource vulnerability.

6) Is the demand decreasing? If yes, look at the vulnerability to the resource/ technology community have chosen.

7) Will the demand increase/decrease in the future climate scenario?

8) Which one is the best alternatives that community/industry will prefer?

9) Within the same feed stock, compare advantages between devices/technologies in terms of mitigation and adaptation potentialities.

10) Vulnerability information and adaptation potentiality will be available from other analyses to make choices.

11) Are there climate related issues? (see vulnerability, adaptation potential, mitigation potential)

12) Is the resource sustainable?

13) What are complementary options to satisfy the demand?

14) Does it emit less including emission in its transportation from origin to destination?

15) Does it contribute to conservation of forests (increase sinks) directly or indirectly with clear linkage?

C.1.2 Checklist for addressing GSI Issues in FGD

Given the review of international experience in Climate, Gender and energy planning the following checklist summarises the key issues which would be expected to be addressed in the DCEP methodology and document.

1) Recognize the vital urgency of gender equality in the growing crises of energy and climate change issues and demonstrate leadership through top –level support for gender mainstreaming.

2) Ensure that women participate in all decisions related to climate change at all levels, in order to build a truly global and effective alliance for energy access, climate protection and gender justice.

3) Collect and publish gender disaggregated data taken at every level and where possible.

4) Undertake gender analysis of all energy policies, climate change policies, programmes, projects and budgets-from research programmes to adaptation plans.

5) Agree measurable gender related targets and create practical tools that help integrate gender equality in climate protection.

6) Develop gender sensitive indicators to use in national governments; local and international communications.

7) Design capacity building, education, and training in gender sensitive way and enhance women's access to them.

8) Invest in gender trainings to support processes of change towards gender equality, sensitising both men and women on the importance of gender analysis in the work that they are doing.

9) Appropriately and sustain ably support all aspects of gender mainstreaming

Annex C.2 KII and stakeholder consultation

C.2.1 Check lists

Same as FGD above

C.2.2 Seasonality Mapping

Seasonal calendar is the tentative time table of hazards that appear in different strength and frequency in a particular period of a year. This is particularly important for climate related hazards such as cold wave, wind storm, hailstone, heat wave etc. This is also known as hazard calendar if hazards are analysed, crop calendar if crops are analysed and so forth.
Purpose and usefulness
This helps to identify the stressful time in a year and supports to strategise preventive and preparedness measures for adaptation. The seasonal calendar can be used to know harvesting time of crops (as residue is used as fuel), fuel wood, peak time of stream flow or the lowest flow, etc. Combined it provides planning framework for adaptation and energy resources and sources management.

Technique
Seasonality can be analysed in FGD, KII and expert group. It depends on the subject of analysis. For agricultural and forestry resources local farmers are suitable. The information can be triangulated with some key informants and subject based experts. Available secondary information (verified) can be utilised as reference to further verify the precision. Meteorological data from the nearest applicable station is one suitable for verification.
Seasonality should be analysed separately for resources, energy demand and the hazards considering the implication of climate change (exposure to the climatic hazards). That can be later compared by overlaying together.
Input process

The facilitator prepares a table showing 12 months of year in separate column. Then identified hazards are listed down in rows as shown in below table.

Facilitator asks the time of year the hazard is intense and more destructive, duration of occurrence etc. Participants may respond to the facilitators questions like when does the flood occur? (June to August?). Second question may be in which month it is intense? The month can be highlighted darker or brighter to show the pick of hazard etc. Besides PRA the calendar can be used to document the measured information of weather, stream flow, growth rate of trees etc.

Output
This gives the scenario of climate related hazards throughout the year. It is helpful for planning (adaptation) particularly when to check for repair and maintenance. When to collect fuel wood and for what long time the storage of resources is necessary etc.

If the road access is blocked for 3 months due to flood, (may be) kerosene should be stocked for at least three months and should be done before June to secure energy.
Seasonal calendar of hazards

SN	Major hazards	Months in Nepali calendar											
		1	2	3	4	5	6	7	8	9	10	11	12
1	Flood												
2	Forest fire												
3	Too hot												
4	Diseases												
5	Thunder												
6	Cold wave												
7	Wind storm												

Seasonal calendar of energy resources strength

SN	Major hazards	Months in Nepali calendar											
		1	2	3	4	5	6	7	8	9	10	11	12
1	Fuel wood collection												
2	Solar panels	High		Less			Moderate			Less		High	
3	Hydropower available	Less		High								Less	
4	Agriculture residues			Less				High					
5	Kerosene purchase												
6	Wind	High		Less						High			
7	Cold wave												
8	Wind storm												

This can be used in the overall matrix with other information coming from exposure, sensitivity, trend and resource analysis. It is assessment tool useful for planning strategy.
Supporting materials
A number of publications are available in forestry, agriculture, water, meteorology sectors.

Annex C.3. Vulnerability mapping

C.3.1 Resource and Hazard (exposure) Mapping,

Also known as diagramming, participatory mapping or resource and hazard mapping in the context of energy planning is a PRA tool to assess the resource status in the access of the community or the institution wishing to utilise the resource for energy generation and use. More importantly mapping helps to assess the exposure of resources to different hazards both climatic and non climatic.

Exposure is a gauge of the potential threat and defined by physical proximity to, as well as, the extent of interaction with a hazard. If energy resources or the generation/production units and their distribution systems are close to a river bank, their exposure to flooding is higher than those further away or on higher ground. In the context of slow onset hazards, the duration of exposure also determines the scale of risk. For example, the longer a forest suffers from drought increases the potential for stress and losses. Mapping may not include some hazards such as drought and these can be indicated where they affect and to what frequency they affect to the properties.

Unlike other resource mapping exercises, the exploration and analysis is focused to the particular resource planned for energy. There are different energy resources such as fuel wood for cooking and heating, water for hydroelectricity, watermills etc, solar and wind for conversion to electricity. Different energy resources are available in different places and time. So the mapping should consider spatial and temporal aspects of availability. The mapping exercise can later be combined with the trend analysis to get comprehensive scenario of the resources over time. This also helps to get future perceptions of the resource status.

In the resource mapping a sketch of the area is drawn in loose paper (or on the ground later to be copied in the paper) where the location of the resource (forest, river etc) is shown indicating there quantity and quality there. It also delineates the distance between resource and the user community. The mapping is not practical enough for agricultural residues, animal dung etc are difficult to map out as they are more or less dynamic in terms of availability and location in the Nepalese agricultural context. However, the location of farm lands, cattle sheds (which are often together with houses) can be marked up.

In many cases resource mapping are overlaid with social mapping to provide resources and social set up together.

Purpose and usefulness of the resource mapping
Resource mapping provides important information in energy planning. It provides information on the access of people to the resource and use pattern, time to collect them opportunities to improve the situation of production and utilisation. A number of energy resources available in the area can be viewed together where planner particularly outsider can get gesture on how resources are being grown/produced and shared among beneficiaries. A connected discussion with mapping helps to understand how resources are

utilised for different purposes, whether the demands are fulfilled or not, what are the supplementary resources to each other etc.

Technique
The mapping can be drawn up with the assistance of focus group which includes forest user groups, farmers, teachers etc available in the community. The process is same to the PRA and the discussion should include climate related hazards that have or would affect the energy resources. For example climate related hazards to forest and agriculture resources include flood, drought, windstorm, hailstones, heavy snow, cold waves, heat waves and thunder. Many of them cannot be mapped out. They can be assessed through other tools. Some hazards such as storms, hail, heat and cold waves affect solar energy and wind energy as well. Therefore, facilitator should consider the vulnerability of multiple hazards to single resource and effect of single hazard to various energy resources.

Input process
Facilitator describes the purpose of the task and introduces the use of the mapping among the participants. A level of orientation may be necessary to the participants on how to put things in the diagram. Then participants delineate the locations where their energy resources exist eg forests, agriculture land, private grass and forest land etc. This also includes water resources, windy zone (passes, hill top etc), sunny areas etc. In the case of exotic resources such as kerosene, candle, coal etc the nearest shops and their relevant supply centres could be marked up. These can be also caught up by a separate mobility map or recorded asking where people go for different energy services. Where there are national grids of electricity the map may not be fully applicable, the information can be grasped in the note book.

After delineating the location of resources existing and potential climate related hazards that affected/would affect should be marked. The strength or severity of hazard can be marked with different colours such as red for very severe and frequent, yellow for moderately severe and frequent, blue for less severe and frequent.

There is not structured rule; facilitator can make use of his/her skill to differentiate the situation. Facilitator moderates the process, catalyzes the individuals for active participation integrating dominant and quiet people, and ensures that participants are focused to the topic along with handling additional information and takes care of time and notes taken by his/her assistants.

The output
The map provides overview of resources and hazards. The additional and supporting information can be recorded in note book. Final summary can be tabulated. Below is one example.

Energy resource	Status	Distance	(potential) Hazards
Forests for fuel wood Name of forest	Good. Provides fuel wood for 8 months for xx households for cooking	Takes 2 hours to reach, 3 hours to collect	Is landslide not much frequently active, Annually on fire, Storms break branches of trees
Agriculture for residue	Good. Provides fuel wood for 3 months for xx households for cooking	Around houses. Some 50 HH have agriculture fields about 7 KM far from	Drought, more intense rainfall, hailstones, storms leading sometimes crop failure

		residence	
Kerosene	Regularly available in two village shop	Shops are closed but kerosene is imported from Terai	Landslides, flood leading road blockage during summer, flight disturbance due to bad weather
Solar	Good, Sunny hill slope, house roofs appropriate for solar panels	Close. Panels are available in Pokhara	Windstorm, hailstorms,
Wind	Batase danda. Continuous wind flow. Needs to measure technically.	Close to about 30 HHs, 1 KM for 50 HHs and 2 KM of 20 HHs.	Storms, hail, forest fire likely to extend to generation plant.

This information can be fed into analysis matrix combined with information from other tools and techniques for different hazards such as their trend, severity etc. and later can be judged through multiple criteria. The output of this assessment should be linked with technology prioritisation in devising the scenario.

C.3.2 Suggested checklist of questions to consider in line with mapping

1) Where are the houses and settlements located?

2) Where are energy resources located?

3) What resources are abundant and what resources are scarce?

4) How are their conditions in terms of their potential energy 'productivity' such as species in terms of quality of fuel wood, growth rate, stock etc?

5) What are the hazards that have been affecting the resources to grow and sustain?

6) Do local people (participants) believe the resource will be sustainable to satisfy future demands?

7) What is the level of knowledge of local women, Dalit, ethnic and existing disadvantaged group about the CC, mitigation and adaptation?

8) Is there equal access to resources? How is the use pattern? Who makes decision?

9) Which groups (men/women/dalit etc) are more likely to be exposed or impacted by climate change and why?

10) Which resource(s) do they have the most problem with?

11) Additional questions to exposure which are equally important to other tools as well.

12) Major types of hazard faced by different energy resources...?

13) Seasonal variation of hazards (dynamics of exposure, measured in terms of timing of occurrence), most severe period of hazard in a year?

14) How sensitive is an exposure identified above (for each of the exposures, treated separately), in terms of sustenance of energy supply and benefit accrual?

15) Do different resources face different hazard? Does a resource face more than single hazard?

16) How some hazards have more effects and others have less to particular resources?

17) What are the changes in exposure over time? Why are some resources more vulnerable now?

18) Are they likely to become (more) vulnerable in future? Why and how?

Materials required

Open field or foreground of a house or a school ground or VDC premises where participants feel easier to assemblage. However, a site from where as much as resources and hazards affecting them can be seen is the best. Materials required for this exercise if the mapping is to be prepared on paper are

- Loose paper sheets generally known as 'brown papers',
- Meta cards of different colours,
- Marker pens, sticking tape, pins etc

If the mapping is to be prepared on ground

- Chalks, different colour powders,
- Wood pieces, leaves,
- Grains etc

However, the sketches should be transformed on paper later if done in the ground.

- A sample diagram prepared somewhere in the past can ease the understanding process. It should be understood that a physical resource map overlapped with GSI Vulnerability of Energy Infrastructure and Resources will result into exposure and sensitivity map.

Annex C.4 Adaptive/resilience capacity assessment

Capacity assessment constitutes of taking inventory of physical, social, natural, financial and human resources and their strengths in terms of their ability to adaptation and consequences management. Besides, there are some other local and remote factors such as policy and external market environment. The strength or ability is generally defined by the abundance and access to different resources.

Local practices of energy use, people's motive to switch to alternate sources of energy etc provide input to the capacity assessment.

Much of the information is available from resource mapping. Some key aspects to consider are:

- Abundance of resources (quantity and its trend)
- Diversity of resources (Quality and its trend)
- Seasonality of resources
- Opportunity of investment
- Access to resources and so forth

Technique and tools

SWOT analysis is the one often used in analysing the capacity of community and resources. As it is stakeholder perspective, FGD, KII, experts and planner should be consulted with a list of questions. A matrix can be utilised to analyse the strength, weakness, opportunity to improve and threats. Energy resources/source /device /distribution, etc:

Energy resource	Strength	Opportunities	Weakness	Threats
Forests (Fuel wood)	Indicators	Indicators	Indicators	Indicators
Agriculture Residue	Indicators	Indicators	Indicators	Indicators
Water	Indicators	Indicators	Indicators	Indicators
Wind	Indicators	Indicators	Indicators	Indicators
Solar	Indicators	Indicators	Indicators	Indicators

Based on the overall indicators, the energy resource/source/device/distribution can be ranked to different category such as very strong, strong, moderate and weak. This provides idea to choose different options or combination of options.

Input process

With a list of resources, sources, devices etc facilitators can precede the discussion on their strength, weaknesses and other parameters. This will also allow planners to know

- The people's choices of energy resources.
- Current practices of resource use to fulfil energy needs
- Potential adaptive capacity of the community and resources.
- Major strategies, interventions used to reduce the effects of vulnerabilities
- Potential resources and assets (capacity) to reduce vulnerability

Questions to be used as a checklist

1) What actions have worked and what haven't so far?

2) How have these actions reduced their vulnerability?

3) How vulnerability affects in decision-making process?

4) What are the livelihood capacities of vulnerable people?

5) How will resilience of the resources and the community be improved to the impacts of climate change (for each exposure listed earlier)?

6) Prediction of what vulnerability to disasters is likely to be in future

7) What energy resources will be dwindling down in the context of climate change?

8) What resources will increase in the context of climate change?

9) What is the demand scenario to particular energy source in future?

10) What are the institutions in the energy production, supply, monitoring etc? Are they effective? What improvements are necessary?

11) Which energy sources/resources are complementary/supplementary to each other? Such as agriculture residue and fuel wood for cooking and heating.

12) Which resources are most useful in the time of hazards and extreme weather events?

13) Which resources are less sensitive to climatic hazards? Are the abundantly available? Can they be introduced?

14) Are there cultural and policy barriers that prevent introduction of alternate source of energy?

15) Which resources are urgently available to the community? Which resources are most important to in the time of hardships?

16) Which energy source is the most reliable?

Output
The completed matrix above provides scenario of the energy resources. Combined with the exposure and sensitivity analysis overall vulnerability can be identified. This also provides what can be done as adaptation options to the energy sustainability in the context of climate change. The weakness can be decreased through management interventions while opportunities can be utilised for betterment.

Annex C.5 Trend analysis

Demography, Climate (sunshine days/hours; wind; hydrology; temperature), Economy (agriculture livestock, industry, SMEs), Deforestation, Hazards, GSI Disaggregated Data (where available)

Introduction

Trend analysis attempts to study accounts of the past of the resources and hazards. It provides the overtime scenario of resource status and trend of hazards and their impacts on the resources. Besides, natural phenomena trend analysis provides socio-economic changes over time in a particular locality or community. It is a bit rigorous process. Status and dynamics of each resource and hazard or stresses should be analysed and documented. There is not any specified time scale suggested but generally at least past 30 years trend is helpful in the context of climate change.

Purpose and usefulness

Purpose of the trend analysis is to know the trend of climate related hazards that have affected resources over time. It also provides future gesture on how climate related hazards will be affecting the resources. On the other part than the climate change, the trend analysis provides useful information on how the exploitation and management of resources has come overtime and will be going ahead.

Technique

Trends can be analysed in focus group discussions and key informant interviews. A checklist of questions can be developed and used to facilitate the discussion. Each resource and hazard should be listed first such as forests, agriculture residue, water, mine, imported fuels, wind flow, sunshine etc and rainfall, stream flow, flood, storms, hails etc. In energy resources vulnerability, demand and technology trend analysis following but not limited to would be the issues to look into:

Historical trend of resource status, trend of weather and weather related hazard events, diseases, energy use trend, socio-economic trends, market trends – demand and supply trend, price and demand trend.

Input process
Facilitator introduces the task among participants. Begins with the issue participants feel easiest. Requests to recall the memories as back as possible in the past and begins with the questions to answer. S/he then documents different responses from among participants after they are confirmed to participate. Drawing the events or the condition of resources against time scale helps participants to collect information systematically.
Some key questions would be:

1) What was the status of forests (stock, species, growth rate etc) XX years' back, how close they were available etc? How it got changed over time or not? What may be the future status of the forest?

2) What were the crops grown in the past? How they came to change overtime or not? What are the residues utilised as energy source over time?

3) What has been the trend of flood, landslide, drought, forest fire, windstorm etc overtime? What have been the effects and impacts of these events/phenomena on the energy resources? What are the perceived impacts and consequences in the future?

4) Are summer days hotter and drier? To what extent?

5) What is the weather pattern over past (rainfall pattern, intensity, timing, wind flow, cloud, fog, cold and hot waves etc) and present? What is the trend of change (consistent or inconsistent)

6) What is the trend of losses of floods, forest fire, drought, diseases over time?

7) What are the new hazards such as disease experienced over time? How they are increasing/ decreasing/expanding over time?

8) What are the beneficial changes due to change (if) in weather pattern? Temperature?

Each hazard has some independent or combined impacts on the resources. Therefore trend should be analysed for individual hazards and individual energy resources.

Facilitator can make use of chart; figure, etc. to present the output.

Outputs
Trend analysis provides historical overview of resources and the factors affecting them. Though not precise it provides future gesture of the hazards and consequences. Information available should be triangulated within the different respondent groups and secondary information. For example, weather trend can be compared with weather data from the nearest weather monitoring station. The synthesized information can be recorded in tables and graphs. The rate of change, frequency of hazard occurrence, severity of effect and impacts can be documented.

This supports also to identify the availability of resources over time. People generally provide information on different resources used as substitute or replacement in different

time that provides on how the resources and priorities have been changing. Many often the reason is also available that can be triangulated with the information coming out of root cause analysis.

The results can be documented in terms of high, moderate, low or none for increment or decrease of frequency, magnitude, losses, production, use etc, based on some locally identified indicators if they cannot be quantified.

Materials required

Facilitators need a range of stationeries as mentioned in the section 1. There are a number of documents on usual PRA tools. Facilitator should have working knowledge on the mechanism and process of climate change and its impacts on different resources.

Annex C.6 Root Cause Analysis

Root cause analysis, also known as problem tree analysis is important tool to assess the factors involved in the process of change either to degradation or improvement of resources. This helps to dig out the underlying causes of vulnerabilities and their effects by figuring out the cause and effect relationships of sources and consequences. This builds on the parts of tree where 'roots' consists of different causative factors of a particular hazard such as flood. The hazard under analysis stands as main stem and consequences (results) as crown (branches, leaves and fruits). There are multiple factors to a particular hazard such as edaphic factors –geology, soil properties, weak structure, topographic factors – slope, exposure, altitude, climatic factors such as temperature, rainfall, wind, weather pattern and biotic factors including human activities. These all factors constitute 'root' feeding to the hazard. The hazard grows based on the factors and their contribution. The hazard extends to affect various resources which constitute branches, leaves and fruits. In the energy resources vulnerability assessment those related to energy resources are only the subject of assessment. This is basically the logical analysis of causes and effects.

Purpose and usefulness

The purpose of the RCA is to identify and understand the factors contributing to the hazard that affects energy resources, their adaptation capacity/potential and to some extent their demand. By identifying the causes of vulnerabilities to energy resources, preventive and mitigation measures can be taken to conserve and better manage the resources. The root cause can is also equally useful and important to identify the reason for different choices. If people have switched to alternate energy resources and sources or exploitation of particular resource is increasing, the causes behind and the implications afterwards can be assessed.

The RCA has significance in project planning; may be it an energy project. There are three stages in the analysis process:

- Analysis of the problem, its causes and effects (problem tree)
- Analysis of the objective –input, output and results (objective tree)
- Analysis of the strategies – how to do, where to do, how much to do and when to do (the project document or the solution tree – log frame also known as decision tree)
-

In some documents 'identification of the problem' is considered as the first step such that it is said four step analysis and planning tool.

Technique

This tool can be use in focus group discussions. A figure of tree should be drawn on the loose paper sheet or on the ground. Facilitator puts a tag with the name of issue or hazard such as flood, increase in fire wood demand/consumption, forest degradation, etc on the stem of the figure tree. Then s/he asks participants to speak up the causes for the hazard. Each cause is written in one meta card and then placed in the roots. Once the causes are completed, information on the effects and impacts are documented accordingly.

Input process

Facilitator should orient participants with an example on how root feed to tree, the effects, more in number and nutrient access of the roots, the stronger the stem (hazard) that produces greater number of branches, leaves, fruits etc. Facilitator should familiarize the logical relationship or causes and effects. Some key questions may vary depending on the context, to begin with are:

- What are the major causes of depletion of forest resources/water springs/ decrease in stream flow…?
- Why people overexploit the forest resources?

- What are the reasons behind fire in the forests annually?
- Why people switched to LPG from fuel wood?
- Why biogas was not successful in the area?

.
Facilitator can show one example of the past analysis such that participants can understand the matter quickly.

Facilitator should take care of grouping related causes together such as natural and human induced factors to a hazard. Participants often bring vague causes such as lack of awareness and population increase that needs to be further specified into different sub roots. Similar responses may come in the case of effects such as loss of crop that needs to specify to 'what' crop. As it is energy sector analysis importance should be given to energy resources. Small but important issues such as negligence to improve cook stove, suppress fire after picnic etc. Therefore possible causes should be noted down by the facilitator beforehand such that the causes can be verified if the participants missed out to document. Other important issue is on slow onset hazards and remote lying causes such as climate change, weather variability, national policy etc.

Output
This provides experienced and logically attributed reasons for the changes in resources and practices on energy use. The reasons can be grouped together and utilised to mitigate the contributing factors in the energy plan.

Supporting materials
Stationeries and materials are similar to the mapping exercises. A number of literatures in different contexts are available regarding the tool. Available tools and techniques can be modified to account for the climatic hazards and energy resources change.

Annex C.7 Sensitivity Analysis

Sensitivity measures the likelihood of being affected by a hazard and is an indicator to how well protected or having capacity to defend those exposed to a hazard are. A forest is less sensitive to drought than agricultural crops such as maize or rice as the former has stronger sustaining capacity in general. A watermill at the bank of river is exposed to flooding but its sensitivity will be low if the embankment is reinforced. A house with a lightening rod is less sensitive to being hit during a thunderstorm. The risk associated with exposure can be reduced by decreasing sensitivity, yet the exposure itself still remains.

Purpose and usefulness
This is very significant area of investigation to identify how the energy resources and components of the energy production and utilization system are sensitive to be affected by climate change and its impacts in terms extreme conditions such as hazards. It is analysis of the defending capacity of energy resources through logical analysis, based on the past experiences and observations of the responses by the components or resources to different degree of change or stresses.

Different resources are differently sensitive to climate change. Forest resources are less sensitive to erratic pattern of rainfall than agricultural crops. Solar panels are not sensitive to drought but the streams (as the source to hydroelectricity or water mill) are sensitive to drought. By knowing the sensitivity of particular resource and their exposure to the hazards future consequences of the resources can be forecasted and the information can be utilised in the energy planning. If the area is exposed frequent drought, solar energy may be more

appropriate than micro hydro to substitute forest and agriculture based energy sources as the stream is more sensitive to drought.

Resources less sensitive to different (climatic) hazards are often capable of providing services to adaptation to climate change within and outside energy sector. Therefore, information from sensitivity analysis is very useful to adaptation capacity assessment.

Technique
Focus group discussion, key informant interview and discussion with subject based experts familiar to the area would be viable technique. A list of questions and comparative analysis such as pair wise comparison are some tools to apply. However, a level of scientific knowledge is necessary to facilitate the discussion, triangulate information from different sources and verify their reliability. The information from PRA may be like: the stream a dried completely when there was no rain between November and May in year xxxx and water supply decreased by ¾ in stream b. Similarly stream a broke embankment in year yyyy but stream b did not when there was heavy rainfall in the catchments of both streams. This means stream 'a' is more sensitive to drought and heavy rainfall. Similarly, agriculture residue reduced by half when there were storms and heavy rainfall but forest resources did not reduce significantly. This means that agriculture resources are more sensitive to storms and rainfall than forest resources. These are arbitrary examples, actual field situations may differ.

However, local people can provide information to what level the resources were affected in the past to 'certain' degree of exposure and this is the information on sensitivity of different resources. Expert consultation can add precision to the information. Therefore, PRA techniques and tools provide comparative scenarios on sensitivity of different resources to the similar exposures to hazards. For more precise data scientific measurements on climate change and variability, hazard dynamics and impacts are necessary.

Input process
Facilitator should list out all the energy resources, system for generation and utilization. The information on exposure needs to be already identified through mapping exercises and secondary information. For example if micro hydro, solar, wind, fuel wood, agriculture residue, imported fossil fuels (kerosene, diesel etc) are the energy sources in the particular community, they may be exposed to different climatic, edaphic, topographic and socioeconomic adversities and privileges.

Then discussion should move forward with which one resource is more sensitive (easily affected) by the different (climate related) hazards. Participants should provide examples of certain events and other relevant indicators that can be documented. Final table of ranking may look like as shown in the output table. The analysis may go iterative. If participants provide some reliable 'examples' based on certain event experiences; should be noted.
A list of open ended questions may help to facilitate the process:

- Are energy resources sensitive (potential to be affected if exposed to) to weather events (too much rainfall, hail, windstorm, drought, extreme temperature, cold wave etc)
- Which resource(s) is/are more sensitive than others? And why?
- Why are some resources affected more than others by the same level of stresses?
- Do resources rejuvenate after a hazard stress or shock? How faster?
- Are there some tailored consequences of certain hazards to particular resource? Such as fire after intense drought? Price hike after road blockade due to bad weather?

- Is there seasonality (such as less power generation during winter by a solar panel, more fuel wood consumption if cloudy days are increased in a year particularly winter?)

Output
Below table may provide some ideas on how sensitivity of different energy resource may look like.

Pair wise sensitivity comparison of different energy resources to drought

Energy resources	Forest	Water	Solar	Wind	Agriculture (residues)
Forest	Xxx	Water	Forest	Forest	Agriculture
Water		Xxx	Water	Water	Agriculture
Solar			xxx	wind	Agriculture
Wind				xxx	Agriculture
Agriculture					xxx

In this analysis agriculture is the most sensitive and solar is the least sensitive to drought. So, if the area is facing increased drought the solar may be the best option provided that other criteria support for the solar. However, there are other factors to cover to be considered holistically such as through multiple criteria analysis (MCA). For example, Water (stream) is exposed to the drought more than agriculture crops as many crops grow in 6 to 9 months often in summer (Paddy is not exposed to the winter drought). Therefore, considering the severity of drought in the analysis matrix, agriculture may be more viable (considering its potentiality of storability) or equally important option as energy source compared to a micro hydro as stream flow may significantly decrease during dry spell. Sensitivity has also importance in adaptation options as less sensitive resources will help to fulfil energy needs during extreme events.
Supporting materials
IPCC assessment reports (III, IV)

Further References (Analytical Tools and Procedures)

Action Aid. The Participatory Vulnerability analysis. www.actionaid.org

CERTI's Rapid Assessment Procedures: www.certi.org/publications/Manuals/rap-16-section3.htm

Community Based Planning: Core Facilitation Team Guidelines – Practical Action Southern Africa

DFID's Social Development toolkit: www.dfid.gov.uk/FOI/tools/chapter_03.htm

EMERGING ISSUES PANEL: Gender Perspectives on Climate Change Commission on the Status of Women, Fifty-second session, New York, 25, February – 7 March 2008,

FAO. A Handbook for Trainers on Participatory Local Development. FAO corporate document repository. http://www.fao.org/documents

Gender, Energy and Climate Change, ENERGIA, the Netherlands http://www.hedon.info/docs/E-MINDSET-GenderHealthAndEnvironmentMDG-MMCT.pdf

Objective oriented project planning (ZOPP). http://gametlibrary.worldbank.org , www.unssc.org/web1/programmes/rcs/cca_undaf_training

ODI: Overseas Development Institute, Research and Policy in Development, Problem tree analysis

South Centre Report - the role of decentralized renewable energy technologies in adaptation to climate change in developing countries

The Change Agency. Problem Tree analysis http://www.thechangeagency.org

The MDF training and consultancy. MDF tool - Problem tree analysis

The NZAID tools. http://nzaidtools.nzaid.govt.nz logical-framework-approach/annex-2-problem-tree-analysis

The Preventionweb. Community Hazard mapping. http://www.preventionweb.net

The role of decentralised renewable energy technologies in adaptation to climate change in developing countries - South Centre, www.southcentre.org/index.php?option=com_docman&task=doc_download&gid=1073&Itemid=&lang=en

The toolkit for development. http://www.toolkitsportdevelopment.org

Toolkits from ENERGIA as well as Global cc, http://www.hedon.info/docs/E-MINDSET-GenderHealthAndEnvironmentMDG-MMCT.pdf

UNDP Toolkit on Gender, Energy And Environment

World Bank Group (2010), The economics of adaptation to climate change, a synthesis report.