



# Development and Energy in Africa (DEA) project

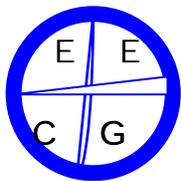
## A case for Botswana

### RURAL ELECTRIFICATION BY GRID ELECTRIFICATION

## Case Study Report

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## Abbreviations and Acronyms

AFREPREN	- African Energy Policy Research Network
BPC	- Botswana Power Corporation
DANIDA	- Danish International Development Assistance
DEA	- Development and Energy in Africa
EAD	- Energy Affairs Division
EECG	- Energy, Environment, Computer and Geophysical Applications
ESCO	- Energy Service Company
EU/EC	- European Union- European Commission
GVEP	- Global Village Energy Partnership
HIV/AIDS	- Acquired Immuno Deficiency Syndrome
ICT	- Information and Communication Technologies
kWh	- kilowatt hour
LPG	- Liquid Petroleum Gas
MDG	- Millennium Development Goals
M&EED	- Monitoring and Evaluation for Energy and Development (GVEP-facilitated international working group)
PV	- Photovoltaic
RCS	- Rural Electrification Collective Scheme
REGE	- Rural Electrification by Grid Electrification
REFAD	- Renewable Energy for African Development
SME	- Small and Medium Enterprises
SMME	- Small, Medium and Micro-Enterprises
TV	- Television
US\$	- United States Dollar
VCR	- Video Camera Recorder
VDC	- Village Development Committee
WSW	- West South West

# 1. INTRODUCTION

## 1.1 Context of the case Study

This case study was undertaken as part of the project “Development and Energy in Africa (DEA). DEA is funded by the European Commission’s Intelligent Energy-Europe programme COOPENER and co-funded by the Danish International Development Agency (DANIDA).

The project commenced in May 2005 and it is expected to last for 30 months to October 2007. The principal aims of the DEA project are (i) to identify and examine the developmental impacts of energy interventions<sup>1</sup> linked to improving energy access and poverty alleviation and (ii) to use the information and insights gained to improve on-going and future energy interventions by energy policymakers and institutions in six Sub-Saharan African countries: Botswana, Ghana, Mali, Senegal, Tanzania and Zambia. The immediate objectives of the DEA project are (i) to establish and apply an Assessment Framework for evaluating development and poverty impacts of energy interventions and (ii) to engage in a dialogue with energy policy makers and other stakeholders on the basis of the framework, with a view to incorporate these issues in energy policy.

DEA has nine work packages that are summarized in Annex 1. To date the project has accomplished the following.

- Literature review that will feed into the development of the Preliminary Assessment Framework (WP2)
- A catalogue of energy interventions from the participating countries (WP3)
- Bilateral consultations conducted by the six African partner centres with key national Stakeholders (WP4)
- First National Workshops, arranged by the six partner centres, to introduce and discuss the DEA project and in particular gather stakeholder opinions on requirements for impact analysis of energy interventions

The case study falls under WP6 as indicated in Fig 1.1, and WP2, WP3, WP4 and WP6 will contribute to the development of the Assessment Framework, which is the main objective of the DEA project (WP5). Each participating country is undertaking one case study selected from their catalogue of energy interventions that have been submitted as WP3.

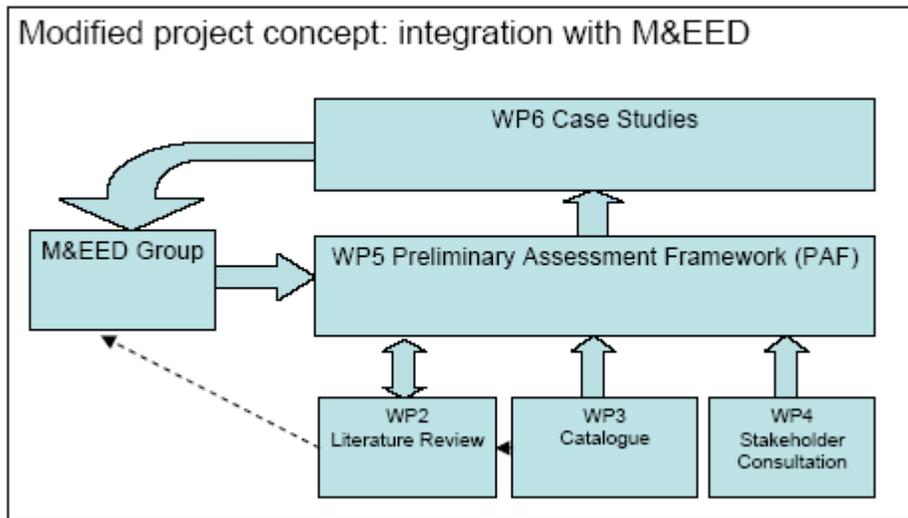
The process leading to the case studies comprised

- Development and agreement on criteria for case study selection
- Selection of case studies for the six countries
- Preparation of causal link diagrams and preliminary tables. These were further elaborated at the second project workshop.

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<sup>1</sup> An energy intervention is here defined as an explicit project, policy or innovation – either technological or institutional – that affects energy demand and/or supply in a country.

**Fig 1.1 Inter-linkages of Work Packages with the Assessment Framework and other initiatives.**



## 1.2 Criteria for Case Study Selection

For the purpose of selecting the case studies, a set of selection criteria, comprising 6 local and 2 global considerations, was developed in collaboration with all project partners in the 6 participating countries. The agreed criteria are presented in Box 1.1

### Box 1.1 Agreed Selection Criteria for country case studies

<p><b>Local Criteria – seen from the point of view of the country team and the country</b></p> <p>L1. National preference/relevance  L2. Development impact  L3: Availability of development impact data  L4. Availability of baseline  L5. Achievability  L6. Synergy with other development projects</p>
<p><b>Global Criteria – seen from the point of view of the DEA project as a whole – contributing to the quality and usefulness of the Assessment Framework</b></p> <p>G1. Representative: The set of interventions in the Case Studies should span a number of different types of interventions or energy technologies in order to “test” or develop the AF.  G2. Illustrative value: The intervention may have high value in illustrating energy-development connections to other countries, i.e. intervention types which are common in other African countries.</p>

The selected case studies for each of the participating countries are listed in table 1.1.

**Table 1.1 Selected Case Studies for each of the DEA participating Countries**

Country	Selected case Study
Botswana	Grid Rural electrification through the Rural Electrification collective scheme
Ghana	Grid-based rural electrification
Mali	Women Renewable Energies Project (focus on one area)
Senegal	PROGEDE (focus on improved stoves)
Tanzania	Small-scale irrigation using solar and wind energy
Zambia	Solar Energy Supply Companies (ESCOs)

The above set of case studies (table 1.1) reflects the local criteria applied by the six participating country energy centres. With regard to the global criteria, the selection is satisfactory in spanning a range of different energy interventions that are also relevant for African countries in general.

## 2.0 CASE STUDY IN THE CONTEXT OF BOTSWANA

### 2.1 Overview

A total of 9 energy interventions have been presented for Botswana in WP3 covering Grid electrification based on the Rural Electrification Collective Scheme (RCS), several solar PV electrification projects, expanded coal utilization, LPG promotion, and sustainable fuelwood supply and utilization. Grid rural electrification employing the RCS is the most widely implemented energy intervention in the country with a significant budget. The RCS has also been evaluated, and hence has indications of development impacts data (EECG, 1999). The project is also impacting on many development sectors: education, health, and domestic welfare, commercial, industrial and institutional sectors. The details of this energy intervention have been presented in detail in the WP3-Country catalogue, but a brief overview is repeated here for reference.

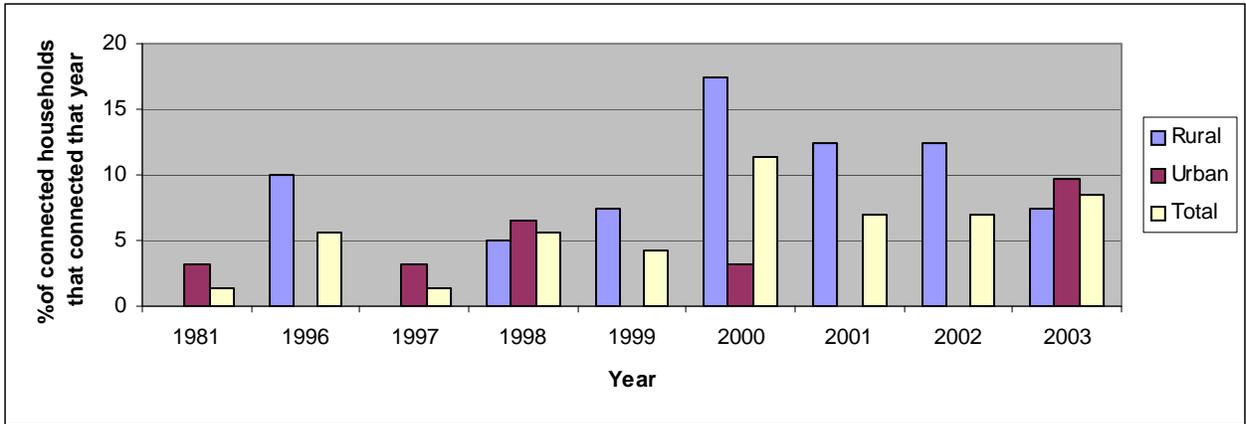
### 2.2 Rural Electrification Collective Scheme (RCS)

The RCS is a financing policy that assists rural customers in the form of a loan to reduce the burden of up-front costs of connecting to the electricity grid. Potential consumers form groups of 4 or more customers when applying for connection to benefit from economies of scale i.e. share the cost of extending the grid closer to their premises. This loan scheme requires potential grid electricity consumers to pay a deposit and make repayments over a period. The Scheme began in 1988 and has undergone several phases and modification with regard to deposits, repayment periods and loan interest rates (table 2.1).

**Table 2 .1Evolutions of the RCS**

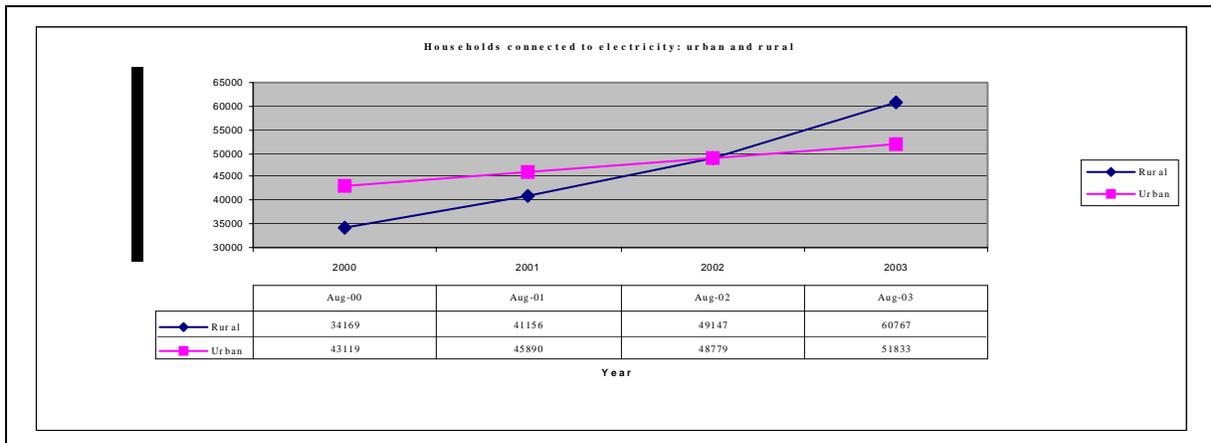
<b>Year</b>	<b>Deposit (%)</b>	<b>Balance (%)</b>	<b>Repayment Period (years)</b>	<b>Interest rate %</b>
1990	40	60	10	8
1995	10	90	10	9
1997 (standard costing introduced)	10	90	10	9
2000	5	95	15	Prime+0.5

Fig 2.1 below shows the response of the changes made to the RCS, indicated by the increases in percentage of rural households/customers that connected to the grid in 1996, 2000 and beyond.



**Fig. 2.1 Rate of household connections by year for rural and urban households.**

The indications from Fig.2.1 are that there is a response to connections when the RCS changed. For instance when the latest changes to RCS were implemented in 2000 of a small deposit and a long repayment period, most people connected then.



**Fig. 2.2 Graph of electricity connection in rural and urban areas 2**

It is also clear that rural electrification started acceleration after the 2000 policy adjustments to overtake the rate of urban electrification (Fig 2.2).

However, despite all these encouraging gains, it is important to assess the real impacts on development, hence the present case study.

### 2.3 Case Study Framework and Causal Chain

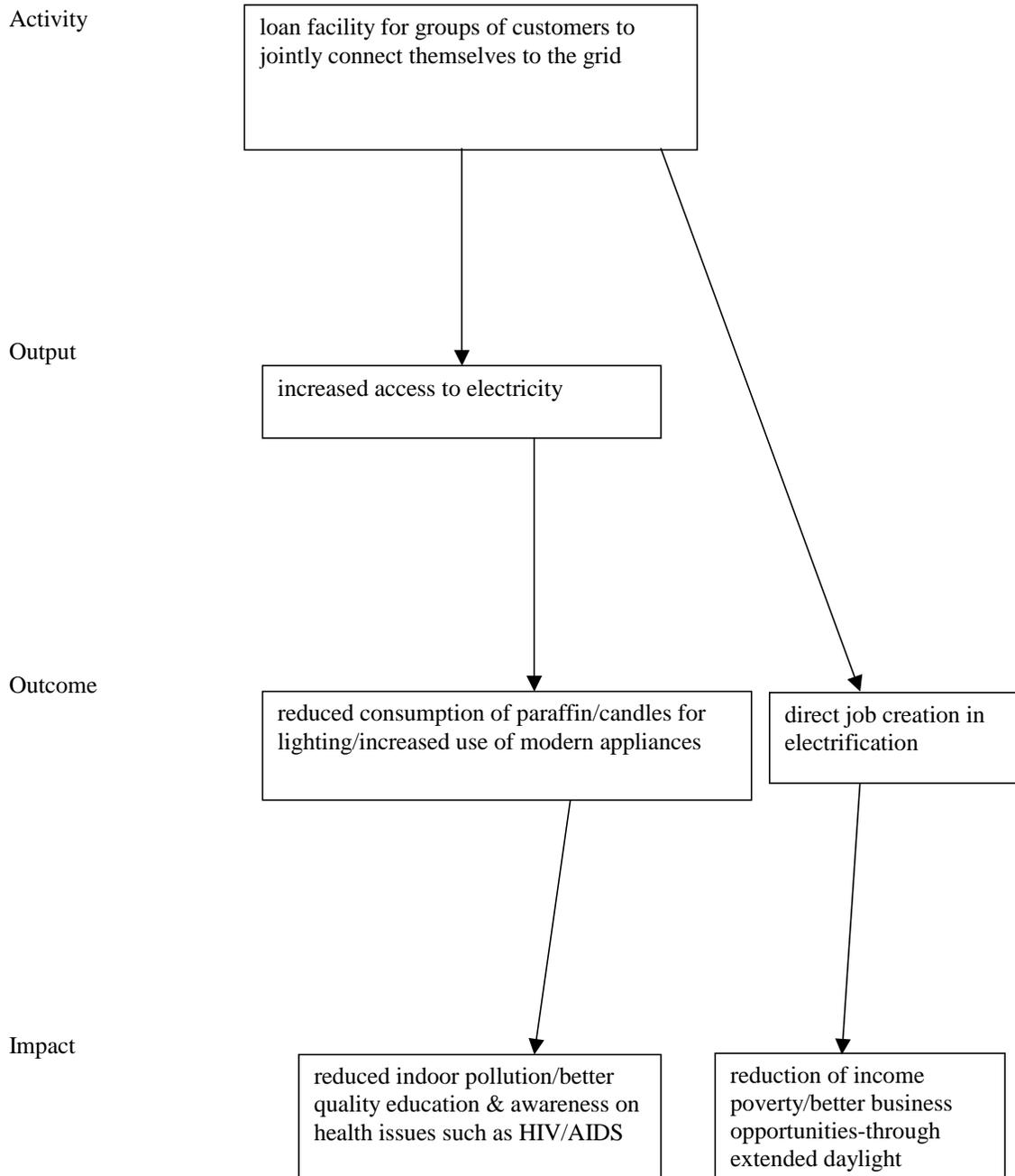
This case study was undertaken with the objective of exposing development that could be linked to the grid rural electrification and hence the RCS.

Development here covers economic, social and environmental achievements that would result in better quality of life for Batswana. There is importance in understanding how energy affects

economic development and communities, in this case the poor, and what decision makers such as government officials should do to ensure the energy needs and hence the welfare of the poor are met through implementation of such energy interventions as the RCS/Rural Electrification by Grid Electrification (REGE). This is with the recognition that access to energy (particularly modern energy) is an essential, though not sufficient, input in the process of development and poverty alleviation.

The causal chain between energy and development that was developed for this case study is presented in Fig 2.3 below. The causal chain consists of the activity or intervention itself, then the output (i.e. access to electricity), the outcomes (i.e. quality lighting, increased use of modern appliances e.g. for communication, health facilities, entertainment, education, offices) and then the impact which links up with development indicators e.g. improved health, improved education quality, productivity, high incomes, informed nation e.g. on HIV/AIDS etc.

**Botswana: Rural electrification collective scheme**

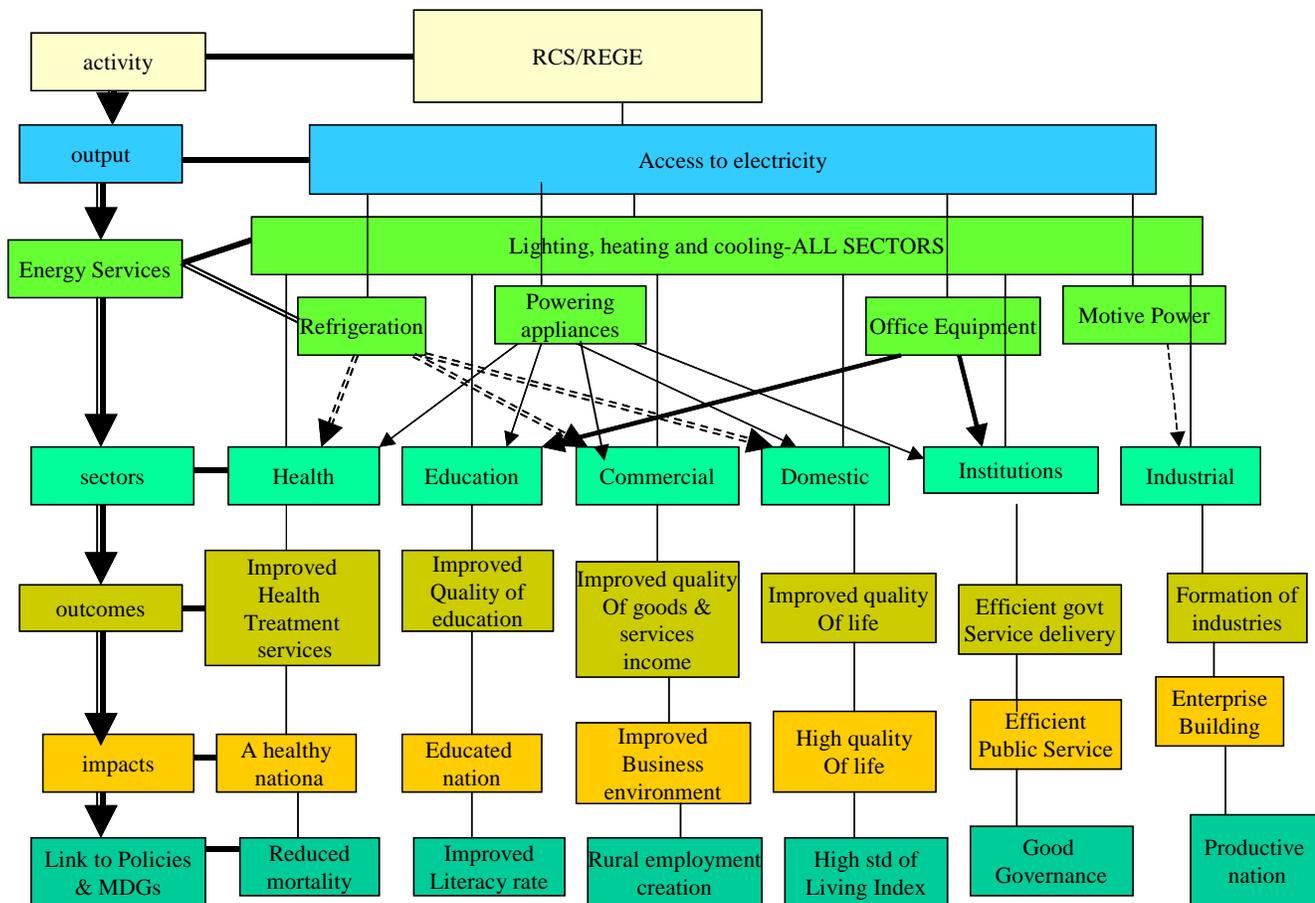


**Fig 2.3 Causal Chain for Grid Rural Electrification and Development- the case for Botswana**

This causal chain in Fig 2.3 was further elaborated to expose the parameters to measure of the anticipated outputs, outcomes and impacts of the RCS energy intervention.

## 2.4 Elaboration of the RCS Causal Chain- the Fringilla Group Approach

At the second workshop held at Fringilla Lodge, Zambia (first week of June, 2006), the causal chain was further elaborated to show sectors that could be affected by the grid rural electrification. Such elaboration assisted in planning the data collection that would be used to analyse what to measure and indicators for outputs, outcomes and impacts of the RCS intervention. Annex 2 shows a more holistic link of energy services with all possible sectors that can be found in a country. Fig 2.4 presents the linkages of RCS/REGE output, energy services and the sectors where the outcomes and impacts are realized, in the case of Botswana. The sectors indicated here are those, which were found to be benefiting from electricity in the village of Manyana, where the case study was undertaken. In Fig 2.4, the energy services and outcomes have been presented separately.



**Fig 2.4 Elaborated causal chain of the RCS/RE and related sectors in Botswana.**

The disaggregation of “what to measure” and the related “indicators” facilitated the identification of data requirements, potential sources of data and allocation of resources to the case study. The study area was also identified based on agreed criteria with the national project stakeholders. These aspects are presented in the Methodology chapter (Chapter 3).

## **3.0 METHODOLOGY**

### **3.1 Criteria for Selection of Study Area**

The criteria for selection of the study area/village were circulated to the national policy stakeholders, with names of tentative villages to be considered. The criteria for selection of the study village were

- a) Proximity to Gaborone (<100km) in consideration of the limited time frame and resources for the case study. A nearby study area would also allow repeated visits to undertake both interviews and focus groups, and also verify information.
- b) Village with many sectors that are using electricity ( e.g. health, education, agriculture, communications, SMMEs etc) in order to have a wider spectrum of development aspects to measure.
- c) A village that was connected 5 years or more ago for impacts to have been realized
- d) Other such as social setting and influence of past initiatives and environment, leadership etc.

The village of Manyana fitted all these criteria and was agreed upon with the national stakeholders.

### **3.2 Study Area- Manyana Village**

The RCS/REGE is being carried out in the whole country of Botswana but for a more focused case study and due to limited time and resources, one village was selected for the study. The case study was carried out in Manyana, a village located in the Southern District about 50km from the nation's capital, Gaborone in the WSW direction. The village is easily accessible by a good paved road from Gaborone. In the last Population and Housing Census (2001), Manyana had a population of 3183 (1475 males and 1710 females). Considering an average rural household size of 5, the population of Manyana translates to about 637 households. The village is dominated by female-headed households. In a previous study (EECG, 1996), female households with no cash incomes were about 3 times those of male-headed households. As much as 70% of female headed households depended on remittances.

Infrastructure is well developed with over 65% of buildings constructed from brick and roofed by zinc/tile.

Government centrally provides water and thus individuals do not need to provide for their own water for the normal domestic and organization use, except that some households, businesses and establishments pay for water connection to their houses or homes. The majority has connected water to their homes/houses and a few are still dependent on standpipes.

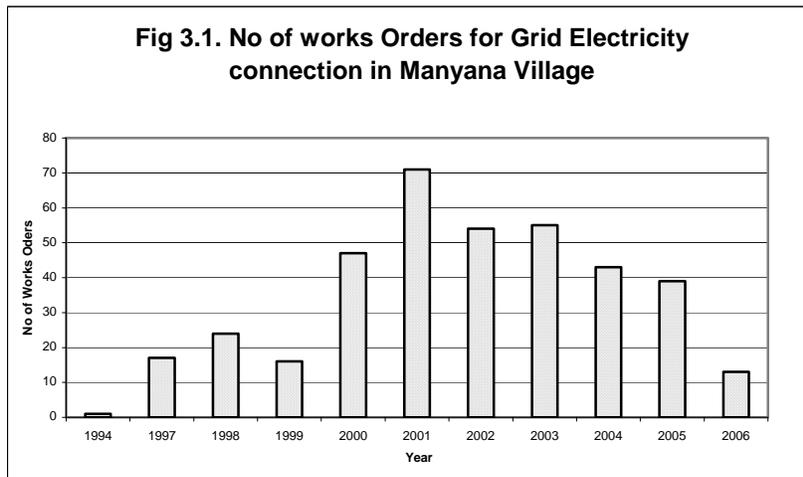


Fig 3.1 indicates the works order for connection to the grid by Manyana Residents as provided by the Botswana Power Corporation and when they were applied for. Even at village level the indications show that although the grid reached the village in 1994, most people requested for connection after 2000, when the low deposit and long repayment period was introduced for the RCS.

The village has about 13 commercial business (general dealers, butcheries, restaurants, bottle stores), two schools (1 secondary and 1 Primary), a clinic, and two industries (sewing and welding).

**Table 3.1 Types of sectors and level of electrification in Manyana Village**

Type of Organization	Number	Number Electrified
Secondary School (Government)	1	1
Primary School (Council)	1	1
Clinic	1	1
Commercial Businesses	13	6
Industries	2	2
Other Government Office=Tribal admin & Customary Court	1	1
Households	637	224
Postal agencies	1	0

According to statistics of the Botswana Power Corporation (generates and supply electricity in Botswana), 224 households have connected (Table 3.1) which is about 35% of the estimated population of households in Manyana. Deriving from the records provided by BPC, 339 applied for connection through RCS and 189 were connected or 56% of those who applied through RCS. Among those who were connected through RCS, 96% are domestic. The other

option for connection is through Hire Purchase. Forty-one domestic and 8 organizations applied through HP were all connected (Table 3.2).

**Table 3.2 RCS and HP applications and connections for Manyana Village**

	RCS applications	RCS-Connected	High Purchase applications	HP Connected
Domestic	328	183	41	41
Govt & business	11	6	8	8
	339	189	49	49

Of all the grid electricity consumers in Manyana, 82% have connected through RCS. And 18% through HP, indicating the RCS intervention is promoting grid connections as it was intended to achieve.

The traditional authority is the main Government institution in the village. There are no post office facilities in the village and the post office is at a nearby village some 10km away, Mmankodi. There is however a postal agency that is not connected to electricity.

The village has experienced some interesting developments in the past and is supported by a progressive traditional leadership. The village was a site for a pilot project that installed 42 households PV systems in 1992 and the pilot project created interest for modern energy in the village according to the evaluation conducted by REFAD (Porter, 1994). Those who benefited from the SHS indicated that the PV systems provided quality lighting and enabled some income generating activities. The village was a target (among 3 villages) for a feasibility study on PV Rural Electrification in 1996 that would also use a loan scheme for groups of households to procure solar home systems-SHS (EECG, 1996) and there was a high interest among households to procure SHS. The interest was considered to be triggered by the earlier PV pilot project. As far back as 1994 the grid was also approaching the village hence REGE has become the main source of electricity in the village.

### **3.3 Socio-cultural setting**

In Botswana, the concept of consultation or “*therisanyo*” is of paramount importance in any national undertaking. This concept is imbibed in the four national principles of democracy, self-reliance, *botho* (respect), development and consultation.

The kgotla is the most important institution in the village where most of the village leadership, influential community members, the chief and other members of the community usually convene to discuss important community issues. It is here that any process of community mobilization should start. The Kgotla through the chief and his associates will mobilize community members to participate in studies such as this case study and give the study some form of legitimacy.

Traditional institutions in the form of chieftaincy, local authorities and village leadership are the hallmark of any consultation process through out the whole country. It is therefore important to engage members of the community in the villages through the traditional authorities and Village

Development Committee (VDC). The VDC is responsible for the overall community development planning and projects and oversees the implementation of government development policies at local level. The first point of call in the village is therefore at the village Kgotla and VDC to introduce the project. With the approval and blessing of these two village institutions it is easy to undertake work throughout in the villages.

### **3.4 Activities undertaken**

The following activities were undertaken as part of data collection to assess the impact of the RCS/REGE on development in Manyana

1. Visit to the traditional authorities (the Chief and Village Development Committee) to explain the project and make arrangements for focus group meetings.
2. Identification of types of sectors that are operating in the village
3. Development of questionnaires/guiding questions for each of the sectors. In the case of Manyana, the sectors that operated in the village and were connected to grid electricity were Domestic (households), Education (schools), Health (clinic), Commercial (stores, restaurant, bars etc), Industrial (welding and sewing), and Government (traditional authority offices). The questionnaires used for each of the sectors are in the Annex 3
4. Undertaking one to one interviews with selected households (10 electrified, 10 electrified with satellite dishes, and 10 un-electrified); representatives of both schools (secondary and primary), clinic, commercial business (6), two industries (welding and sewing), and the Chiefs Office representative.
5. Undertaking a focus group at the Chiefs kgotla. Annex 4 contains the guiding presentation that was made in soliciting views of the village stakeholders.

### **3.5 Study Respondents**

Various sector respondents were approached to provide the information required for the case study. Table 3.3 shows the sectors, mode of information gathering, sample sizes where applicable, respondent type and any comments to support the study approach.

**Table 3.3 Sectoral respondents for the Case Study in Manyana Village**

Source/Sector	Information gathering	Sample size	Respondent	Comments
Households	Interviews	10	Electrified	Household heads (husband or wife These categories may also be defining income category
		10	Electrified with satellite dishes	
		10	Un-electrified	
	Focus groups		Combined women and men-household heads	Men and women have equal opportunities to debate at kgotla meetings in Botswana
Clinic	Interviews	1	Nurse in charge- new	
		1	Clinic employee- knew most of the history at the clinic	
School	Interviews	Secondary-1	Head of all Departments at school	
		7	Students	
		Primary 1	Principal	
	Records	1	Teacher	
		2	Employees	
Commercial	Interviews	64	owners	
			2 employees	
Industries	Interviews	2	Owners	
Traditional authority	Interviews	1	Deputy Chief	
		1	Court clerk	
Utilities	Records	Electricity	Botswana Power Corporation- Commercial Division	
<b>Total</b>		<b>54 village respondents</b>		

The interviews and the focus group meetings were led by a qualified socio-economist supported by two research assistants. The Team leader provided guidance, developed the information collection tools, analyzed the results and compiled the case study report. The whole team of four was introduced to the village authorities at the start of the study.

### **3.6 Analysis of Information**

The interviews were recorded and entered into Excel for compilation. The compiled views were interpreted in the context of the predetermined “what to measure” aspects and as indicators that could be derived from information e.g. number of sector entities with access to electricity; quality of results etc. Perceptions on the effect of REGE in Manyana were also extracted and synthesized, qualitatively.

The views expressed at the Focus group meetings are presented as those who spoke at the meetings provided them. (Box refer to 4.1).

## **4.0 OBSERVATIONS, RESULTS and FINDINGS,**

This chapter presents the informal stakeholder engagement, the analysis of responses provided for the interviews, and the views provided at the Focus group meeting.

### **4.1 The Informal Community Consultations.**

The chairperson of the village Development Committee was consulted in an informal atmosphere. From discussions with the Chairperson of the VDC, it was apparent that the VDC views the electrification project as an important step in the development of the village. The chairperson was of the view that electricity has indeed improved community livelihoods in that schools, clinics, businesses and households are now connected to the national grid electricity. Businesses are now able to use various kinds of electrical applications that include storage or refrigeration, lighting, and communications. However, the electrification project has had its own problems. According to the chairperson, the consultation process at the initiation of the project was not adequate. Community members did not have a clear understanding of their obligations toward the project. Most people were expected to form themselves into groups and thereafter connected to the grid. The understanding was that individuals would then pay instalments toward group connection. However, the project had failed to explain to the community that they are expected to start paying the moment electricity poles were erected in their yards. Most of them did not pay immediately and accumulated arrears that spurned over five years. The Botswana Power Corporation is now disconnecting most villagers and therefore reversing the gains of the project. While the concept of electrification is welcome, incidents such as these may have a negative effect on the attitude of the community on the project.

Staff at the clinic was of the view that indeed electricity has had a positive effect on the execution of their duties as health staff. They are able to use electrical appliances such as refrigerators for storing drugs, television and VCR for public health education, and lighting. Prior to the introduction of electricity, the clinic was unable to administer certain treatments such as asthma as the use of oxygen could not be permitted near candlelight or any flame. Patients often had to be referred to other hospitals in Gaborone or Kanye. They are also of the view that there is general improvement in the health of people as the clinic can now attend to emergencies even at night.

The primary school has also benefited immensely from the use of electricity. The school now has electrical appliances such as radios for the schools broadcasting programme, computer room and water heating appliances. The use of electricity has also eased the challenges of reading and studying for students. However, the Head teacher and members of staff who were present during the interview were not able to link improvements in their standard seven results directly to the use of electricity. They could not discern any tangible differences as a result of electricity. In terms of staff retention, there was no direct correlation between electricity and retention of competent professional staff although people would prefer to have electrified staff houses and electronic appliances.

A senior school official at the Junior Secondary School alluded to the fact that electricity has eased their teaching and learning activities. The school has several buildings electrified that include, classrooms, library, home economics lab, design and technology lab, computer lab, art lab and the administration building. The school uses a variety of equipment that facilitates easier learning and studying. There was however uncertainty as to whether the use of electricity has contributed anything to the schools examination results. All staff houses are electrified. Both students and teachers have access to the Internet for research purposes.

The small business community in Manyana mostly consists of small general dealers, butcheries, shops, kiosks, bars, textiles, welding etc. Most of these enterprises are connected to the national power grid. Most of them use electricity for a variety of purposes that include, refrigeration, scales for butcheries and restaurants, TV's, VCR's, radio-hifi for bars, welding and fabrication. The business community has attributed part of the sustainability of their enterprises to access to electricity. Most shops can now store perishable products such as vegetables, milk, fresh meat and beverages. The enterprises also contribute to employment creation and income generation to their communities.

## **4.2 Analyzed Responses from Interviews**

The responses for the interviews are presented separately for each sector. The aspects analyzed are provided in detail in Annex 5. Below are only the synthesized analysis of the village stakeholder views.

### *4.2.1 Domestic Sector*

In the case of the domestic sector, the views of households with electricity, with electricity and satellite dishes and those un-electrified are presented. For each of the three types of households, there were specific information that was gathered and analyzed as indicated in Annex 3.

#### a) Un electrified Households

In the case of un-electrified households, information gathered was on

- Current expenditure on energy fuels
- Effect of grid electricity in the village (both positive and negative if any)
- Effects that impact on their lives indirectly as households that are not connected
- Which development objectives are being met in their view?
- Their constraint to connection and how that can be helped

In terms of the current energy fuels used, paraffin is mostly widely used by all the 10 households interviewed and expenditure on the fuel ranges from P4.50 to P108 per month. Those who use small amounts of paraffin also use candles for lighting. Those who spend a significant amount on paraffin also use it for cooking. LPG and wood were used by one household for cooking to the tune of P250.

The un-electrified households indicated that while the effects of electricity would vary between rich and poor, the effects of grid electricity they observe are that:

- That workers now stay longer in the village than before
- The village is well lit at night and there is security and beautiful environment
- Those with electricity tend to benefit more and some of them have started small businesses selling ice-pops, which help them, buy groceries and even pay for the electricity
- University graduates from the village are able to use modern technologies such as computers
- Children have time to read unlike in the past
- They can use cellular phones and charge them

Un-electrified household heads also expressed that their children are using lit classrooms in the evening for studying and that there is improvement in their results. The use of electrified refrigeration at the clinic was also said to be better than the gas ones which sometimes finished un-expectedly. Refrigerated medicines are also said to be available locally. Previously residents would visit Mmankodi and Thamaga where refrigerated medicines were available. One respondent however complained that there are no medicines at the clinic and previously clinic used to keep medicines in surrounding villages where there was electricity. In the case of the clinic, respondents indicated that now they can take patients for attention at night unlike in the past. The Clinic staff also now stays locally but before electricity came they stayed in Moshupa and Thamaga. Electrical appliances like TV are now providing entertainment to teenagers that would be preoccupied doing unbecoming activities such as stealing. Use of computers is also believed to empower students by advancing their knowledge.

While the School and clinic are electrified, the postal agency is not and service is said to be inadequate.

With respect to meeting government development objectives, most respondents do not see any but some expressed that government should solicit for building of industrial sites and malls and bring in other government institutions to promote creation of employment in the village. Communication is said to have improved.

All the un-electrified households mentioned lack of income, lack of money or employment or that connection costs are expensive as reasons for not yet connected to the grid. They wish Government could create employment and assist those who are poor and cannot afford (targeted subsidy).

b) Electrified Households

For electrified households, information sought was related to

- When households were electrified
- Whether they used the RCS
- The electrical appliances they now use and for how long
- The monthly expenditure on electricity
- Electricity impact on their individual households
- Electricity impact to the village
- Government development objectives that are being met

All the respondents interviewed connected between 1999 and 2006 but out of the 10 households interviewed only two used the RCS. In Chapter3, it was however evident that most households connected through RCS than through HP.

Electrified households use a range of electrical appliances namely televisions, radios, refrigerators, kettle, irons. All of the interviewed households had refrigerators and 80% had televisions. Half of the households owned radios, kettles and irons. Only one household each used a hot plate, a computer, a microwave Oven, and an electrical hot water geyser. Apart from the refrigerator that operates all day, most households use their televisions for 2 hours per day listening to news except in exceptional cases. Items such as iron, kettle are used for a short time ( 1 to 3 hours).

Expenditure on electricity ranges from P30 to P200 per month with an average of P85/month. In Botswana this can buy 100 to 660 kWh electricity per month with an average of 280kwh.

In terms of what electricity has done to the electrified households directly, households' respondents indicated that their lives had improved tremendously although sometimes there is power failure in the rainy season. Among the improvements is keeping food for a longer time through refrigeration and also having the opportunity to use radios and televisions. Those who cook with electricity indicated that cooking with electricity is faster than using other fuels particularly paraffin. They are also able to use electric vacuum cleaners for cleaning, which turns out to be faster than before electricity was available.

The village households are boasting of producing university graduates as electricity has enabled their children to study at home and also use advanced equipment such as computers. One of the respondents indicated that electricity even allows children to study seating in wider space unlike when they are using a candle or paraffin lamp.

Electricity was also said to be a safer than other fuels such as paraffin and candles. Contrary to this opinion another respondent indicated that electricity could result in electrical faults that can burn property.

On the negative side, one of the respondents indicated that children are no longer performing well at school because they spend more time watching television. Another indicated that electricity light is not good for the eyes when reading. The third indicated that the electrical appliances they have bought are attracting thieves.

In terms of how electricity has affected the village, electrified households indicated that, the village is more secure as a result of outside and streetlights. There is the realization that the village is developing through creation of electrified businesses, schools, clinic and kgotla (Tribal office). In addition they are able to use easy communication through cellular phones. In the past people used to go to the kgotla to ask for telephone. Now they can notify their relatives about any sickness, deaths and even call the mortuary vehicle to pick up dead bodies without having to travel. Cellular telephones have become possible because electricity is powering the cellular phone transmitters in the village for the main providers namely Orange and Mascom.

General dealers and butcheries are also said to operate for longer times than when there was no electricity. People in the village now have the courage to start small business e.g. tuck shops and Mascom public phone service shops, welding shop, tailor shop etc since electricity was connected

In terms of what government development objectives have been met, some didn't know, or felt there was none but, some see improvement in education, health service sectors and hope that by 2016 at the end of Vision 2016, Botswana will be an educated and healthy nation partly through REGE. For education, the introduction of computers is seen as significant milestone in improving the quality of education. The public office in this case the tribal office is also expected to provide good service as a results of electrification.

#### c) Electrified with satellite Dish Households

Information sought from this group was similar as for electrified households but additionally what was ought was the effect of the satellite dish to their lives.

In terms of electrification, all households interviewed in this category except one indicated that they connected individually rather than through RCS. Again referring to BPC records. Most households connected through RCS.

Again television (90%) and refrigerators (80%)v are the widely used by this category of households appliances, followed by electric irons and kettles (50% each). Electric stoves. Microwaves, washing machines and computers are used by 30% or less.

The length of time the appliances are used for these electrified households are indicated in Table 4.1 below.

**Table 4.1 Time of use for electrical appliances**

<b>Electrical appliance</b>	<b>Time of use (hours per day)</b>
Television	7 to 15
Refrigerators	24
Stoves	Seldom to 5
Computers	13
Microwave	2 to 3
Washing machine	Difficulty to measure
Iron	1 to 5 hrs
Kettle	2 to 4

The impacts of the appliances and their effect on the lives of the households are also summarized in Table 4.2

**Table 4.2 Effects of electrical appliances on households**

<b>Electrical appliance</b>	<b>Effects</b>
Television	Watching news, films, music
Refrigerators	Preserving and storing food
Stoves	Cooking sometimes used when Gas is finished
Computers	Access to internet, children do their homework
Microwave	Cooking and warming food
Washing machine	Easy family laundry
Iron	Easy family laundry
Kettle	Quick hot water

Expenditure on electricity for this category is P40 to P300, with over 80% of them paying over P100/month. And an average is P130/month indicating that this category of electrified households could be of a higher income than the other group of electrified households, hence the use of satellite dishes as well.

Similar responses on the effect of electricity on households were presented. They now have access to radio and televisions all the time unless when a power failure occurs. In the case of television, there is indication that such households are now up to date with what is happening

around the world. They can now preserve food for long periods through refrigeration and that electrical appliances are quicker to use and make-work easier. Children are able to study without being crowded around a candle, or lamp. The outside lights are also assisting in deterring would be thieves and cellular phones can be used.

On the negative side they also feel that electrical appliances have attracted thieves who even sell them at lower prices. Cellular phones are also affected by the power failures in the case of Mascom.. Again there was expression that children learn bad things from televisions and also spend more time watching televisions instead of studying. Contrary to that another view is that children can learn through television and radio programmes. Knowledge is required though to operate electrical appliances e.g. washing machines, otherwise they can be risky.

With specific reference to satellite dish, households indicated that now have access to more television channels and also clearer television reception.

At village level this category of electrified households also echoed that the village is progressing since schools, clinic, kgotla and businesses are electrified, more butcheries are open and meat is now readily available. Businesses (butcheries, general dealers etc) are also closing late thus increasing their sales. The establishment of small business, welding and tailor shops was also mentioned as improvement to the village. The Village Development Committee and councillors are however prompted to ask for more development projects from government and potential investors.

On Government development objectives, the householders believe this is a way to fulfilling Vision 2016. They are however calling for more government offices to be established in the village so that employment will increase and poverty reduced. They also want a proper Post Office that can serve their needs. Others didn't see any link with government objectives.

#### *4.2.2 Education (Schools)*

The information sought was on:

- When the schools were electrified
- How electricity is paid for
- Buildings that are electrified
- Equipment in the school that use electricity
- Availability of study /educational facilities and how they are utilized
- Staff turnover
- Impact on village and government development objectives

Information was gathered for the Junior Secondary School and the Primary School; the only two schools in the village.

In the case of the Junior Secondary School, Boswelakgosi Junior School was electrified in 1991 and Government paid for the connection and is also providing votes for payment of the electricity bills.

The buildings that are electrified, the numbers and time of use are presented in table 4.3 below.

**Table 4.3 Buildings that are electrified at Boswelakgosi Junior Secondary School**

<b>Type of Building</b>	<b>Number</b>	<b>Time of use</b>
Classrooms	8	7:30a.m-4:30pm
Art lab	1	7:30a.m-4:30pm
Science lab	2	7:30a.m-4:30pm
Library	1	7:30a.m-4:30pm
Staff houses	27	7:30a.m-4:30pm
Staff room	1	7:30a.m-4:30pm
Home economics lab	1	7:30a.m-4:30pm
Design and technology lab	1	7:30a.m-4:30pm

It is surprising that the library use also closes at 4.30pm when the school finishes for the day.

The equipment in use at school, the number and purpose are also listed in table 4.4

**Table 4.4 Electric equipment used at Boswelakgosi Junior Secondary School**

<b>Appliance/Item</b>	<b>Number</b>	<b>Purpose</b>
Computers	24	For research
Fans	2	To cool the staff room
Kettle	1	For making tea
Stove	1	Practical for Home Economics students
Television	1	It is used if the lesson requires the use of television
VCR		It works with the television
Radio		For radio lesson (English)

There are indications from the school that results were satisfying before electricity came. There is no difference in pass rate before and after electricity because students are not taking advantage of the learning facilities brought about by electrification of the school.

However on a positive note, since the village was electrified, staff members/teachers are residing in Manyana because they can use all the appliances they could use.

Those in the School that were interviewed are of the opinion that the goal of educated nation in this village can only be realized if children are encouraged to study hard starting from primary School.

In the case of the Manyana Primary School, it was established in 1956 and was only electrified in 2000. The District council paid for the connection and provides money for the bills. Eight classrooms are electrified and another 12 are not. Table 4.5 indicates the type of equipment that the Primary school uses.

**Table 4.5 Electric equipment used at Manyana Primary School**

Type of equipment	No	Use
Computer	5	To teach students
Urn	2	For hot water & tea
T.V	1	Raises funds (films) and also they watch talk back
Radio	8	Radio lessons
Photocopying Machine	1	Reproducing teaching material

In the school, students that are using electrified classrooms are said to perform better than those who are in un-electrified classrooms.

The staff members are staying for longer periods of time at the school because the staff houses are electrified and they stay comfortably.

The same response was echoed at the primary school that pupils are not taking full advantage of electricity in their homes and school to study.

#### *4.2.3 Health Sector (Clinic)*

In the case of the Clinic, the information sought was on.

- When the clinic was electrified
- How electricity is paid for
- Buildings that are electrified
- Equipment in the clinic that use electricity
- Volume of patients
- Treatment facilities
- Staff turnover/retention
- Impact on village and government development objectives

The clinic was electrified in 1999 but before that it was a beneficiary of the PV pilot project. The Council also paid for the connection and is paying for the bills.

The outpatient clinic, maternity ward and three staff houses are electrified. Both the clinic and maternity ward operate from 7.30 am to 4.30pm but the maternity is available for emergency.

Table 4.6 shows the electric equipment in use at the clinic and their purpose/use.

**Table 4.6 Electric equipment in use at the Manyana Clinic**

Type of equipment	No	End Use
Heater	1	To warm themselves when it is cold
Geysers	1	Warm water to bath patients who are dirty and new born babies
Fan	1	When hot during summer they put it on to cool themselves
Fridge	1	To keep medicines which needs to be stored in a cool place
T.V	1	To inform patients about break outs of new diseases, how they should prevent contracting such diseases and how they should keep themselves healthy.
Incinerator	1	To burn medical waste

Since electricity arrived the number of patients has increased because there are now available medicines that are kept in refrigerators and also the clinic can be consulted during the night if it's urgent. Electricity affected the village positively because now patients are given the medicines they need and can be treated locally. In the past they used to travel to other villages with electricity for certain treatment e.g. to far places like Thamaga (>20km) and Kanye (>70km).

In terms of new treatment facilities, the Nebolizer is used for asthmatic patients, incubator is used for small babies who have just been born for breathing helping them to adapt to the outside environment and finally oxygen machine to help patients who have problems in breathing.

In terms of staff retention, electricity attracted staff to the village because they can use electric equipment, which offers quick service. Also they can use the external lights as security to prevent the thieves from attacking them. TVs also keep them entertained after hours when at home.

With respect to impact on the village, clinic respondents believe that because of television, people in the village have information about harmful diseases. They are able to watch films that impart to them with valuable information

In terms of meeting government development objectives, respondents at the clinic indicated that the number of healthy people in the village is increasing and hence productive people who will be able to work and produce quality output.

#### *4.2.4 Commercial Sector*

The information sought in the case of these businesses were

- Type of business
- When established
- When electrified
- Appliances in use for the business and number and purpose
- How electricity affected the business
- Impact on the village and development objectives

The types of commercial business, when they were established and when they connected to electricity, appliances and the purpose for which electricity is used are presented in table 4.7

**Table 4.7 Types of commercial business in Manyana that are electrified**

TYPE OF BUSINESS	WHEN STARTED THE BUSINESS	WHEN STARTED USING ELECTRICITY AT THE BUSINESS AND HOW PAID	TYPE	NUMBER	PURPOSE/USE
General Dealer	1994	They connected electricity in 1994, which is a prepaid, and roughly they use P200. per month.	Deep freezer Display fridge	2 1	To keep meat & drinks, margarine, polonies and Russian sausages.
General Dealer & Butchery	1981	He used generator before 1994 & in 1994 he connected to grid electricity and pays a bill of about P650 monthly.	Deep freezer Display fridge Meat cut. machine Meat scale	2 2 1 1	To keep meat To keep drinks To cut meat To weigh & price the meat
Restaurant and General Dealer	2004	2004	Microwave Meat scale Fresh chips cooker Refrigerator Elect. cash register	1 1 1 4 1	Cooking & warming food Price meat Cooking fresh chips Meat & drinks storage Register cash sale & total cash
General Dealer & Butchery	They started the business in 1991	Connected to grid electricity in 1998 and they were in the groups of 9 members. They use P150 monthly for electricity. RCS	Fridge Meat scale	1 1	Storage and preserve To weigh the meat
Wholesale	Started the business 80yrs back	They used generator before. They connected to grid electricity in 2000.They paid it through HP.	Fridge Deep freezer Electric till	1 2 1	Keep perishable products Storage of meat Register cash sale
General Dealer & Butchery	1975	Connected to electricity in 2003 and they spend P250 monthly. They were in a group of 11 members and shared the cost from BPC equally-RCS.	Fridge Deep freezer Meat scale Electronic till	3 2 1 1	Storage of drinks Storage of meat Weigh and price meat Register cash sale
Co-op multi purpose	Established over 30 years ago	Connected to electricity in 1997 and they pay a bill of about P700 per month	Fridges Deep freezer Electric till T.V Kettle Heater	3 1 2 1 1 1	To keep drinks To keep meat sometimes Register cash sale To entertain customers For making tea To warm up when cold

The majority of the commercial business are combined General dealers and Butcheries, and there are also a stand alone General Dealer, Restaurant combined with General dealer, one wholesale and a Cooperative Multipurpose shop.

Five out of the 6 businesses that are electrified were started before 1994 and only the restaurant and general dealer was established in 2004.

Two businesses connected in 1994 at the time the grid arrived in the village, one in 1997 and the rest in 2000, 2003 and 2004.

The range of equipment used is Refrigeration equipment, meat cutting and weighing/scales, cash register/tills, microwave, fresh chips cooker, televisions, kettle and heaters.

It was difficult to extract turnover of these businesses but there is indication that quantity of stock has increased and some have introduced new products, for instance a general dealer has introduced meat to its products since refrigeration is now available. Some have added drinks that they never used to sell. In a few occasions, time of business operating has been extended otherwise some business previously used generators and time of operation was the same except that their stock was less.

On the positive side, electricity is said to have created more business and modern appliances are in use. On the negative side, electricity has created competition as more shops e.g. are selling meat., Workers have also been reduced in some cases e.g. night watchman who used to guard before electricity came. Electrified shops are believed by thieves to be making more money and hence are a target for thieves.

On meeting government development objective, electricity created employment and income for the employed locals and brought development to the village.

#### *4.2.5 Industrial Sector*

The information sought from the industrial entities was

- When the business started
- When the business started using electricity
- Equipment in use that use electricity
- How electricity has affected the business
- Impact on the village and Government development objectives

There are two industrial businesses identified in Manyana, one for welding and the other for tailoring.

The welding industry started in 1999 and utilizes a transformer, grinder and cut off for the purposes listed in table 4.8.

**Table 4.8 Equipment used for welding that uses electricity in Manyana**

Type of equipment	No	Purpose
Transformer	1	For welding
Grinder	1	To cut and to sharpen material
Cut-off	1	To create corners

This is a business that could not have operated without electricity or generator and there are indications that the welding shop has produced many products including gates and burglar bars. The owner of the welding shop sees, this is a contribution to boosting the local economy in Manyana by producing products for the local market, rather than the village depending on similar products sourced from other locations. Before electricity came, the owner was alone but now employs 4 people. The business operates for 12 hours between Monday and Saturday and is realizing some profit (P600/m=US\$100/m).

The tailoring/sewing business started recently in March of 2006 and uses the equipment in table 4.9 for the purposes indicated. The number of workers is two and profit of P700 (US\$110/m) is being realized.

The business owner sees the contribution to development as providing services locally and being able to employ local people.

**Table 4.9 Equipment used for tailoring/sewing that uses electricity in Manyana**

Type of equipment	No	Purpose
Over locker machine	1	To over lock clothes
Straight machine	1	
Button hole	1	To make button holes
Iron	1	To iron clothes after being finished.

#### *4.2.6 Tribal Offices*

Information sought from the Tribal Office pertained to:

- When the office was electrified
- How electricity is paid for
- Buildings that are electrified
- Services provided
- Staff turnover/retention
- Impact on village and government development objectives

The Tribal Office was electrified in 2000 and Government through the Ministry of Local, Department of Tribal Administration, paid for the connection and allocates votes for payment of bills. Three offices are electrified, that for administration, and the offices of the sub inspector and the typist. The Tribal office has air conditioning equipment. The operating time of the office is 7.30 am to 4.30 pm.

The office believes that it is now providing a higher standard of service since electricity was connected. Apart from air conditioning, the office is able to fax and type cases, letters and minutes of meetings quickly using electrical equipment at the Junior School. Staff in the village are also said to stay for a longer time because their houses are electrified and they have access to services like Internet, radio and television news.

There are now people who work in towns such as Gaborone that live in Manyana because there is electricity.

The respondents from the Office indicated the hope that all tribal offices in the country will be electrified so that a higher level of government service can be provided.

### **4.3 Views of the Village stakeholders**

The views of Manyana residents as presented at the Focus group meeting are presented in Box 4.1 and are related as the participants presented them. The views presented in this focus group were also used to confirm the responses and perspectives provided during the interviews and other consultations.

**Box 4.1 Group Meeting at Manyana  
Impact of Grid Electrification Programme in Manyana  
31<sup>st</sup> August 2006**

The chief of Manyana Mr. Mareko Mosielele when saying his views about grid electricity he said that the electricity brought many changes in their lives. He said the discussion was going to be effective if the representatives from schools, nurses and owner of the businesses would have attended the meeting to tell about what changes electricity has brought on their side, because they are the only ones who know what is happening concerning their sides and the public are very far from them. Mr. Mosielele said that before the introduction of grid electricity they used the solar power electricity, which was very unreliable to them, he said that when it was cloudy or rainy then they had to use candles or paraffin to light at night. Though the electricity was affordable but it was weak more so that they didn't plug as many electric appliances as they wished to use.

Talking about the grid electricity the chief said that they appreciated it because they use it in many things like lighting, cooking and other many electric appliances. He said that before electricity arrived they used firewood for cooking now they have cleared the forest so electricity and gas are the only options left they can use for cooking even though they are very expensive. He said that according to him before electricity was connected the B.P.C company would have come to address the people about the payments that is how they should pay deposit and instalments and how to prevent arrears to be charged because some of the people their electricity had been cut due to lack of knowledge.

Last but not least, he said since the electricity is very expensive and not all people can afford it, it would be better if the charges of connection fee varied according to the classes of their wealth. He also said because of electricity they have access to cell phones in their village so communication is not a problem anymore.

One lady when giving out her views said that electricity is very expensive because mostly in a family you may find that the husband is the only one working. Children are not working and he cannot afford to do all the tasks alone because money is not enough to cover everything that they want. She also said that sometimes-careless mistakes are done by B.P.C whereby they cut electricity where it was not supposed to be cut and leave where it was to cut and this happens because they don't communicate with the customers.

Most of the speakers like the chief said they complained that the electricity is very expensive. They also argued that the connection fees vary because if the pole is far from their house they have to pay for it to be brought near their houses implying a lot of money to do that. But if the neighbour wants to connect he/she just connects to electricity for less money and does not pay for the pole, which they are saying, is very unfair. Otherwise they said that since grid electricity arrived children have improved at school. Also those who connected electricity started to sell ice-pops during summer because they can now keep them in fridges and make money to buy small stuff.

The residents also said that since electricity was connected there are some people who started small businesses like welding and now they have burglar bars in their houses to prevent thieves from getting in their houses and also the external lights are left on at night for security. The other problem is that when it is cloudy, windy or rainy they experience power failure.

The deputy chief Mr. Robert Mangope said according to how he has recognized things is like the connection fees of electricity vary from village to village and wants to know why that is the case. He said that if the electricity was subsidized it was going to make a difference in the lives of Batswana.

## **5.0 LINK BETWEEN ENERGY INTERVENTION AND DEVELOPMENT**

The link between electrification in Manyana and development has been drawn by referring back to the Elaborated Causal Chain (Fig 2.4).

The Assessment Framework (WP5) should be a tool that will assist in designing energy interventions and also evaluate the impacts of such interventions on development. The elaborated causal chain (Fig 2.4) as part of the AF could be the planning stage of the interventions. After an evaluation or a case study has been done, the results can also be used to evaluate what has been achieved by the energy intervention.

The presentation here is to indicate achievements in development that can be attributed to the Rural Electrification in Manyana village in relation to the sectors that are operating in the village.

Table 5.1 summarizes outputs, outcomes, impacts and link to MDGs and national development objectives/policies in the case of the village. These are now derived from the results of the surveys done in the village. In terms of linking impacts to national and international policies, reference is made to the MDGs, Vision 2016 and NDP9 objectives (Annex 6).

**Table 5.1 Confirmed achievements resulting from Grid electrification in Manyana**

Sector	Output-Access	Confirmed Services	Confirmed Outcomes	Confirmed Impacts	Link to MDG or National Policies/Vision 2016 (Refer to Annex 6)
Domestic	35%	<ol style="list-style-type: none"> <li>1. Refrigeration</li> <li>2. Lighting</li> <li>3. Other Electric Appliance use</li> <li>4. Cell phones access</li> </ol>	<ol style="list-style-type: none"> <li>1. Long food life</li> <li>2. Conducive study environment &amp; security</li> <li>3. Entertainment &amp; information. easy burden of H/H chores</li> <li>4. Easy Communication</li> </ol>	<ol style="list-style-type: none"> <li>1. Retention of residents in village (curb rural-urban movement)</li> <li>2. Education facilities &amp; reduced crime</li> <li>3. Exposed to new information, avail productive time</li> <li>4. Improved ICT</li> </ol>	<ol style="list-style-type: none"> <li>1. MDGs 1 to 7</li> <li>2. MDGs 2, 3; V(4)</li> <li>3. MDGs 6, 7; V(1); NDP9(6)</li> </ol>
Education	100%	<ol style="list-style-type: none"> <li>1. Computing &amp; internet facilities: Teaching aids/labs</li> <li>2. HVAC</li> <li>3. Electrified staff housing</li> </ol>	<ol style="list-style-type: none"> <li>1. Improved teaching facilities</li> <li>2. Conducive staff and student environment</li> <li>3. Staff/Teacher retention</li> </ol>	<ol style="list-style-type: none"> <li>1. Quality education</li> <li>2. Curb rural-urban migration</li> </ol>	<ol style="list-style-type: none"> <li>1. MGD2, V(1)</li> <li>2. NDP9(7)</li> </ol>
Health	100%	<ol style="list-style-type: none"> <li>1. Refrigerated medicines</li> <li>2. Communication aids</li> <li>3. Treatment &amp; emergency facilities</li> <li>4. Waste management</li> <li>5. Conducive staff environment</li> </ol>	<ol style="list-style-type: none"> <li>1. New treatment services</li> <li>2. Informed on diseases</li> <li>3. Effective and secure treatment facilities</li> <li>4. Curb disease spread</li> <li>5. Staff retention</li> </ol>	<ol style="list-style-type: none"> <li>1. Improved health system</li> <li>2. Reduced mortality</li> <li>3. Healthy &amp; productive residents</li> <li>4. Curb rural-urban migration</li> </ol>	<ol style="list-style-type: none"> <li>1. MDG</li> <li>2. MDG 4, 5</li> <li>3. NDP9(7)</li> </ol>
Commercial	46%	<ol style="list-style-type: none"> <li>1. Refrigeration-Introduction of new products &amp; Larger stocks of goods</li> <li>2. Other electric Appliance use &amp; lighting</li> </ol>	<ol style="list-style-type: none"> <li>1. Increased volume of sales</li> <li>2. Conducive business environment</li> </ol>	<ol style="list-style-type: none"> <li>1. Increased turnover &amp; profits, and employment</li> <li>2. Staff retention</li> </ol>	<ol style="list-style-type: none"> <li>1. MDG1</li> <li>2. NDP9(1;2;3)</li> <li>3. NDP9(7)</li> </ol>
Industrial	100%	<ol style="list-style-type: none"> <li>1. Motive power</li> </ol>	<ol style="list-style-type: none"> <li>1. Formation of industries</li> </ol>	<ol style="list-style-type: none"> <li>1. Rural development and enterprise building</li> </ol>	<ol style="list-style-type: none"> <li>1. V(2); NDP9(1;2;3;7)</li> </ol>
Government	100%	<ol style="list-style-type: none"> <li>1. Electric Appliance use</li> <li>2. HVAC</li> </ol>	<ol style="list-style-type: none"> <li>3. Speedy delivery of services</li> <li>4. Conducive work environment</li> </ol>	<ol style="list-style-type: none"> <li>1. Efficient public service</li> <li>2. Staff retention</li> </ol>	<ol style="list-style-type: none"> <li>1. NDP9(4,5)</li> <li>2. NDP9(7)</li> </ol>

In evaluating the achievements of an energy intervention it should be realized that outputs and services can be linked to the intervention in a more direct way. Moving towards outcomes and impacts is like comparing the purpose and global objectives in a Logical Framework in the sense that the outcomes and impacts could be a combination of factors beyond the intervention itself. For instance, in the case of Manyana, the schools indicate that yes electricity has allowed them to use advanced teaching aids and equipment but the students are not taking advantage of the available opportunities. The element of culture, attitudes and even teacher's effectiveness could be contributing to the lack of expected impact. This more than emphasizes the need for multisectoral planning of energy interventions so that all the ingredients that will enable required impacts are put in place at the onset of the energy intervention.

Needless to say, the contribution to the global objective is there and it is a matter of the extent of that contribution. It is often not easy to quantify and assign the contribution of one intervention to the global objective e.g. "educated and informed nation". In the same manner, it is legitimate to see the energy intervention, in this case the grid rural electrification as contributing to the national development objectives as stipulated in the Millennium Development Goals, Vision 2016 and NDP9 in the manner they have been treated in Table 5.1.

## **6.CONCLUSIONS AND RECOMMENDATIONS**

### **6.1 Conclusions**

Records show that the RCS intervention has enabled the majority of people in the study village of Manyana to connect to grid electricity. Thus, as an intervention intended to achieve increased access to electricity, it is indeed achieving its objective. What has been presented above are the perceptions among residents and employees in the village of how the situation has changed with the availability of grid electricity. There have been no constraints on the part of respondents in exposing the differences between the baseline (without grid electricity) and intervention (RCS to support connection to grid electricity) scenarios. Rather, the respondents have been able to provide with little doubt as to what has changed.

The collected evidence point to utilization of electricity for a number of end uses; refrigeration in domestic, health and commercial business sectors; use of electric appliances and communication facilities and lighting in the domestic sector, education, health, government and commercial sectors; use of motive power in industry sector. Linked to the utilization of grid electricity are improvements to the quality of life in households, of education facilities in schools, and in treatment facilities in the clinic. Further, evidence also suggests that grid electricity has made caused increased business sales, widened product ranges available in commercial business, and initiation of industrial enterprises in the village.

Additional quantitative information, for example on increased number of patients at the clinic, results changes in schools, business turnover and increased number of graduates emanating from the village as a result of presence of electricity would have added weight to the above evidence. However, such data are difficult and costly to acquire and time consuming to assess.

As indicated in Chapter 5, the links from the intervention to impacts on development and national and international policies are associated with Botswana's Vision 2016 and the current NDP9; and to the MDGs. Seeing that energy is in many cases an input into many activities, these links are indirect and would be strengthened further by increased coordination with other sectors.

### **6.2 Recommendations**

The case study should be used as a lesson on how future energy interventions should be assessed with regard to their impact on development. In that regard the lessons can be incorporated in future energy policies.

The Assessment Framework can be a tool that multi-sector stakeholders can use to plan energy interventions (or any intervention for that matter) and provide an opportunity for the development sector stakeholders to define their anticipated outcomes and impacts that could accrue from the intervention. The sector stakeholders can then position themselves to fulfil their development objectives by putting inputs at the appropriate time. For instance when the grid is being extended into a new village, education, health, industry, commerce can be prepared to

ensure that their development objectives are met, and that there will be cohesion in maximizing the development benefits.

It is therefore imperative to form a multisectoral task group (MTG) that can oversee future energy interventions. This is an issue that was raised at the National First Workshop held September, 2005 and still requires to be addressed. At that same workshop it was proposed that the Department of Energy would mobilise stakeholders to form the MTG and steer its activities.

The Assessment Framework, through similar case studies as this one for RCS/REGE, can be utilized after implementing the energy intervention to measure if the intended development objectives for the sectors have been met.

In order to have a more comprehensive evaluation of impact of REGE on development, the Department of Energy could extend the case study to other villages in the country where the grid has been extended.

Lessons on other types of intervention that the other partner countries are undertaking can also provide lessons that the Department of Energy in Botswana can learn from.

## **6.0 REFERENCES**

1. EECG 1996. PV Rural Electrification Feasibility Study in Manyana, Molepolole and Takatokwane, Botswana. Ministry of Minerals, Energy and Water Resources, Gaborone.
2. EECG 1999 Evaluation of the Rural Electrification Collective Scheme. Department of Energy, Ministry of Minerals Energy and Water Resources. Botswana.
3. Porter, J. 1994. Manyana Pilot Project Evaluation. Ministry of Minerals Energy and Water Resources.

## 7.0 ANNEXES

### Annex 1 List of deliverables for the DEA project

An update of the deliverables is included in Annex 1. A summary of the major elements of delay is presented below.

#### **WP1 Project Management**

The Quality Control procedure which involves reviewing of outputs (deliverables) has not been fully implemented. It is planned to ensure review of key deliverables such as the Literature Review and Catalogue Synthesis Reports. No major changes in WP1 deliverables are expected.

#### **WP2 Literature Review**

As described in 3.1.2 above, the Literature Review has not been completed by the end of the second reporting period. This was due mainly to the changing perception of the project informed by the country stakeholder consultations and increasing awareness of the synergies to be gained by linkage to the M&EED programme. With this new perception, the Literature Review was no longer crucial for the choice of methodology, and preparation for the case study was therefore given higher priority in order to avoid significant delay in this component.

The Literature Review report is expected to be completed by the end of the third 6-month project period in October 2006.

#### **WP3 Catalogue of Energy Interventions**

The analysis of country input, categorization of interventions and reporting (component 3.3) was completed by mid-December 2005. The synthesis report has been circulated among project partners and comments received. Completion of the final report has been delayed because of concentration on preparations for the second project workshop and the case studies. The report is expected to be finalized by the end of July 2006.

#### **WP4 Consultations**

All national workshops were carried out in the period between 1 September and 12 October. Some country inputs (sub-components of 4.2) were delayed, but the synthesis of stakeholder requirements could be prepared on the basis of available input. Most of the remaining country input was delivered by the end of December 2005, with the exception of Zambia whose team experienced delays in some components. The synthesis report on stakeholder requirements (deliverable 4.2.4) was completed in December 2005. It is under review by ECN and will be finalized early in the third reporting period.

#### **WP5 Preliminary Assessment Framework**

Work on the core element of the project, the Preliminary Assessment Framework, was originally planned to start in October following completion of WP2, 3 and 4. Following the discussion presented in 3.1.1 and 3.1.5 above, a decision was made to link the methodological approach on that of the M&EED group. The specific deliverables planned under WP5 must therefore be revised somewhat to take this into account. For example, deliverable 5.1.1 is no longer directly applicable since linkages and indicators are specific to interventions. Each type of energy intervention has own potential linkages, to be described in "assessment templates" being developed in collaboration with M&EED group. The description of the Preliminary Assessment Framework, essentially all of WP5, will be included in the PAF manual report to be completed in parallel with the case studies, WP6.

DEA Report number: Risø 1.3 **26**

#### **WP6 Case Studies**

The Case Studies were originally scheduled to be carried out following the completion of the Preliminary Assessment Framework in WP5. With the adoption of the "M&EED Approach" the methodology was determined and the six partner centres introduced to the procedure during the second reporting period. In particular, as noted above in 3.1.6, the choice of interventions for the case studies were brought forward, due to the case specificity of the methodology. The first delivery for the Work Package, 6.1 "common structure (TOR) for the case studies" was thus prepared during the second reporting period and made ready before the Second Project Workshop scheduled for 5-7 June in Zambia. The practical arrangements for the case studies and their actual execution, deliverables 6.2 and 6.3, are scheduled to follow immediately after

the workshop, with completion by September 2006. No significant delay in completion of WP6, beyond a month or so, is foreseen.

**WP7 Refinement**

This Work Package will commence following completion of WP6. No significant delay in deliverables is anticipated at this stage.

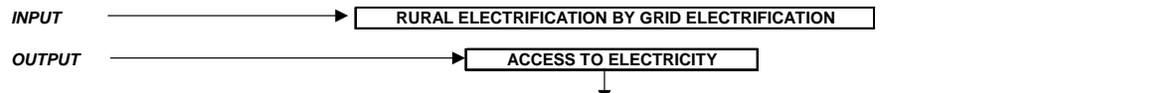
**WP8 Dissemination**

Dissemination material (8.2) based on the results of work packages 2, 3 and 4 is delayed awaiting the completion of the work packages. Likewise the promotion of the project using this and other material is delayed. Nevertheless, through the website and contact to stakeholders at the first National Workshops, awareness of the project has been maintained. Preparation of material 8.2 and targeted dissemination is expected to take place in parallel with WP5 and WP6 so that it can include concrete information on the actual case studies being carried out in the countries. This is likely to attract more interest among the country stakeholders than the somewhat abstract description of the assessment framework. Appropriate dissemination material will be completed for distribution at the Second National Workshops, scheduled for October 2006.

**WP9 Common Dissemination**

Not applicable within the reporting period.

**Annex 2a- Elaborated Causal Chain for sectors**



SECTORS	WATER	HEALTH	EDUCATION	COMMUNICATION	SMEs	DOMESTIC	AGRICULTURE	OTHERs /OTHER PROJECTS
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Energy services	<b>Energy Services</b>							
	Motive power for water pumping	-Lighting	-Lighting	-Lighting	-Lighting	-Lighting	-Lighting (poultry)	availability of soft loans for entrepreneurs
	Refrigeration	Equipment (Lab, PC, TV, Wkshop,	Equipment (PC, Fax, Photocopier, Internet, Cell phone)	Motive Power, Drill, Processing, Welding, Plaining,	Appliances (TV, Radio, Refrigerator, HVAC,	Processing equipment	good inflow of remittances	
	Equipment Use				Equipment	Heating		
	-Heating				Heating	Irrigation/livestock watering		
						Refrigeration		

OUTCOMES	Safe Drinking Water	Improved treatment services (operating equip, radiography, medicines/vaccines,	Improved Quality of education (Teaching aids available,)	Improved Access to information	Increased productivity and product quality	Improved Quality of life (lighting, appliances, reading, proper ventilation, comfort,	increased poultry, Increased quality of chicken production.	Capital for business available for business start-ups
	time savings in fetching water	Low referrals of cases to district hospitals	Teacher attrition reduced	Time savings (no more travel Time and distances to place or receive a call/fax/copies)	Job creation at the rural level	Well ventilated homes	increased yield marketed (increased weight of chicked)	
		Indirectly decongesting district level hospitals	-Student study time increased	Reduced cost of information exchange	Improved income	cooking	reduced post harvest losses (	
		-Better maternal health care				heating		
						less socialising	employment (?)	
						interference with social values		



**Annex 2b: Effect Of The Rural Collective Scheme On Development- An Assessment**

<b>ELEMENTS</b>	<b>WHAT TO MEASURE</b>	<b>INDICATORS</b>	<b>UNIT</b>	<b>SOURCE INFORMATION</b>	<b>OF DATA METHODS</b>	<b>COLLECTION</b>
<b>OUTPUT water</b>	access to electricity for water pumping	# of water electric water pumps and working	number	Utility records/villagers		interview/observation/desk study
<b>OUTPUTS water</b>	access to electricity	Quantity of water pumped	litres per hour	Utility records/villagers		interview/observation/desk study
<b>OUTPUTS health</b>	access to lighting	electrified clinics	number	health posts		Interview
<b>OUTPUTS health</b>	extent of use for lighting	number of lighting points and hours of lighting	number/hours	clinic staff/		interview/observation
<b>OUTPUTS health</b>	access to refrigeration	types and number and size of refrigeration facilities	number/volume	staff		interview/observation
<b>OUTPUTS health</b>	Equipment	types and number	number	staff		interview/observation
<b>OUTPUTS health</b>	heating	types and number	number	staff		interview/observation
<b>OUTPUTS education</b>	access to electricity for lighting	number of schools electrified	nos	staff/pupils		interviews/observation
<b>OUTPUTS education</b>	access to electricity for lighting	number of buildings electrified	nos	staff/pupils		interviews/observation
<b>OUTPUTS education</b>	access to electricity for lighting	times of use	period and hours	staff/pupils		Interviews
<b>OUTPUTS education</b>	access to electricity for Equipment(LAB,PC,TV, WKSHOP)	types and number of electric equipment in schools	nos	staff/pupils		Interviews
<b>OUTPUTS education</b>	access to electricity for Equipment(LAB,PC,TV, WKSHOP)	times of use	period and hours	staff/pupils		Interviews

<b>OUTPUTS COMMUNICATION</b>	Lighting for communication centres	no of electrified centres and time of use	No/hours	centre staff and villagers	Interviews
<b>OUTPUTS COMMUNICATION</b>	Equipment (PC, Fax, Photocopier, Internet, Cell phone)	types and nos of equipment and time of use	No/hours	centre staff and villagers	Interviews
<b>OUTPUTS SME</b>	access to electricity for Lighting	no of SMMEs using the electricity for lighting	No	utility records/SMME owners	interview/desk study
<b>OUTPUTS SME</b>	Motive Power, Drill, Processing, Welding, Planing,	types and numbers of machinery	No	SMME owners	Interview
<b>OUTPUTS DOMESTIC</b>	access to electricity for Lighting	no of households and extent of use	No/hours	utility records/villages	desk study/interviews
<b>OUTPUTS DOMESTIC</b>	Appliances (TV, Radio, Refrigerator, HVAC,	types, extent of use per household	No/hours	utility records/villages	desk study/interviews
<b>OUTPUTS DOMESTIC</b>	Equipment	types, extent of use per household	No/hours	utility records/villages	desk study/interviews
<b>OUTPUTS DOMESTIC</b>	Heating	types, extent of use per household	No/hours	utility records/villages	desk study/interviews
<b>OUTPUTS AGRICULTURE</b>	Lighting (poultry)	no of poultry farms electrified	No	farms records/farm owners	interviews/desk study
<b>OUTPUTS AGRICULTURE</b>	Processing equipment	Type, no and extent of use	No/hours/cons umption	records/users/farm owners	interviews/desk study
<b>OUTPUTS AGRICULTURE</b>	Irrigation/livestock watering	no of electric irrigation systems	No	records/users/farm owners	interviews/desk study
<b>OUTPUTS AGRICULTURE</b>	Refrigeration	type, no and extent of use	No/hours/cons umption	records/users/farm owners	interviews/desk study
<b>OUTCOMES AGRICULTURE</b>	increased poultry, Increased quality of chicken production.	Yield/qty	No/weight	records/users/farm owners	interviews/desk study

<b>OUTCOMES AGRICULTURE</b>	increased yield marketed (increased weight of chicken)	unit qty	Kg/bird	records/users/farm owners	interviews/desk study
<b>OUTCOMES AGRICULTURE</b>	reduced post harvest losses(	improved harvest	tonne/no	records/users/farm owners	interviews/desk study
<b>OUTCOMES AGRICULTURE</b>	employment (?)				
<b>OUTCOMES DOMESTIC</b>	Improved Quality of services(lighting, appliances, reading, proper ventilation, comfort,	availability of services	hours	villagers	interviews/focus groups
<b>OUTCOMES DOMESTIC</b>	less socializing	complains	No	villagers	interviews/focus groups
<b>OUTCOMES DOMESTIC</b>	interference with social values	complains	No	villagers	interviews/focus groups
<b>OUTCOMES SME</b>	Increased productivity and product quality	products per investment	No	records/SMME owners	interview/desk study
<b>OUTCOMES SME</b>	Job creation at the rural level	number of employees of SMMEs	No	records/SMME owners	interview/desk study
<b>OUTCOMES SME</b>	Improved income	turnover	Cedis/Pulla	records/SMME owners	interview/desk study
<b>OUTCOMES COMMUNICATION</b>	Improved Access to information	no of users	No	centre staff and villagers/records	interviews/desk study/focus group
<b>OUTCOMES COMMUNICATION</b>	cost savings(no more travel Time and distances to place or receive a call/fax/copies)	cost of transportation to previous nearest centre	Cedis	centre staff and villagers/records	interviews/desk study/focus group
<b>OUTCOMES education</b>	Improved Quality of education (Teaching aids available,)	results of pupils	grades	records/staff/pupils/villagers	interviews/desk study/focus group
<b>OUTCOMES education</b>	Teacher attrition reduced	number at post	No	records/staff/pupils/villagers	interviews/desk study/focus group
<b>OUTCOMES education</b>	Teacher attrition reduced	qualification and experience	No	records/staff/pupils/villagers	interviews/desk study/focus group

<b>OUTCOMES education</b>	Teacher attrition reduced	staff turnover	No per year	records/staff/pupils/villagers	interviews/desk study/focus group
<b>OUTCOMES education</b>	Student study time increased	availability of study areas	No of hours	staff/pupils/villagers	interviews/desk study/focus group
<b>OUTCOMES health</b>	Types of treatment services	no of different services	No	staff/villagers	interviews/observation/focus groups
<b>OUTCOMES health</b>	Improved treatment services (operating equip, radiography, medicines/vaccines,	Types and number	No	staff/villagers	Interviews
<b>OUTCOMES health</b>	Low referrals of cases to district hospitals	number of referred patients	No	staff/villagers	Interviews
<b>OUTCOMES health</b>	Better health care	number of incidences	No	records/staff/villagers	interview/desk study/focus group
<b>OUTCOMES water</b>	Safe Drinking Water	Quality of water	proportion of pollutants	Utility records/villagers/Research institutions' records	interview/desk study
<b>OUTCOMES water</b>	time savings in fetching water	time to get water	hours	villagers	Interview
<b>IMPACTS water</b>	low level of water borne diseases	incidence of water borne diseases	number of patients	health records/villagers	post-interview/observation/desk study
<b>IMPACTS health</b>	Healthy village population	number of patients per period (year)	No	records/staff/villagers	interview/desk study/focus group
<b>IMPACTS health</b>	reduced mortality rates (maternal and infant)	number of deaths	No	records/staff/villagers	interview/desk study/focus group
<b>IMPACTS education</b>	improved literacy	education level of population	No	records/staff/villagers	interviews/focus groups
<b>IMPACTS COMMUNICATION</b>	Families separated by distance linked up	no of families who use the facility	No	records/staff and villagers	interviews/desk study/focus group
<b>IMPACTS COMMUNICATION</b>	Bridging of the Digital-Divide	access per population	No	records/staff and villagers	interviews/desk study/focus group

<b>IMPACTS COMMUNICATION</b>	increased e-commerce	no of people who use the facility	no	records/staff and villagers	interviews/desk study/focus group
<b>IMPACTS SME</b>	increased Economic activity in rural communities	no of SMMEs after electrified	no	utility records/SMME owners	interview/desk study/focus group
<b>IMPACTS SME</b>	Employment creation for rural communities	proportion of SMME employees	percentage	village authorities/SMME owners	interview/desk study/focus group
<b>IMPACTS DOMESTIC</b>	improved quality of life	perception	proportion	villagers	interviews/focus groups
<b>IMPACTS DOMESTIC</b>	increased awareness of knowledge on constitution	perception	proportion	villagers	interviews/focus groups
<b>IMPACTS AGRICULTURE</b>	improved agricultural production	perception	no	villagers	interviews/focus group
<b>IMPACTS AGRICULTURE</b>	improved quality of products and improved nutrition	perception	no	villagers	interviews/focus group
<b>IMPACTS AGRICULTURE</b>	reduced processing time	perception	no	villagers	interviews/focus group

## **Annex 3 Sector Questionnaires**

### *Annex 3.1 Domestic Sector*

**Development and energy in Africa**  
**Botswana case Study- Manyana Village**  
**Effect of rural electrification scheme on development in Botswana**  
**7<sup>th</sup> –11<sup>th</sup> August, 2006**

\*\*\*\*GENERAL. SEE IF YOU CAN GET TOTAL NUMBER OF CONNECTED HOUSEHOLDS THROUGH GROUP LEADERS- ASK MMA LM TEBOGO.

\*\*\*ASK HOUSEHOLD HEAD AND ANY OTHER MEMBERS THAT MAY BE THERE\*\*\*

a) **Interview 10 electrified households**

- When electrified
- How electrified- did they use Rural Collective Scheme or paid themselves
- The electric equipment/appliances they have and what facilities do they as a result of connecting to electricity.
- How long they use these equipment/appliances and what is the effect.
- What is their monthly expenditure on electricity on average
- What has electricity done to their lives as individual households since connection?- Balance if they also have both positive and negative effects
- What has electricity done to their village
- Which of government development objectives do you think are being met by this provision of electricity to your village?

b) **10 electrified with Dish for communications- households**

- When electrified?
- How electrified- did they use Rural Collective Scheme or paid themselves
- The electric equipment/appliances they have and what facilities do they as a result of connecting to electricity.
- How long they use these equipment/appliances and what is the effect.
- What is their monthly expenditure on electricity on average
- What has electricity done to their lives as individual households since connection?- Balance if they also have both positive and negative effects
- Refer to the communications they receive through the dish- can they say how electricity has affected their lives through this communication facility.
- What has electricity done to their village
- Which of government development objectives do you think are being met by this provision of electricity to your village?

c) **10 un-electrified households**

- What is their monthly expenditure on energy sources- paraffin etc
- How has electricity affected lives in the village?- Balance if they also have both positive and negative effects
- Do they see any effects indirectly e.g. through school or clinic facilities
- Which of government development objectives do you think are being met by this provision of electricity to your village?
- What is their constraint to connection
- How can their situation be helped

Annex 3.2 Education (Schools)

**Development and energy in Africa**  
**Botswana case Study- Manyana Village**  
**Effect of rural electrification scheme on development in Botswana**  
**7<sup>th</sup> –11<sup>th</sup> August, 2006**

\*\*\*\*\*ASK EACH OF THE TWO SCHOOLS; headmaster, 5 pupils e.g. at break time; 5 teachers at break time or lunch

- When electrified
  
- How paid for electricity
  
- Buildings in each school electrified

Type	Number	Time of use per day (hours)

- Electric equipment school acquired as a result of electricity being available

Type	Number	Purpose

- Check on Availability of study facilities and time of use, attendance by those who are to use the facilities. Do they take advantage of the facilities?
  
- How has electricity affected results of students/pupils

\*\*\*ASK FOR RESULTS BEFORE ELECTRICITY AND AFTER ELECTRICITY E.G. FOR STD SEVEN\*\*\*

- How has electricity affected retention of ADEQUATE and QUALIFIED staff
  
- How has electricity affected education in the village
  
- How do Schools see this effect as a contribution to meeting Government objectives in Education?

*Annex 3.3 Health (Clinic)*

**Development and energy in Africa**  
**Botswana case Study- Manyana Village**  
**Effect of rural electrification scheme on development in Botswana**  
**7<sup>th</sup> –11<sup>th</sup> August, 2006**

\*\* ASK MATRON, NURSES AND 5 TO 10 PATIENTS\*\*\*\*

- When electrified
- How paid for electricity
- Buildings in each clinic electrified

Type	Number	Time of use per day (hours)

- Electric equipment clinic acquired as a result of electricity being available

Type	Number	Purpose

- No of patients treated per month on average and is the number increasing or decreasing since electricity arrived?
- How has electricity affected quality of treatment provided to patients ion the village
- Mention types of treatment that now the clinic offers that was not possible before electricity came
- How has electricity affected retention of ADEQUATE and QUALIFIED staff
- How has electricity affected general health situation in the village
- How does the clinic now able to contribute to meeting Government objectives in Health sector in general?

*Annex 3.4 Commercial Sector*

**Development and energy in Africa**  
**Botswana case Study- Manyana Village**  
**Effect of rural electrification scheme on development in Botswana**  
**7<sup>th</sup> –11<sup>th</sup> August, 2006**

\*\*\*\*\*SAMPLE THE 12 ELECTRIFIED BUSINESSES-maybe half of them\*\*\*\*\*

1. Restaurant
2. Bottle store
3. General dealer
4. Butcher shop
5. Other

\*\*ASK OWNER AND WORKERS\*\*\*\*\*

- When started the business
- When started using electricity for the business
- What equipment has been acquired that could be used only with electricity

Type	Number	Purpose/use

- How has electricity affected your business?

Item	After electricity	Before electricity
No. of products sold		
No. Of workers		
Turnover of company in Pula		
Customer satisfaction		
Time of business operation		
Other		

- How has electricity affected the village
- How do you see your situation as contributing to Government development objectives

*Annex 3.5 Industrial Sector*

**Development and energy in Africa**  
**Botswana case Study- Manyana Village**  
**Effect of rural electrification scheme on development in Botswana**  
**7<sup>th</sup> –11<sup>th</sup> August, 2006**

b) Sewing shop

c) Welding shop

\*\*\*\*ARE THERE ANY OTHER SUCH BUSINESSES IN THE VILLAGE OR ABOUT TO START

\*\*ASK OWNER AND WORKERS\*\*\*\*

- When started the business
- When started using electricity for the business
- What equipment has been acquired that could be used only with electricity

Type	Number	Purpose/use

- How has electricity affected your business?

Item	After electricity	Before electricity
Productivity- e.g. no of products produced per month		
No. of workers		
Turnover of company in Pula		
Customer satisfaction		
Time of business operation		
Other		

- How has electricity affected the village
- How do you see your situation as contributing to Government development objectives

*Annex 3.6 Government Institutions*

**Development and energy in Africa**  
**Botswana case Study- Manyana Village**  
**Effect of rural electrification scheme on development in Botswana**  
**7<sup>th</sup> –11<sup>th</sup> August, 2006**

Other Government Office-MENTION-----

\*\*\*\*\*ASK IN CHARGE AND OTHER EMPLOYEES\*\*\*\*\*

- When electrified
- How paid for electricity
- Buildings in premise electrified

Type	Number	Time of use per day (hours)

- Electric equipment by Tribal Office acquired as a result of electricity being available

Type	Number	Purpose

- How has electricity affected quality of service provided to villagers and other government responsibilities
- Mention types of services that can now be achieved that were not possible before electricity came
- How has electricity affected retention of ADEQUATE and QUALIFIED staff
- How has electricity affected general situation in the village
- How does the Office now able to contribute to meeting Government objectives in Public sector in general?

**Development and energy in Africa**  
**Botswana case Study- Manyana Village**  
**Effect of rural electrification scheme on development in Botswana**  
**7<sup>th</sup> –11<sup>th</sup> August, 2006**

\*\* ASK KGOSI AND OTHER EMPLOYEES\*\*

- When electrified
- How paid for electricity
- Buildings in premise electrified

Type	Number	Time of use per day (hours)

- Electric equipment by Tribal Office acquired as a result of electricity being available

Type	Number	Purpose

- How has electricity affected quality of service provided to villagers and other government responsibilities
- Mention types of services that can now be achieved that were not possible before electricity came
- How has electricity affected retention of ADEQUATE and QUALIFIED staff
- How has electricity affected general situation in the village
- How does the Tribal Office now able to contribute to meeting Government objectives in Public sector in general?

## **Annex 4- Presentation at the Focus Group at Manyana**

DEVELOPMENT AND ENERGY IN AFRICA

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BOTSWANA CASE STUDY

IMPACT OF GRID RURAL ELECTRIFICATION PROGRAMME IN MANYANA

Our names

We are here in connection with the DEA Project that is intended to assess impact of energy interventions in six African countries including Botswana. The project started 2005 and will finish in 2007.

The Project is funded by EU and is coordinated by Danish and Dutch organizations.

The Department of Energy is aware of this project and has given it their support. Doe has officiated at previous workshop.

In the last weeks we have been here to interview households, schools, clinic, commercial and industrial businesses on how they see as the changes brought to the village by grid electricity.

This kgotla meeting is intended to hear your views on the following.

- What has electricity done to your lives as residents of Manyana?- Balance if they also have both positive and negative effects
- What has electricity done to their village
- Which of government development objectives do you think are being met by this provision of electricity to your village?

Balance across sectors

1. Education
2. Health
3. Business
4. Homes
5. Govt Offices/Kgotla included
6. Other

The output of this exercise will be a report to be discussed at a stakeholder workshop in Gaborone on the 30-31<sup>st</sup> October, 2006. It is hoped that the findings will help Government to design better energy interventions that can impact positively on development in all the sectors. We will make a copy available to the VDC/Kgotla when it is finalized. We will also appreciate representation at the workshop.

**I WILL NOW OPEN THE DISCUSSION FOR YOU TO SAY YOUR VIEWS ON THE PROJECT**

### Annex 5. Excel Results of the Sector Responses to the Interviews

**DEVELOPMENT AND ENERGY IN AFRICA  
EFFECT OF ELECTRIFICATION SCHEME ON DEVELOPMENT IN BOTSWANA  
DOMESTIC UNELECTRIFIED**

	NAME OF INTERVIEWEE	CONTACT NO:	MONTHLY EXPENDITURE ON ENERGY SOURCES- PARAFFIN	HOW HAS ELECTRICITY AFFECTED LIVES IN THE VILLAGE? POSITIVE AND NEGATIVE EFFECTS	DO THEY SEE ANY EFFECTS INDIRECTLY E.G THROUGH SCHOOL OR CLINICAL FACILITIES	WHICH GOVERNMENT DEVELOPMENT OBJECTIVES DO YOU THINK ARE BEING MET BY THIS PROVISION OF ELECTRICITY TO YOUR VILLAGE?	WHAT IS THEIR CONSTRAINT TO CONNECT?	HOW CAN THEIR SITUATION BE HELPED?
1	Dikeledi Macha	727731109	3 litres paraffin P13.5	There is difference between the rich and the poor families.	Our children in the village are using classroom for evening studies and there is improvement in their results. Shortage of medicines that they used experience before electricity has now come to an end because they keep medicines in fridges because of availability electricity.	None	I am are not working so we cannot afford to pay connection fees	They wish government can create job opportunities in their village also they wish that the government could help them with connection fees and they can manage to buy cards since it's a prepaid for usage.
					We are the electricity at the clinic unlike before they were using gas to operate the fridge which sometimes finished			
2	Mr. Kgokgotso Macha		10 litres paraffin 45	They have more commercial businesses	The electricity did not bring any differences in the village because when go to the clinic you wont even	Doesn't know	He does not have enough money to connect electricity	He doesn't see any way he can be helped because the government cannot do everything to the

							because it is very expensive	public.
					get medicines but first they told them that before electricity they used to keep medicines in areas surrounding them like Thamaga and Ramotswa that is why medicines were not available.			
Goitseone 3Mangope	728623351	5 litres paraffin P22.50 and a pack of candles	Positive impact- Workers like teachers and other government employees do not have any problem of staying in their village because electricity is connected so their life style is just the same as those living in towns. Also they use the external lights as security at night.	Evening studies for children at the school.				
			Our village beautiful during the night for those who electricity light on the outer lights for security purpose.	Evening studies for our kids at the school. Most of the patients are given medications locally rather than going to other villages for health facilities e.g. they have maternity ward in Manyana.	None, I wish our government can build industrial site/mall and other government institutions in our village.	Lack of money	Unlike school fees are paid for destitute students, government should follow the same procedure to help the villagers to connect electricity. Government must make a survey to assess our life style so that those who are	

								poor can be helped.
4	Mrs. Pauline N Keeled		Paraffin 4.50 and we also use candles since they are cheaper than paraffin though they are risky to children because they can burn the houses.	Those who have electricity are the one who benefits e.g. they can use electrical appliances which are quick to use.	They are happy because their children attend evening studies and also the clinic have electrical equipments, which are used to save lives of people.	None	I am a destitute	I wish our government could help those who cannot afford to pay connection fee by reducing the prices.
5	Seganeleng Kgaodi		Paraffin P60 and 2 packets of candles costing P12.50	Those who connected electricity started small businesses like selling ice-pops, which help them to buy small groceries or even to buy electricity itself. Negatively-televisions and VCRs attracts thieves to steal their electrical equipments because they can make a lot of money when they sell them.	Since electricity is connected if they have patient they can take him/her to the clinic at night.	None	Lack of money	If there was no corruption at head offices of Botswana Youth Council ,their children could have started their own businesses and they were going to connect electricity for their parents. She said that only youth who are living in towns and neighbouring village are the only ones who benefit from B.Y.C and they forget about other rural areas.
6	Mrs. Abana Keogotsitse	72729969	Paraffin 94.50	We have university graduates because our	We attend clinic in the evenings nowadays because the clinical staff stay locally unlike before they were staying at Moshupa and Thamaga.	I am not working		They wish BPC can do the same as SHHA because SHHA helps people with money

			children uses modern technologies e.g. computers				and later people pay back that money in the long run.
			They (children) have time to read unlike the situation before they is no paraffin .				
7	Mosadinyana Nkedile	P67.50 paraffin	The village is not dark at night because those who have it they light the external lights and also Mascom and Orange aerials are connected in their village hence good communication by cell-phones.	We can go to the clinic in the evenings unlike the time there was no electricity in the village.	We have good communication because we are using cell phones.	We do not have money and we are not working.	We wish our government can create employment so that we can all afford to connect electricity.
8	Kutlo Motshwiri	P20 Paraffin ,19kg gas which cost P250and a load of fire- wood	Positively- television are entertaining teenagers, this keep them busy from stealing. At school especially junior school students have access to computers and keep them advanced in their		Because of electricity there are establishment of businesses like they now have a tailor shop where they can alter their clothes.	I have financial problems	No how

			studies. Negatively the rate of theft have increased because electrical appliances attracts the thieves.				
9	Lesenyo Shwai		P108 for 24 litres of paraffin for lighting and cooking	Negatively There is the difference between the rich and the poor. Positively the government benefit on the government facilities like health, education and services from the kgotla.	They have graduates from universities in their village	none	I am not working children are the ones who are working and they earn less wages. I am getting an old pension scheme.  We wish our government can increase old pension scheme to P500 so that we can manage have basic needs.
10	Gareitsanye Mangope	72252876	P44 Paraffin	Our shops are electrified we shop around things that are kept in fridge e.g. meat and drinks	None	I am happy because our children uses modern technology e.g. computers which improves their education.	I am not working  I suggest that if the price can be reduced we can all manage to pay for electricity.

**DEVELOPMENT AND ENERGY IN AFRICA**  
**EFFECT OF ELECTRIFICATION SCHEME ON DEVELOPMENT IN BOTSWANA**  
**DOMECTIC ELECTRIFIED**

	NAME OF INTERVIEWEE	CONTACT NO:	WHEN ELECTRIFIED	HOW ELECTRIFIED	WHAT ELECTRIC EQUIPMENT DO THEY HAVE ,TIME OF USE AND ITS EFFECT	MONTHLY EXPENDITUR E (AVERAGE)	WHAT HAS ELECTRICITY DONE TO THEIR LIVES INDIVIDUAL HOUSEHOLDS SINCES CONNECTION ?POSITIVE AND NEGATIVE EFFECTS	WHAT HAS ELECTRICITY DONE TO THIER VILLAGE	WHICH OF GOVERNMENT OBJECTIVES DO YOU THINK ARE BEIGN MET BY THIS PROVISION OF ELECTRICITY TO YOUR VILLAGE?
1	Olaotse Ramhago	72476449	2001	Rural collective scheme	Television, Radio, Fridge and a computer	P200	Improved our lives tremendously, even though during rainy season we experience power failure (cut).	It is no longer dark at night in the village because of external lights that are switched on at night.	doesn't know
2	Mr. Pasela Macha	72133706	2004	individually	We use fridge for storing and preserving food for a longer period, we switch it on for the whole day (24hrs)T.V for watching news-3hrs and two-burner hot plate for cooking-3hrs.	P100	It is faster to use electrical appliances than other energy sources like paraffin e.g. for cooking.	Our village is developing we have electrified businesses, schools, clinic and kgotla	There is improvement in the education and health sector because they are all electrified ,we hope that by 2016 we will be an educated and healthy nation because at our schools students are taught computers and at the clinic we

									have electrical appliances e.g. fridges for medicines.
3	Ms I. Sethibe		2005	Individually	I have a television, which I watch news on for 2hrs, a day and kettle for making tea only an hour a day. Fridge is always on (24hrs)because I have a tuck shop. And lastly iron is used for an hour especially after washing clothes.	P100	We live a better and a cheaper life ever since we connected electricity because we can keep food for a longer period and we listen to radio and television news since it is cheap.	Positively There is easy communication because of the use of cellular phones and also they use external lights as security. We also have a well-equipped clinic, which provides us with satisfactory service.	None
4	Mrs Mariam Mokokwe	72261067	2000	individually	Television for local and international news for 2hrs a day, fridge is always on (24hrs) to preserve food. Kettle for making hot water, an hour in a day.	P50	We store food for a longer period of time's he household duties are quicker because of electrical equipment e.g. cooking and cleaning carpets they use vacuum cleaner.	We are developing because there are new businesses being established e.g. shops, welding shop, tailor shop and our government institution are electrified e.g. kgotla.	Provision of computers at our junior and primary school will also improve the education of our children hence educated nation, which will provide quality developments in our village.
5	Thandiwe Sethono	5930335	1997	Rural collective scheme	I have a television, which I switch it on from	P60	Positively-They are happy because they can	We have businesses like butcheries, general dealers that operates for	We have many development like our primary,

					6a.m to 9p.m watching stories ,news and music. Radio is switch on from 8am-8pm.Fridge is always on to preserve food. Kettle is used for boiling water normally an hour is enough.		now store food for a longer time in the fridge. We are also producing university graduates because students use electricity to study at home.	a longer period unlike that time when there was no electricity in the village.	junior and kgotla are electrified hence provision of good service.
6	Ms Tiro	5930311	2001	Individually	Fridge for cold water and food preservation, it operates for the whole day (24hrs).Stove for cooking, I use it for 5hrs daily. Microwave for cooking and warming food 2hrs a day, geyser for hot bath water it is kept on for the whole day in winter. Iron and kettle are used an hour in a day.	P100	Positively-Children study at home and negatively electrical equipments attract thieves.	People have courage to start small business e.g. tuck shops and Mascom public phone since electricity was connected.	
7	Mr. T.K.Mokokwe	72757812	2003	Individually	Radio is on most the time especially in the evening, fridge is always on in	P30-P40	Positive impact-Keeps kids home watching the television, external lights are left on at	Good communication because there are Orange and Mascom transmitters	Computers are installed at our junior school.

					summer because food get rotten easily and switched off in winter when very cold.		night to prevent thieves from attacking them. Negatively electrical faults may cause the houses to burn hence loss of properties and people's lives. Children do not perform well at school because they spend more time watching T.V	
8	Mrs Lapologang Kgaswane	72147351	1999	Individually	Fridge-24hrs, T.V-3hrs, Iron seldom, radio and vacuum cleaner-4hrs	P100	Positively-Easy to clean because we are using vacuum cleaner and lightens the work because more effort is not needed and children can study at home. Negatively electrical light affect eyes especially when reading.	Electricity is connected to what has existed e.g. all government institution that are local
9	Ms Gloria Kalanke		2004	Individually	I have a fridge that keeps water cold and other foods that needs to be stored in cool places for 24hrs. Watch T.V	P50	Positively External lights are used as security and negatively electrical appliances attract thieves.	

					for news and entertainment 7hrs daily. kettle for hot water 3hrs and iron 4hrs			
10	Boitumelo Madiba	72216963	2006	Individual	I have a fridge that operates eleven days after month end because when they got nothing to put in they switch it off, this help them to conserve electricity since it's expensive.	P60	I think that electricity is safe compared other fuels e.g. candles and paraffin and also they can study properly without being crowded in one table unlike when using other fuels.	Cellular phones now are available ,they can communicate with people from far without going to tribal office to ask for help especially when someone is sick or has passed away .In times of death the can call mortuary car to come and pick the corpse from home

**BOTSWANA CASE STUDY-MANYANA VILLAGE  
DOMESTIC(ELECTRIFIED WTH DISH)**

NO	NAME OF INTERVIEWEE	CONTACTS	WHEN ELECTRICIFIED	HOW ELECTRIFIED	ELECTRICAL EQUIPMENT/APPLIANCES THEY HAVE	TIME/LENGTH OF USAGE	WHAT ARE THE EFFECTS OF THE NAMED EQUIPMENTS	MONTHLY EXPENDITURE	WHAT HAS ELCTRICITY DONE TO THEIR LIVES AS INDIVIDUAL HOUSEHOLD (POSITIVE/NEGATIVE)	HOW HAS ELECTRICITY EFFECTED THEIR LIVES THROUGH THIS COMMUNICATION (DISH)	WHAT HAS ELECTRICITY DONE TO THEIR VILLAGE	WHICH GOVERNMENT OBJECTIVES ARE BEING MET BY THIS PROVISION OF ELECTRICTY TO YOUR VILLAGE
1	Thato Setlhabi		2004	Individualy	1 Computer	7a.m-8p.m	Access to internet	P300	They can now listen to radio and T.V all the time unless there is power failure. They preserve food in fridge for a longer period of time and electrical appliances are quicker. Negatively people steal electrical appliances and sell them for less prices.	They have access to more T.V channels and also clear T.V.	Their village is developing in the sense that schools, clinics, kgotla and businesses are electrified.	Provision of electricity in their village will meet the government development objectives e.g. vision 2016 because they are using modern technology at their homes, clinics and schools.
					1Microvawe	3hrs daily	cooking and warming					

							food					
					1 Stove	5hrs	for cooking lunch and supper					
					television	7a.m-10p.m	Watching news, films, music and sport news					
					fridge	the whole day (24hrs)	preserving and storing food					
2	Mma Senti	72984595	2004	Individual	shing machine	difficult to measure time	easy to do the family washing	P100	Positively- electric appliances make work easy and possible, children study well without being crowded in one table and they have access to computers. External lights are used as security because thieves can be identified in lights. Cell phones are used for easy communication because of electricity. The bad part of Mascom network is that when there is no electricity they experience network problems.	They have access to more T.V channels and also clear T.V.	More butcheries are open now the availability of meat satisfy them.	Nothing at the moment but if more offices of govt. are to be open more people will get jobs and solve the problem of unemployment and poverty. A proper Post office with all the services needed and a

												police station.
					T.V		watch news & entertainment					
					Computer		children do their assignments					
					Fridge	24hrs	storage of food					
					Iron & kettle		to iron clothes and for making tea					
					Stove	seldom	cooking when gas is finished					
	Monnusi 3 Molefe	5930359	2002	Was in a group		24hrs	to keep perishable foods in and others which needs to be kept in cool temperatures.	P100	The electrical appliances are very useful to them the lights make the house bright. Negatively-children learn bad things from TVs and they take more time watching T.V than doing their studies.		Those who have electricity at their businesses benefit a lot because they close late and this increase the sales.	nothing
						2hrs weekly	to iron clothes					
						6hrs daily	listening to news other useful information					

						10hrs daily	watch news and entertainment					
	Mrs Boitumelo Kgawane	5930552/72155708	2005	Individual	Fridge	24hrs		P40	We can light ,store and preserve food for a longer time in the fridge, my children learn a lot of useful things on television and radio programmes which help her children with their studies.		They are not happy with village elders their councillors, VDC because are not active in bring development s in their village.	primary and junior and clinic are electrified.
					Television	9hrs					There are Mascom and orange aerials	
					Kettle	2hrs						
					Iron	1hrs						
	Ms Keneilwe Tlhabologa		2003		Television	8hrs	Preserving and storing food	150	Quicker to use the electrical appliances	They have access to more T.V channels and also clear T.V.	There is little changes in the village because all government institution are electrified and other families around.	
									No effort needed			

ng												
					Fridge	24hrs	Watching news and stories		There are not time consuming			
					Iron	2hrs	Press clothes					
					Kettle	4hrs	Hot water					
					Radio	10hrs	radio news and other programmes					
	Gorata 6 Setsiba		2004	Individual	Fridge	24hrs	keeping food for a long period of time	60	they keep food for a longer period of time in the fridges.	Access to more channels.	We have business like butchers and general dealer	None
					Iron	3hrs	ironing clothes					
					Radio	10hrs	listening to radio news and music					
					T.V	9hrs	watching news and sport news					
	7 T.Molefe		1999	Individual	Stove	5hrs daily	For cooking	P250	You need less effort when using electrical appliances like washing machine and they are faster. Negatively - for someone to operate electrical equipment she/he needs to have knowledge because they are risky.	They have access to more T.V channels and also clear T.V.	Small businesses are established because of electricity and this satisfy their needs.	None
					Fridge	24hrs	preserving					

							and storing food				
					Television and a decoder	10hrs	for watching news, sport, music and soapies.				
					Geyser	24hrs	for hot water				
					Washing machine	5hrs daily	for washing clothes				
8 S.Phale		2006y	Individual	T.V	8hrs	watching news and entertainment	P125.	it is very faster to use electrical appliances	They have access to more T.V channels and also clear T.V.	Because of electricity they think that they are developing when they compare their life before electricity, whereby they had to travel to other neighbouring villages looking for services like internet.	none
				Radio	6hrs	news and music					
				Kettle	3hrs	hot water					
				Iron		to iron					

						clothes						
9	G.Masole		2002	Individual	Iron	5hrs after washing	to iron clothes		it is very faster to use electrical appliances	He has a strong feeling that by 2016 they will be productive, educated and healthy nation, because the service provided by the govt. after electricity is been connected they are satisfying.		None
					Kettle	2hrs daily	hot water					
					Microwave	2hrs daily	to warm food					
					T.V	7-9hrs daily	news watching and entertainment					
10	Mrs K.Tlhobolo		2006	Individual	Computer	13hrs	internet	P200	They are living in an advanced life because they have access to internet & television news and they are up to date to what is happening around the world.	They have access to many television channels around the world and it is also clear	Establishment of small businesses like welding and tailor shops.	None

										compared to when there was no dish connected.		
					Microwave	3hrs	cooking and warming food					
					Stove	5hrs	preparing breakfast, lunch and supper					
					T.V	15hrs	watching news, films, music and sport news.					

COMMERCIAL BUSINESSES

					WHAT EQUIPMENT HAS BEEN ACQUIRED THAT COULD BE USED ONLY WITH ELECTRICITY			HOW HAS ELECTRICITY AFFECTED YOUR BUSINESS				
NAME OF INTERVIEWEE	TEL	TYPE OF BUSINESS	WHEN STARTED THE BUSINESS	WHEN STARTED USING ELECTRICITY AT THE BUSINESS AND HOW PAID	TYPE	NUMBER	PURPOSE/USE	ITEM	AFTER ELECTRICITY	BEFORE ELECTRICITY	HOW HAS ELECTRICITY AFFECTED THE VILLAGE	HOW DO YOU SEE YOUR SITUATION AS CONTRIBUTING TO GOVERNMENT DEVELOPMENT OBJECTIVES
1 Itumeleng Ntloedile	72612140	General Dealer	1994	They connected electricity in 1994, which is a prepaid, and roughly they use P200. per month.	Deep freezer	2	to keep meat	NO. OF PRODU CTS SOLD	Grocery, drinks & meat	Grocery	Electricity created more businesses like those who have connected in their homes opened salons because they can use hair dryers. Because of electricity Mascom and orange have installed their aerials for network in their village hence good communication with other people.	Electricity created employment to the people in their village.
					Display fridge	1	to keep drinks,	NO.OF WORKE	2	2		

							margarine, polonies and Russian sausages	RS				
								TURNOVER OF COMPANY IN PULA	They normally do Big 11 special to increase the sales every month			
								CUSTOMER SATISFACTION	satisfied			
								TIME OF BUSINESS OPERATION	7.30am-7.30pm winter & summer 6.30am-8.30pm	7.30am-7.30pm winter & summer 6.30am-8.30pm.		
								OTHER				
2	Mr. J.Letlole	72173 292	General Dealer & Butchery	1981	P650	Deep freezer	to keep meat	NO. OF PRODUCTS SOLD	increase stock like drinks and meat	kept less meat in fridges because he was conserving fuel of generator		

				monthly.							
					Display fridge	2	to keep drinks	NO.OF WORKE RS	2	5	
					Meat cutting machine	1	to cut meat	TURNOV ER OF COMPA NY IN PULA			
					Meat scale	1	to weigh & price the meat	CUSTO MER SATISFA CTION	satisfied	satisfied	
								TIME OF BUSINE SS OPERAT ION	0800hrs- 1930hrs	0800hrs- 1930hrs	
								OTHER			
								N.B he reduced the no: of workers after electricity because those people who used to watch at night are no longer working because of the			

								external lights in the village. Electric equipment makes work easier.				
								Also due to unstable economy it forced him to reduce no: of workers to 2 because vat was introduced and it affected his business very badly.				
								NO. OF PRODUCTS SOLD	consumable		Modern machinery available for use by the businesses and also schools and clinics benefit the villages more.	Employed locals and bring development to the rural areas.

3	L.M.T	72227 387	Restaura nt and General Dealer	2004	2004	Microwav e	1	cooking & warming food	NO.OF WORKE RS	3		
						Meat scale	1	price meat	TURNOV ER OF COMPA NY IN PULA			
						Fresh chips cooker	1	cooking fresh chips	CUSTO MER SATISFA CTION	70%		
						Refrigera tor	4	meat & drinks storage	TIME OF BUSINE SS OPERAT ION	0600hs- 2300hrs		
						Electroni c cash register	1	register cash sale & total cash	OTHER			
4	Mmeisi Sethibe	72552 880	General Dealer & Butchery	They started the business in 1991	Connected grid electricity in 1998 and they were in the groups of 9 members. They use P150 monthly for electricity.	Fridge	1	storage and preserve	NO. OF PRODU CTS SOLD	Many drinks	Never sold drinks	
						Meat scale	1	to weigh the meat	NO.OF WORKE	1	1	

								RS				
								TURN OVER OF COMPA NY IN PULA	Never keep records	Never kept records		
								CUSTO MER SATISFA CTION				
								TIME OF BUSINE SS OPERAT ION	6.30am- 7.30pm in summer	6.30am- 7.30pm in summer		
								OTHER				
								N.B The business is run by the family members so there is no need to hire more employe es. Also since the business is next to the house they open earlier in summer			Since there is electricity there is competition of businesses especially the sale of meat and this affect the turnover of the business at the end of the year.	

								like 6.30am- 7.30pm and in winter 8.00am- 6.30pm.				
5	Ireen Modise	72597 756e	Wholesale	Started the business 80yrs back	They used generator before they connected electricity in 2000.They paid it themselves.	Fridge	1	keep perishabl e products	NO. OF PRODU CTS SOLD	there is no differenc e because she was using the generator before.		
						Deep freezer	2	storage of meat	NO.OF WORKE RS	1	1	
						Electric till	1	register cash sale	TURNOV ER OF COMPA NY IN PULA			
									CUSTO MER SATISFA CTION	customer s are happy because it's a wholesale e and it meets their needs.		
									TIME OF BUSINE	0800hrs- 1700hrs	0800hrs- 1700hrs	doesn't know

								SS OPERAT ION				
								OTHER				
Goitsewang 6 Radiposo	39022 69	General Dealer & Butchery	1975	Connected electricity in 2003 and they spend P250 monthly. They were in a group of 11 members and shared the cost from BPC equally.	Fridge	3	storage of drinks	NO. OF PRODU CTS SOLD	stocked more goods because fridges are there to keep which needs cool temperat ures.			
					Deep freezer	2	storage of meat	NO. OF WORKE RS	2	3		
					Meat scale	1	weigh and price meat	TURNOV ER OF COMPA NY IN PULA				
					Electroni c till	1	register cash sale	CUSTO MER SATISFA CTION	satisfied			
								TIME OF BUSINE SS OPERAT ION	0800hrs- 19.30hrs	0800hrs- 19.30hrs	Only those who connected electricity are the ones who are benefiting from it.	They increase the turnover of their local businesses in the

												village because they don't have go to other places for shopping unless otherwise.
								OTHER				
7	Othana Motlogelwa	59304 66	Co-op multi purpose	Established over 30 years ago	Connected electricity in 1997 and they pay a bill of about P700 per month	Fridges	to keep 3drinks	NO. OF PRODU CTS SOLD	They stocked more drinks & meat	They were not selling meat	Electricity attracted more thieves because they now think that when a shop is electrified it is making more money.	Created more jobs for people in the village and also because of electricity they hope that this will attract more investors in their village and hence create even more jobs in the village. At the clinic they get a good service in terms of medicines because are now kept in





											Most of effective equipments use electricity and this lead to establishment of businesses in the village and hence creation of employment.	This contributes to the economy of the local since they do not have to go long distances to and seek for such services .
	Kelennets 1e Molefe	5930599/ 7226871 6	Sewing Shop	March.2 006	Overlocker machine	1	To over lock clothes	No. of workers	2	2		Hire other people
					Straight machine	1		Turnover of company in pula		P700		
					Button hole	1	To make button holes	Customer satisfaction				
					Iron	1	To iron clothes after being finished.	Time of business operation	0800hrs	1700hrs		
								Other				





**BOTSWANA CASE STUDY-MANYANA VILLAGE  
TRIBAL OFFICE**

INTERVIEW WEE	CONTACTS	WHEN ELECTRI FIED	HOW PAID FOR ELECTRICIT Y	BUILDING IN PREMISE ELECTRIFI ED	ELECTRIC EQUIPMENT BY TRIBAL OFFICE ACQUIRED AS A RESULT OF ELECTRICITY BEING AVAILABLE			HOW HAS ELECTRICITY AFFECTED QUALITY OF SERVICE PROVIDED TO VILLAGERS AND OTHER GOVERNMENT RESPONSBLITIES		HOW HAS ELECTRICITY AFFECTED RETENTION OF ADEQUATE AND QUALIFIED STAFF	HOW DOES THE TRIBAL OFFICE NOW ABLE TO CONTRIBUTE TO MEETING GOVERNMENT OBJECTIVES IN PUBLIC SECTOR IN GENERAL?	
					TYPE	NUMBER	TIME OF USE PER DAY (Hours)		MENTION TYPES OF SERVICES THAT CAN NOW BE ACHIED THAT WERE NOT POSSIBLE BEFORE ELECTRICITY			
1e	7E+07	2000	Departmen t of tribal pays the bill.	6	Administr ation	1	7.30- 4.30	Because we are using facilities from our junior school we provide both the villagers with higher standard service and we working on good conditions.	At the moment there is no electrical equipment except air conditioners only, we can fax and type cases, letters, minutes etc since we are using electrical equipment at our junior school.	They stay for a longer time because their houses are electrified they have access to services like internet, radio and television news.	Those who are working at the towns are staying local because there is electricity.	Not all tribal department in Botswana are electrified we hope in the future there will be covered.
					Sub- inspector	1	7.30- 4.30					

**BOTSWANA CASE STUDY-MANYANA VILLAGE SCHOOLS**

NO:	NAME OF SCHOOL	NAME OF INTERVIEWEE	JOB TITLE	TEL	WHEN ELECTRIFIED	HOW PAID FOR ELECTRICITY	TYPE	NUMBER	TIME OF USE PER DAY(HRS)	TYPE
1	Manyana Primary School	Mrs Siele	Principal		The school is established in 1956 and was connected electricity in 2000	Council takes care of the bill	Classrooms	8	24	Com
							12 classes are un-electrified			Urn
										T.V
										Radi

										Photo Mach
2	Boswelakgosi Junior School	Mma Modisana	Head of Department	5930468	1991	Government gives the school votes e.g. we pay P35000 in 8months	classrooms	8	7:30a.m-4:30pm	comp
							Art lab	1	7:30a.m-4:30pm	fans
							science lab	2	7:30a.m-4:30pm	kettle
							library	1	7:30a.m-4:30pm	stove
							staff houses	27		Tele
							staff room	1	7:30a.m-4:30pm	VCR
							home economics lab	1	7:30a.m-4:30pm	radio
							design and technology lab	1	7:30a.m-4:30pm	

**BOTSWANA CASE STUDY-MANYANA VILLAGE CLINIC**

TYPE	NUMBER	TIME PER HRS	TYPE	NUMBER	PURPOSE	Effect on Volume of patients	Quality of Treatment in Village	New Treatments	Staff Retention	Affected Village Health	Contribution to Govt Objectives
Clinic	1	7.30am-4.30pm	Heater	1	To m mselve hen it old	Since electricity arrived the no: of patients have increased because available medicines that are kept in fridges and also they can be consul	it affected it positively because now patients are given good medicines they are now healed. They don't need to go to far places like Thamaga Kanye.	Nebolizer is used for asthmatic patients, succession machine is used for small babies who have just been born for breathing helping them to adopt the outside environment and finally oxygen machine to help patients who have	Electricity attracted staff to the village because they can use electric equipment, which offers quick service. Also they can use the external lights as security to prevent the thieves from attacking them. TVs also keep	Because of TVs people in the village have information about harmful diseases. They are able to watch films, which leave them with valuable information.	Number of healthy people in the village is increasing and hence productive people who will be able to work and produce quality output.

						ted during night if its urgent .		problems in breathing.	them busy after hours when at home.		
Maternity	1	7.30am-4.30pm plus emergency	Geyser	1	warm water to bath patients who are dirty and new born babies						
Staff houses	3	Depends on the owner	Fan	1	when hot during summer they put it on to cool themselves						

			Fridge	1	to keep medicines which need s to be stored in a cool place						
			T.V	1	to inform patients about break outs of new diseases, how they should prevent themselves from such	.					

				diseases and how they should keep themselves healthy.					
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## **Annex 6. Millennium Development Goals and Botswana Vision 2016 and National Development Plan 9 Objectives**

### **Millennium Development Goals**

#### *Goal 1: Eradicate Extreme Poverty and hunger*

Energy inputs, particularly electricity are essential to generate jobs, industrial activities, commerce, micro-enterprise and agricultural outputs. Most staple foods need to be processed, preserved and cooked.

#### *Goal 2: Achieve universal primary education*

To attract teachers to rural areas, electricity is needed for schools and teachers' residential houses. Evening study requires illumination and only children in areas with appropriate energy services in the form of electricity are able to access this additional study opportunity. Availability of energy services also reduces demands on many children especially girls, to carry wood and water to meet family subsistence needs thus missing classes and at times not attend primary schools at all. This situation may rise with the high adult mortality resulting from HIV/AIDS.

#### *Goal 3: Promote gender equality and empower women*

Lack of access to modern fuels, such as electricity contributes to gender inequality. Women and girls are responsible for households cooking and water-boiling activities. This takes time away from other productive activities as well as from studying and social participation. Access to modern fuels eases the domestic burden on women and girls, and allows them to pursue educational, economic and other opportunities.

#### *Goal 4: Reduce child mortality*

Diseases caused by un-boiled water and respiratory illness caused by the effects of indoor air- pollution from traditional fuels and stoves, directly contribute to infant and child disease and mortality. Availability of clean energy services will help to reduce under-five mortality through improved households sterilization techniques.

#### *Goal 5: Improve maternal health*

Women are disproportional affected by indoor air pollution and water and food-borne illnesses because of the frequency of interaction with water and fire during food processing. Lack of electricity in health clinics, illumination for night time childbirths, and transport, coupled with the daily drudgery and physical burden of fuel collection all contribute to poor maternal health conditions, especially in rural areas.

*Goal 6: Combat HIV/AIDS, Malaria and other diseases*

Electricity for communication such as radio and television can spread important public health information to combat deadly diseases. Health care facilities, doctors and nurses, all require electricity and the services that it provides to deliver effective health services.

*Goal 7: Ensure environmental sustainability*

Energy production, distribution and consumption has many adverse effects on the local, regional and global environment including indoor, local and regional air pollution, local particulates, land degradation, acidification of land and water, and climate change. Cleaner energy systems are needed to address all of these effects and to contribute to environmental sustainability.

Clean water and sanitation services require electricity and other forms of energy for filtrations, booster-pumps, purification and administration of such services. Where energy services are lacking, these essential services are compromised.

*Goal 8: Develop a global partnership for development*

In the context of this MDG, the world summit for sustainable development called for partnerships between public entities, development agencies, civil society and the private sector to support sustainable development, including the delivery of affordable, reliable and environmentally sustainable energy sources.

**Vision 2016**

Vision 2016 places emphasis on:

1. Education and information - for instance HIV/AIDS awareness building will be achieved through all possible media of communication,
2. Prosperity, productivity and innovation - emphasising the role of Government as facilitator in partnership with the private sector to create an environment where business and entrepreneurship activities are encouraged and supported,
3. Compassion, justice and caring - offering support and opportunity to those who are poor,
4. Safety and security,
5. Democracy, transparency and accountability, and
6. Morality and tolerance, and unity and pride.

## **National Development Plan 9**

NDP 9 is based on Vision 2016 and emphasises Sustainable Development through competitiveness in global markets resulting in:

1. Economic diversification,
2. Employment creation,
3. Poverty alleviation,
4. Continued macroeconomic stability and financial discipline,
5. Public sector reforms,
6. Environmental protection,
7. Rural development, and
8. Human resource development including the fight against HIV/AIDS and disaster management.