

**RURAL ENERGY SYSTEMS AND THE RURAL DEVELOPMENT  
PROCESS : A CASE STUDY FROM LIMPOPO PROVINCE.**

by

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## **ABSTRACT**

The rapid and sustained development of the rural regions of South Africa continues to pose an extraordinary challenge to the development community of the country. Policy makers continue to be overwhelmed by the lack of development in the rural areas in spite of the various efforts made to develop them. A review of the publications and development plans of the study region indicates that the planners have for long been pre-occupied with taking limited perspectives of the development planning problems. Development plans have been conceived and implemented in terms of individual sectors instead of looking at their relations with other sectors and regions.

This study seeks to make a contribution to the solution of the development problems of the rural areas of the former homeland regions by demonstrating how an integrated approach to the research process and to development planning could make a difference to the lives of the rural communities. This theme is illustrated with reference to the rural energy sector and its relations with the broader regional development problems, challenges and plans of the Sekhukhune district municipality of the Limpopo Province.

## **KEY TERMS**

Rural poverty; Rural energy system ; Rural electrification ; Reification ; Energy city;  
Environmental degradation ; Integrated development planning; Critical realist methodology

## **DECLARATION**

**I declare that “Rural Energy Systems and the Rural development Process: A Case Study from the Limpopo Province” is my own work, and that the sources that I have used or quoted have been indicated and acknowledged by means of complete references.**

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**SIGNATURE**

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## **CHAPTER 1 : INTRODUCTION**

### **1.1 Energy as a basic need**

Energy is a basic household need and also a vital input into all sectors of the South African economy. Energy cannot be viewed as an isolated element but as a relation. It is an integral part of the sustainable development process. Various public documents in South Africa indicate the increasing awareness that the development process is inseparable from the performance of the energy sector. Energy drives motors and other appliances to assist in producing goods and services in various sectors of the South African economy. The amount of energy used is an indication of the levels of development of the various sectors, regions and communities in South Africa. The Reconstruction and Development Programme (RDP) for example, states that access to clean, reliable, and modern energy services is not only essential for household uses but also in opening opportunities in the communication, industrial, transport and other sectors of the economy. The programme indicates that no meaningful national development planning is conceivable without the contributions of the energy sector (African National Congress, 1992). The supply of energy therefore needs to be assured to all sections of the society on a continuous basis. Also, the impacts of the energy sector on other sectors need to be monitored on a constant basis to ensure that energy use does not compromise the ability of the other sectors to make their maximum contributions to the overall sustained development of the country. The national, provincial and local governments therefore are most qualified to mobilise other stakeholders to relate the energy sector to the broad development process in a sustained way.

The major forms of energy used in South Africa as a whole consist of human motive power and the use of fossil fuels such as oil, coal and gas which are finite and also associated with green house emissions. The use of renewable sources such as solar energy, windmills, hydro-electricity, geothermal, and tidal power is still rudimentary. The national government document on energy policy (Dept. of Minerals & Energy, 1998) indicates however that the long term goal is to promote the use of renewable energy in the future. The document also indicates that there are many opportunities to be created in future for renewable energy technologies to create jobs, provide social services, ensure food security and other development benefits. The White Paper indicates further that for many applications, renewable energy technologies can be the least-cost source of reliable modern energy. Finally, the paper stresses that the future development of the energy sector is to be planned as part of the national and local development planning processes. These statements indicate that in broad terms, the relations between the energy sector and the overall development process is a reality which is recognized (Anneck, 1992; Golding 1993). Appendix 1 provides a broad overview of the government's energy position as articulated by the then Deputy Minister of Minerals and Energy.

## 1.2 Poverty, energy and underdevelopment

This research seeks to bring this critical development issue to the attention of the South African public by highlighting how the overall level of development in a region can be related to the forms of energy used in a sustained way. This topic is important because the energy sector has a particular function to perform in the development process, a function which can only be properly performed under certain conditions or requirements (Choquill, 1996; Davidson, 1996). It is these critical conditions which this study seeks to disclose.

Talking about the levels of development immediately brings into focus the roles of the various tiers of government in development plan formulation and implementation. In recent years, people have formed wrong impressions about contemporary development issues such as globalization, structural adjustment, participatory community development, bottom up and self-reliant development as an indication that the state sector needs to reduce or even withdraw its influence in the rural development processes to allow communities to take care of their own development. One outcome of this notion is the little attention that is now being paid to the relations between public development policy and standards of living. The levels and nature of regional development depend largely on the development planning processes in place (Budd, 1978; Bryson & Roering, 1988; Rodrik, 1996; Kemp, 1993). It is such plans which determine what is happening to problems of rural poverty, the energy system, environmental degradation, out-migration, investment levels, and issues of distributive justice, among others. These issues are interdependent. The private and civil society sectors cannot be relied upon to devote the bulk of their attention to address these inter-related issues. Rather, it is the national, provincial, and local governments which by nature are equipped to mobilise local communities to co-ordinate such inter-related systems (Bryson, 1995). A strong developmental state is therefore, no doubt, key to the integrated development effort. The local governments in particular are important - they represent the levels of representative democracy closest to the people with knowledge about the various development issues and their relations. Whether the state-sponsored development programmes can succeed to make the desired impacts will depend largely on the manner in which they are conceptualised and implemented at the grassroots level. All the individual local programmes form part of the broader development process. One key hypothesis which this research will therefore refer to from time to time is that conceptualisation plays a central role in social change and sustainable development. Of particular relevance in this study is the concept of Impact Analysis, an important part of the conceptualisation exercise which examines how individual activity systems must relate to others (Cloke, 1989).

The relevance of this concept can be clearly noted in the various government white papers and other policy documents on the numerous local and national development strategic development plans (Limpopo Provincial Government 2004). The history of development in the Sekhukhune district municipality demonstrates how state-provincial-local government strategic development plans were conceptualised in various ways in the past to create rural poverty in the

district, how poverty in turn has adversely affected the rural energy sector, and how this sector in turn, is adversely affecting the current overall development of the Sekhukhune region. On the positive side, one equally has to note the potential positive impacts of the various on-going development projects in South Africa. On the energy side, one needs in particular, to acknowledge, for example, the role of ESKOM and the National Electricity Regulator in the promotion of the ambitious rural electrification programmes in South Africa since 1994. The aim of the programme is to electrify thousands of rural South African homes (Dept. of Minerals & Energy, 1995). Between 1996 and 1999, for example, some 450,000 homes in South Africa were electrified (Dept. of Minerals & Energy, 1998). This is undoubtedly a classic example of the use of state influence to promote development at the household level (van Arkadie, 1989). Government-sponsored strategic plans are now becoming one of the key instruments for transforming the development processes at the macro and micro scales. But the research question is, how do these electrification programmes relate to other development programmes to eradicate poverty and ensure sustainable development?

In spite of the various interventions by the various tiers of government, poverty in the rural areas of the former homelands of South Africa still constitutes one of the biggest legacies of apartheid government development planning (Fox & Rowntree, 2000). In the context of the theory of relations, poverty is one of the major determinants of what happens to the on-going efforts to restructure the economies of Limpopo, Eastern Cape, Kwazulu-Natal, Mpumalanga and the North-West regions (Wilson & Ramphele 1989; South Africa 1995). The situation in the Limpopo Province is of particular significance since three former homelands are located here: Venda, Gazankulu, and Lebowa. The 2001 Census of South Africa indicates that of the total population of 4.92 million in the Limpopo Province, 4.38 million (ie 95%) were rural and poor. No meaningful discussion of the current development process in the Limpopo Province can therefore be contemplated without adequate attention being given to the rural development problems of the former homelands of this province where the poor households survive on less than the equivalent of \$1, ie about (R7.20) a day. The poverty problems of these regions are manifested in various forms such as the prevalence of under-performing micro enterprises, poor housing, dietary, education, health, and other conditions (Alcock 1997; Development Bank of Southern Africa 2005a). The poverty problem also explains why most of the able-bodied males continue to migrate to the urban centres for jobs leaving the women as the household heads. Currently the unemployment rate for the Sekhukhune district municipality stands at 21% (Statistics South Africa, 2004a: 197).

The women household heads of the study region are generally concerned with addressing basic household subsistence and survival issues (Dept of Agriculture, 2005). Such subsistence imperatives are by nature, associated with low incomes, which in turn, explain the low living conditions that characterise the rural sector. Maintaining the households takes so much of their time which also explains why the household heads cannot devote enough time to address important issues outside the homestead such as involving themselves in community afforestation

projects, or building and maintaining public projects in the villages (Parpart, 1989)

### **1.3 The causal powers of poverty**

One particular dimension of the contemporary impacts of poverty in the development of the rural areas of the study region concerns the problem of deforestation, resulting from the excessive harvesting of firewood to address the rural household energy needs. The poor rural households cannot afford to purchase stoves and other relatively expensive equipment for addressing their energy needs, and therefore find the “free gifts of nature”- the trees growing in the veldt - as the natural sources of their energy requirements. The same trees however protect and enrich their soils; they provide the natural regulation of their hydrological cycles, and influence watershed flows of surface and groundwater, among other things. The trees also have religious and medicinal values for the households. The conservation of the trees in the rural communities is therefore a crucial factor in their development. Unfortunately, the rural firewood sector is one activity system which is responsible for destroying much of the natural vegetation of the rural communities of the Sekhukhune district. Herein lies the relationship between poverty, the firewood sector, and deforestation (World Bank, 1996).

Table 1.1 gives some insight into the importance of firewood consumption in the lives of the people of Limpopo Province. Over 600,000 households in the province currently depend on firewood as the main source of energy for cooking and heating. The table indicates that firewood consumption for cooking for example, constitutes about 60% of the total energy source for cooking in Limpopo Province. The table further indicates that firewood source for cooking in the province constitutes about 31% of the total consumption in South Africa.

The rural communities cannot engage in afforestation programmes on their own because of a number of problems such as financial, household responsibilities and organizational constraints. The seriousness of the deforestation problem can be better captured if it is noted that deforestation is associated with soil erosion, reduced agricultural output, reduced household incomes, increased rural-urban migration, and the continued flight of potential investments from the rural areas. Poverty, the firewood sector, and deforestation are therefore creating major development problems in the Sekhukhune district. These three related problems can, to a large extent, be described as constituting a trinity of crises in the development of the Sekhukhune region whose details this research seeks to disclose. The research will endeavour to describe the feedback relations inherent in the relationships; how an understanding of one of the elements will necessarily imply understanding the others; how changing the operations of one will involve changing the others; and how, above all the trinity operate in a broader developmental context. A relational perspective will thus constitute the theme of this research. The work will demonstrate that no meaningful understanding of the research problem is possible unless one devotes considerable attention to the

**Table .1.1: Energy source for cooking, heating, and lighting by province, 2001 (number of households)**

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Energy source for cooking	Eastern Cape	Free State	Gauteng	KwaZulu-Natal	Limpopo	Mpumalanga	Northern Cape	North West	Western Cape	South Africa
Electricity	419 997	344 592	1 939 945	1 007 737	295 512	293 055	122 132	414 234	924 151	<b>5 761 354</b>
Gas	44 014	25 519	37 539	63 917	19 625	13 861	13 291	26 538	39 991	<b>284 295</b>
Paraffin	445 082	250 166	567 851	374 356	131 633	126 756	37 281	296 785	165 008	<b>2 394 919</b>
Wood	543 561	58 138	18 437	562 970	702 428	170 907	31 711	170 272	34 251	<b>2 292 674</b>
Coal	4 607	39 236	72 819	42 267	18 651	118 227	1 198	10 404	2 651	<b>310 059</b>
Animal dung	49 329	11 953	5 477	20 736	5 272	6 065	467	8 259	3 411	<b>110 969</b>
Solar	2 003	1 893	5 461	6 146	2 981	1 960	421	1 314	2 047	<b>24 225</b>
Other	4 070	1 805	3 715	8 122	3 864	2 299	342	1 198	1 795	<b>27 210</b>
<b>Total</b>	<b>1 512 664</b>	<b>733 302</b>	<b>2 651 244</b>	<b>2 086 250</b>	<b>1 179 965</b>	<b>733 131</b>	<b>206 842</b>	<b>929 004</b>	<b>1 173 304</b>	<b>11 205 705</b>
<b>Energy source for heating</b>										
Electricity	354 407	296 661	1 865 181	981 524	322 904	283 206	112 342	415 336	861 461	<b>5 493 021</b>
Gas	11 369	11 000	38 764	23 912	7 441	6 330	2 834	8 548	14 784	<b>124 982</b>
Paraffin	425 210	176 448	321 946	229 557	82 363	57 745	17 184	157 697	173 307	<b>1 641 458</b>
Wood	636 371	103 518	61 402	671 433	703 416	193 127	59 139	246 521	83 935	<b>2 758 861</b>
Coal	13 277	108 299	286 713	72 904	26 831	158 373	5 040	59 783	3 236	<b>734 455</b>
Animal dung	30 942	12 083	3 923	16 834	4 384	5 129	328	7 864	1 570	<b>83 058</b>
Solar	1 850	2 163	4 297	5 819	2 909	2 123	304	2 716	1 329	<b>23 509</b>
Other	39 238	23 131	69 017	84 267	29 717	27 098	9 671	30 539	33 682	<b>346 361</b>
<b>Total</b>	<b>1 512 664</b>	<b>733 302</b>	<b>2 651 244</b>	<b>2 086 250</b>	<b>1 179 965</b>	<b>733 131</b>	<b>206 842</b>	<b>929 004</b>	<b>1 173 304</b>	<b>11 205 705</b>
<b>Energy source for lighting</b>										
Electricity	749 092	545 266	2 142 070	1 281 415	752 691	500 749	156 779	654 918	1 032 291	<b>7 815 270</b>
Gas	4 912	1 107	4 984	7 593	2 072	2 244	411	892	2 849	<b>27 065</b>
Paraffin	354 538	34 687	76 115	53 503	90 420	30 448	8 348	28 020	83 738	<b>759 817</b>
Candles	392 925	148 631	420 664	730 532	325 834	195 833	37 761	241 783	51 568	<b>2 545 532</b>
Solar	4 067	2 108	3 635	5 178	3 169	1 193	2 157	1 312	1 356	<b>24 175</b>
Other	7 129	1 502	3 776	8 029	5 778	2 664	1 387	2 079	1 502	<b>33 845</b>
<b>Total</b>	<b>1 512 664</b>	<b>733 302</b>	<b>2 651 244</b>	<b>2 086 250</b>	<b>1 179 965</b>	<b>733 131</b>	<b>206 842</b>	<b>929 004</b>	<b>1 173 304</b>	<b>11 205 705</b>

Source : Statistics South Africa. 2004b. *Statistics in Brief* : 127



search for relationships.

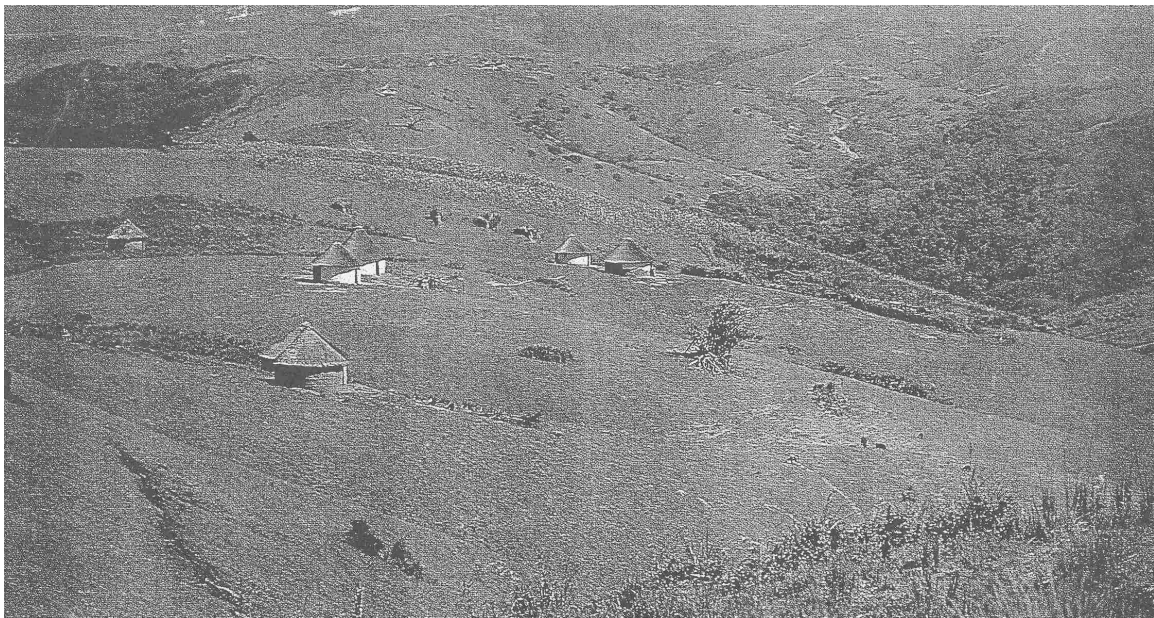
#### **1.4 The role of the public institutions**

The above indicates the complex nature of the issues that need to be considered in the analysis of the rural energy systems by the relevant authorities (House, 1982). One critical issue which one therefore needs to look at concerns the national government's rural electrification programme. The programme has been introduced, no doubt, to reduce the pressure on the use of firewood. It is a programme aimed in the long run, at substituting firewood with electricity. The programme also seeks to improve the quality of life in the rural households. Shifting the attention from firewood to electricity from the environmental perspective implies further that reliance on firewood and deforestation will hopefully be reduced with all the benefits to agriculture and the natural environmental system. It would also imply opening vast opportunities to the households to join the mainstream of South African society. The rural electrification programme is therefore a key element in South Africa's post-apartheid reconstruction programme. It is one programme where the problems of bureaucracy, mismanagement and corruption cannot and must not thrive.

Providing rural communities with electricity is however a daunting task which requires in-depth studies on the overall regional income levels, and the culture of the people, among others. For example, providing rural communities with electricity for their development requires information on their per capita incomes, since the electricity bills have to be settled by the families. Information will also be needed on the changes which could take place in the lives of the rural women households who tend to carry the bulk of the burden of supplying firewood (McDowell, 1986). One needs to note that gender equity, for example, cannot be achieved as long as the women have to spend their energies in the bush searching for ever-scarcer firewood for family subsistence. The electricity sector can also affect the water supply sector because supplying safe drinking water to the rural households will also not be possible without electrical energy for pumping, and clean fuels for boiling the water. The electricity sector also relates to the productivity of people. Productivity cannot be increased if the rural women are forced to spend long hours in the veldt searching for firewood. With electricity in the villages however, it will be possible to keep the households working at home doing the cooking, small scale manufacturing, preserving the perishable products in the refrigerators, and entertaining themselves with the radios and televisions at home. In the education sector, one needs to note too that providing education to the rural school children cannot have the maximum positive impacts if the children are forced to spend long hours in the veldt looking for firewood and if they do not have reliable electricity supply at home to study at night. In the health sector, one can also observe that rural clinics cannot operate successfully without reliable electrical power to run key medical equipment. Above all, the rural poverty problem cannot be addressed if electricity is not introduced to create jobs and generate incomes in the rural communities. Apart from the social services which electricity can provide, it is undoubtedly a veritable

source for removing poverty in the rural communities by creating jobs. Rural electrification is one critical issue which needs to be addressed as a matter of urgency. Electricity provision is a central sustainable development requirement. It cuts across all sectors in the rural development process. The relevance of this research can therefore be judged in terms of the awareness it seeks to create about the importance of the rural electrification programme from a developmental perspective.

Plates 1.1 and 1.2 provide familiar pictures of the deforestation problems associated with the rural “firewood sector” in the Sekhukhune district.



**Plate1.1: Deforestation: A major problem in Sekhukhuneland**



**Plate1. 2 : Another perspective of the Sekhukhuneland deforestation problem**

The pictures in Plate 1 and 2 above indicate the extent of deforestation resulting from the firewood activities. They indicate that researchers in the area of rural energy systems need to pay careful attention to the factors behind the rural firewood energy sector before appropriate strategic electrification development plans for example, can be formulated and implemented. The illustrations indicate that we need to analyse rural development plans in Sekhukhune district so that we can discern clearly how they require solutions to the current rural energy system and also analyse the energy system in such a manner that we can grasp how the system necessarily affects broader sustainable development programmes of the communities concerned. The energy system and broader development questions cannot therefore be analysed as two independently given sets of phenomena but in terms of necessary relations, with each being dependent upon and implicating the other in a mutual process of transformation (Soutter, 1987; Von Haren & Eberland, 1995).

The above therefore implies that the rural energy sector of the study region needs to be analysed in terms of the following:

(i) it needs to be conceived as an essential part of the overall standards of living, as well as the cultural, historical and other social policies and practices of the rural communities (McDowell 1986; Parpart, 1989).

(ii) any attempts by the public institutions to restructure the overall energy sector will therefore have to be implemented with reference to the following developmental factors : the extent to which the rural communities can afford to pay for any new energy programmes; the extent to which any new energy programmes can address basic issues such as poverty alleviation, job creation, food, education, health, and water supplies; the relations between the new energy programmes and cooking, lighting, and heating at home; the extent to which the new energy system can promote the principle of self-reliance and community-based development; the environmental impacts of the new energy system; and, above all, the social, cultural, and political implications of any new energy systems. A central theme of this research therefore is the integration perspective (Kates & Burton, 1985; Taylor, 1985; Fox & Rowntree, 2000).

All these issues therefore imply that important ecological, economic, political, and social issues are involved in sustaining any rural energy development programme. All these ultimately need to be seen within the geographical concepts of the man-environment theme, spatial interaction, integration, and regional development planning, among others ( Wolch & Dear, 1989; Goudie, 1993; Johnston, 1983; Johnston, 1986; Johnston, Gregory & Smith 1986; Unwin, 1992; Leibenberg, 1995; Johnston, 1997).

The term “sustainable energy” can, to a large extent, be used to examine all these critically related issues. It can be used to examine the implications of using certain energy forms as resources to address human needs. This relational definition of sustainability was popularised by Brundtland (1987) who

expressed concern about how certain activities in a country can make it difficult for other important activities to make their maximum contributions for future development. Brundtland stressed that sustaining the development process implies being serious about the future by ensuring that current activities leave future generations with a better resource endowment and therefore better development prospects than that which they inherited. The public institutions, in particular, the state development organizations, thus have important roles to play by establishing the relevant structures to facilitate the long term sustainable development process.

### **1.5 Critical research issues**

From the above, it emerges that there are certain research issues that need to feature and addressed systematically in this research.

- The problem of poverty in the study region needs to be analysed as a first step in understanding the dominance of the firewood sector.
- The dilemmas facing those rural households who depend largely on the firewood sector as their major energy coping mechanism also need to feature in the research.
- The impacts of the current attempts under way by the government to introduce rural electrification to the households as a way of reducing their dependence on the firewood-dominated energy systems also need to be evaluated.
- The various ways in which innovations in the energy sector are influencing and must influence the development of the communities are important development planning issues that also need to be addressed.

The above points indicate that there are critical issues that need to be addressed in the energy systems of the Sekhukhune district. The rationale behind these points is to contribute to the on-going attempts to conceptualise individual sectors of an economy as part of bigger wholes. The points are set within the regional sustainable development research perspective which also relates to those crucial development imperatives which indicate :

- how communities simplify their world by identifying and exploiting particular resources to address some specific needs( Mclvor,1993; Kaale, 1994; Cecile, 1995).
- how such communities address their needs by taking cognisance of all the implications of such activities, ie how communities conceptualise particular activity systems ( the rural energy system in this case), to relate to their development goals (Shackleton, 1994,1995; Dyer, 1996; Eberhard, 1992; Banks, 1996) and
- how the outcomes of such activities in turn need to influence future broader regional development programmes (Anderson & Fishwick, 1984; Binns,1995 ; Warren et al,1995; Anderson & Anderson, 2001).

- how the state and other public institutions can take the lead as development facilitators in the change processes (van Arkadie, 1989).

This research project thus seeks to study the dialectic relations between acts of production and reproduction as related to poverty, energy systems and development planning and disclosing any underlying coherence or sense in such activities whose meanings may otherwise in one way or the other, be unclear to the public (Giddens, 1984).

Communities always face the realities of operating in open systems in which external factors can either assist them or steer them away from their set ideal development goals. Thus, one has to acknowledge the fact that activity systems such as the rural energy sector may, under certain conditions, benefit from external support (such as government electrification programmes) to enable it to make positive contributions to the development of the rural communities concerned. In this project, the author strongly associates with this positive perspective of external institutions in contributing to the rural development process. One sees ESCOM and the provincial government of Limpopo playing a key role in acting as facilitators in the development of the rural energy sector of the Sekhukhune district municipality (World Bank, 1994). In the negative sense, the energy sector may also be forced, as a result of unfavourable external forces, to generate negative impacts on the long-term development process. Inappropriate government and other non-government top-down energy development policies and programmes could thus constitute some of the real causes of rural poverty and underdevelopment. Such situations can lead to major environmental, economic, social, political and other negative consequences (Munslow et al, 1988; Wood & Baldwin, 1985). It is such negative development paradigms which this research seeks to argue against.

In spite of the positive changes taking place in the rural energy sector of the study region (through the national electrification programme) one has to acknowledge the fact that the firewood sector continues to dominate showing signs of malfunction and crises with negative impacts on the broader development process of the regions (Leistner, 1984; Soutter, 1987; De Wees, 1989). In the villages, the search for firewood continues to take the families farther and farther from their homes as the trees become depleted. Deforestation in turn, is leading to soil erosion in several places with attendant reduced agricultural output, outmigration, and continued economic stagnation. Such a situation demands a research model which can influence the stakeholders concerned to turn the situation around for the better (Cline-Cole, et al 1990; World Bank, 1995). The fact that the fuelwood sector continues to pose a major problem in the development of the rural communities of Sekhukhuneland indicates that a long term sustainable solution has not been found yet for the problem. Two opposing forces are in fact currently at work in the rural energy systems - those working through the firewood sector and other existing inappropriate methods to create problems, and

those positive initiatives related to the electrification programme. The one big challenge then is to find the right research approach to understand and change the situation for the better ( Beukes, 1987; Liebenberg,1995) .

An appropriate research paradigm/framework on the rural energy sector can make a big difference to the lives of people in the study region, Sekhukhuneland. This research is based on the philosophy that the worth of good social research does not lie in its sophistication in disclosing empirical information about the status quo to the public, but rather, in its ability to identify distortions within the status quo, to find new solutions to existing problems, and to constantly interact with people with the goal of producing positive changes in their lives (Kuhn,1970;1978; Bhaskar,1991). The critical realist approach associates with this development paradigm. The paradigm finds expression in the objectives which are indicated below.

### **1.6 Objectives of the research**

The broad goal of this research is to examine how the rural energy sector of the 5 municipalities of Sekhukhune district has affected and ought to affect the overall development process of the area. To achieve this broad goal the following three objectives will guide this research:

- (1) To undertake a broad overview of the problem of poverty and the various ways in which the problem impacts on the firewood sector of the municipalities in Sekhukhuneland.
- (2) To disclose how the firewood sector in turn, impacts on the development processes in the Sekhukhune region.
- (3) To suggest ways in which the on-going state-sponsored rural electrification and other energy programmes could be made to contribute to the long term sustainable development of the Sekhukhune region.

To put the above objectives in context, it is important now to have a general overview of the study region – its natural-environmental system, the socio-economic background, and how they relate to address the energy and related development needs of the communities in the area.

## CHAPTER 2: THE STUDY REGION

### 2.1 Introduction

During the period of apartheid, the Sekhukhune district used to belong to the former Transvaal province of the Republic of South Africa. It was during this long period that the economy was structured within the apartheid model of division of labour in which Sekhukhuneland was to be primarily a rural-based dependent economy (the second economy), specializing in the export of cheap labour to “white ‘ South Africa (the first economy).

Before the political changes in 1994, Sekhukhuneland was part of the Lebowa homeland that elected to take the non-internationally recognized independence offered by Pretoria as part of its separate development policy. A central part of this policy was the extension of Sekhukhuneland’s role as a labour reserve. One of the consequences was the conversion of the regional population from tribal producers into semi-proletarian labour under very unfavourable circumstances (Banaji, 1977; Natrass & Natrass, 1990; Ramutsindela, 2001).

The Gross Domestic Product (GDP) of the study region is dominated by incomes based on migrant labour-based remittances, the informal and micro- enterprises, and on pension and family support funds contributing about 20% to the GDP. The large subsistence sector needs to be monetised to enable it to raise the GDP of the region. Since 1994, the boundary of the region has changed considerably with part of Sekhukhuneland incorporated into Mpumalanga province.

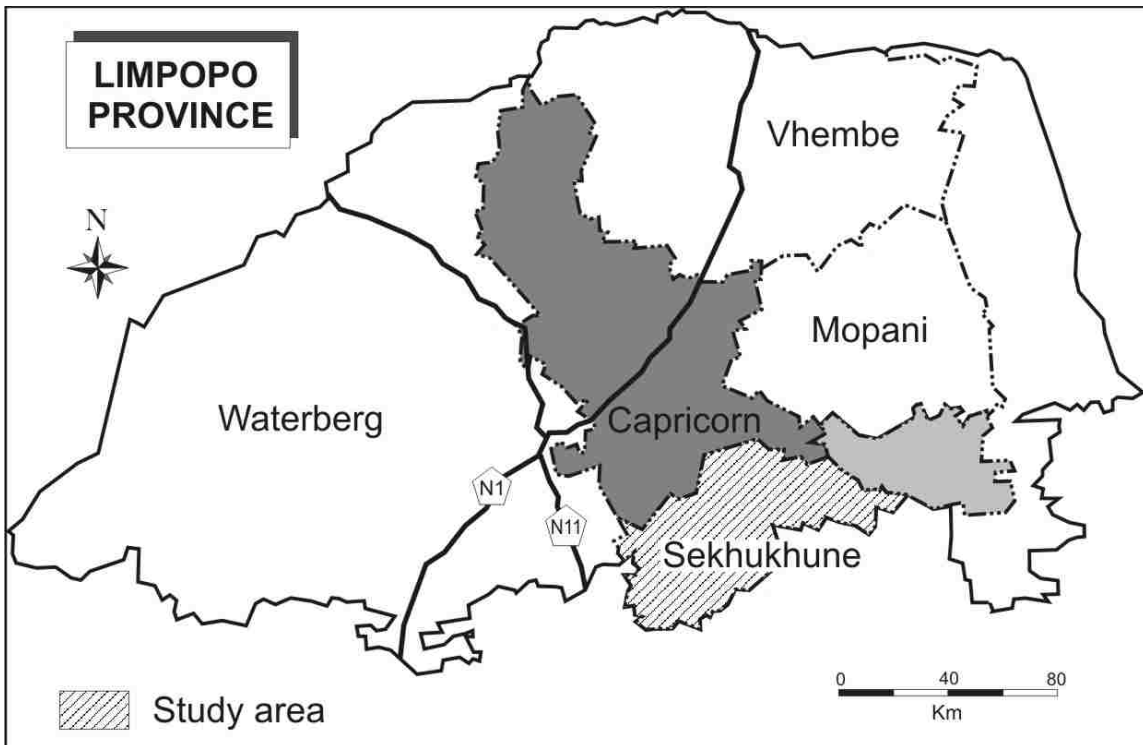
Fig 2.1 indicates the current location of the Sekhukhune District Municipality.

Under the apartheid dispensation, the former Lebowa Homeland included other regional authorities such as Bochum, Bolobedu, Mapulaneng, and Mokerong (Fig 2.2).

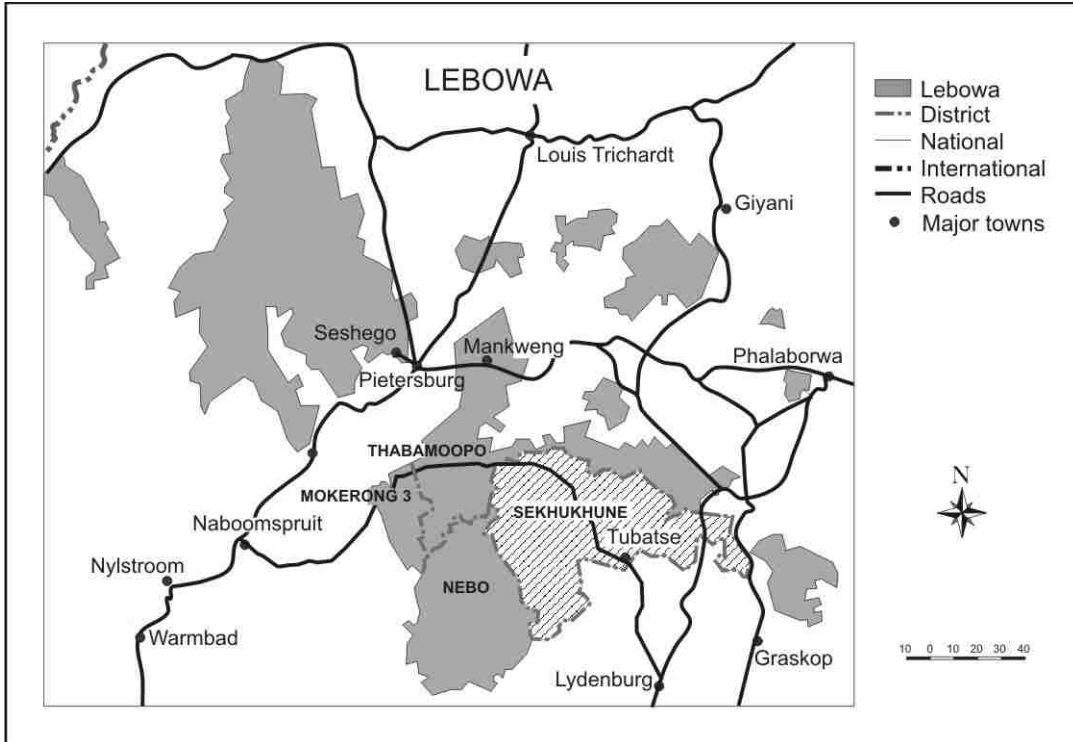
Today, (ie 2006), the study region comprises of 5 municipalities located in the Limpopo province:

- (1) Makhuduthamaga( Ngwaritsi)
- (2) Fetakgomo
- (3) Greater Marble Hall (cross border)
- (4) Greater Groblersdal (cross border)
- (5) Greater Tubatse (cross border)





**Fig 2.1 : The current location of the Study region in Limpopo Province**



**Fig 2.2 : Location of Sekhukhuneland in the former homeland of Lebowa during the apartheid era.**

## **2.2 Climate and vegetation**

The topography ranges from undulating to gently undulating plateau remnants to granite inselbergs with ferricrete in the mid and lower slopes. Around plateau remnants, soils are deep, red, apedal, gritty sandy and sandy clay loams that are highly leached. On granite inselbergs they are dominantly shallow or moderately deep, yellowish brown, apedal, gritty loamy coarse sands and sandy loams. Soils on bottomlands tend to be wet.

The region is characterised by summers which include a warm to hot dry period and warm to hot moist period. Winters are cool to cold and dry with a mean annual temperature of 20 degrees. Summer temperatures tend to hover around 32 degrees.

The vegetation in the region consists of mixed grassland and trees, which is generally known as Bushveld. It is characterised by a grassy groundlayer and a distinct upper layer of woody plants. A major factor delimiting the biome is the lack of sufficient rainfall which prevents the upper layer from dominating, coupled with fires and grazing. The mean annual rainfall range in the region is between 500 and 1000mm per annum.

The natural vegetation supports different kinds of livestock, especially goats and cattle. Many of the rural people practice subsistence agriculture. The vegetation has, however, been badly damaged over large areas, and has in some cases been almost completely destroyed by over-grazing and injudicious utilization. Dense vegetation is confined largely to the banks of the major drainage systems such as the Olifants, Lepelane, and Steelepoort rivers.

## **2.3 Why this region is a suitable case study**

Today, the study region is one of the 5 district councils of the Limpopo Province, the other four being Waterberg, Capricorn, Vembe, and Mopane. The Sekhukhune district council is located to the south-east corner of Limpopo Province.

Appendix 3, (pages 103-108) provides detailed socio-economic statistics about the 5 municipalities.

This district municipality was selected for study for a number of reasons. In the first case, the author has spent the greater part of his life schooling and working here. This means that there is tremendous amount of intimate knowledge on the part of the author about this area. The close proximity of the author to the government officials at Jane Furse, the largest urban center in this region, where the author incidentally has resided for many years, has meant that access to information has been quite easy whilst face-to-face contacts with people with intimate knowledge on the topic of this research has also been favourable. Another factor in support of this region for a case study is that this area is literally synonymous with the firewood crisis of the Limpopo province. The authors of the current provincial Development Index Framework for Limpopo Province for

example provide a number of statistical indicators such as dependency ratio and unemployment levels to highlight the fact that the Sekhukhune district municipality is the least developed in Limpopo Province ( Leibrandt & Woolard 1999; Dept of Finance & Economic Dev, 2003). Compared with the other four district municipalities, Sekhukhuneland shows more evidence of firewood-induced deforestation and poverty than the Vembe, Mopane and Capricorn district municipalities ( Dept of Finance & Economic Dev, 2005a.) . Moreover, whilst major afforestation programmes are occurring in the four other district municipalities, there does not currently seem to be any evidence of any major afforestation projects in the Sekhukhune region.

One other advantage of using this region as a case study relates to its relative small size and compactness. This district municipality is the smallest of the 5 district municipalities in Limpopo making it relatively easy to travel extensively to get access to as much information as possible. The government officials handling important documents on the rural energy systems of this district municipality showed tremendous interest in this research by giving the researcher all the support needed to produce this report. The officials were even ready to point out specific villages which were easy to visit as many times as possible for detailed information on specific topics.

#### **2.4 Some current statistics on Sekhukhuneland**

The population figures of the 5 municipalities of Sekhukhuneland appear below

**Table 2.1: Population and number of settlements in the 5 municipalities**

<b>Municipality and Settlements</b>	<b>Pop. Density km<sup>2</sup></b>	<b>% Rural</b>	<b>Total Pop.</b>
Makhuduthamaga 185 settlements	141	94.1	262903
Fetakgomo 49 settlements	89	100.0	92080
Greater Marble Hall 58 settlements	55	92.2	121327
Greater Groblersdal 57 settlements	69	88.2	220749
Greater Tubatse 180 settlements	48	99.1	270122
Total number of settlements:	<b>529</b>	<b>94.7</b>	
Total population	<b>: 967185</b>		

**Source : Statistics South Africa. 2001 Census : 197- 202**

From the 2001 Census Report, one learns that the study region had a total of 195285 households in 529 settlements making a total population of 967,185. The majority of the population is youthful with 56% of the population younger than 19 years. About 38% of the population is in the economic active group of between 20-59 years while 9% are older than 60 years. The predominantly youthful population presents its own set of challenges. It means that there will be an increased future demand for jobs, and social services like schools, clinics, and houses in the future.

## **2.5 Poverty issues and the electrification programme**

Unequal land and population ratios established by the land and population influx control and settlement laws of apartheid have reduced the amount of land currently available per household. In addition, the insecurity of urban tenure means that many households must retain their rural land base, not for agricultural purposes, but essentially as places of retirement. This results in increased pressure on utilized arable land. The continuous cropping and the soil impoverishment it causes, is a prime explanation for the declining crop yields in the study region (Tapson, 1990).

The system of communal pasturage also results in deforestation. Since the cost to the individual of increased herd size is negligible, there is a tendency to increase the level of stock holdings beyond the carrying capacity of the land. Erosion and the reduced availability of water are the most obvious indications of land pressure. However, other common features such as replacement of cattle by smaller stock, declining crop yields, poor cattle condition, high drought losses, and the disappearance of wild fruit and game resources once prevalent in rural Sekhukhune are also critical issues. These inter-relationships may be described as a vicious cycle of land and cattle deterioration arising out of overpopulation and limited rural investment opportunities leading to serious overgrazing, overstocking, erosion, reduction in the carrying capacity of the land, and a low level of animal production (Wilson & Ramphele, 1989).

Over 90 per cent of human settlements in the region are non-urban as shown in Table 2.1 above. As a result, most settlements in the region have traditional villages. These are made up of scattered homesteads surrounded by arable land for use by households. The size of the area occupied by a household depends on the capability of its members as they may fence in large areas which they can afford to cultivate. Many of the rural people practise subsistence agriculture. Grazing land is communal and there is no division into camps. A number of these scattered households, together with the grazing lands constitute a village. Very few or no services are provided in these villages. Most residents provide their own housing and draw water from wells. It is interesting to note that the number of traditional villages is declining in recent years as more of them are planned.

The region has typically underdeveloped areas. The main sources of income are

from migrant workers and farming activities. The income of the head of the household constitutes the major proportion of total household income. Such incomes are however woefully inadequate to maintain the families. The average family income is less than the equivalent of \$1, ( R7.20) a day (Ngwane, Venkata, Yadavalli, 2003). Social services such as schools, hospitals and roads are also few and of low quality. The overall standards of living are therefore low explaining why rural depopulation is still a major developmental problem.

The provincial government development report (Limpopo Provincial Government, 2004) indicates that more than 75% of the people earn less than R1200/ per annum or R100 / month. From the report it is clear that a monthly income of R1100 is regarded as a minimum level to survive The report indicates further that more than 75% of the economically active population is un-employed. Thus the Sekhukhune District Council has a very low revenue base and sits in the category of less than R50 million per annum.

The information provided by Statistics South Africa (Statistics SA, Census 2001) in the table below gives a still more authentic picture of the poverty levels in the study region as reflected in the unemployment situation.

**Table 2.2 : The employment situation in the study region**

Employment status	Number of persons
Employed	70620
Unemployed	110111
Not economically active	334849
Total	515581

Source: Stats SA. Census 2001 : Key Municipal Data : 197

Several development potentials have been identified in mining, agriculture, tourism, and in the manufacturing sector.

The local communities as organized into 5 municipalities, constitute the key regional development building blocks. The communities in the municipalities of Sekhukhune have long identified their energy sector as a major impediment in their development process, in need of external support before it can perform its normal functions in the overall development process of the region. As indicated above, this research project seeks to indicate how the 5 municipalities could be mobilized as the key development regions in the context of the Limpopo province's rural energy systems. In this connection, the role of the relevant local government departments cannot be ignored as already emphasized (van Arkadie, 1989; UNDP, 2002). The people of the 5 municipalities go about their developmental activities in the context of the broader policies of their local governments. It is in this connection that one needs to put emphasis on the 5 municipal structures as key to the current local de-centralized development planning structures in the region (World Bank, 1994).

Under the current constitution, the South African central government encourages

the local municipal communities to formulate and implement their own local integrated development plans. There are thus, currently, 5 local municipality integrated development plans in the Sekhukhune District Municipality (Limpopo Provincial Govt. 2004). These 5 municipality regions thus constitute the local development planning regions in the District Municipality for fighting poverty, among other problems.

Sekhukhune region has benefitted from the current electrification scheme. The long term energy development plan indicates that the whole district municipality is to be electrified by 2015. Since 2001, the following electricity connections have been made:

**Table 2.3 : Recent Electricity connections in the Study Region**

<b>Municipality</b>	<b>Year</b>	<b>Village</b>	<b>No. of connections</b>
<b>Tubase</b>	2000/1	Batau	1250
		Phasa	1000
	2001/2	Tukakgomo	1341
		Maphopha	700
		Selala/Manyaka	10381
		Dipale/Scuwe	1039
	2002/3	Makgemeng	240
		Tsakane	173
		Kutullo	345
	2003/4	Kgautswane	1600
<b>Marble Hall</b>	2003/4	Moganyaka	25
		Rakgwadi	15
		Tompi Seleka	60
		Mmakola	68
		Tsimanyane	145
		Kromdraai	140
<b>Mahuduthamaga</b>	2002/3	Ngwanamatlang	245
		Phokoane	327
		Tjatane	1200

**Source:** Field Research: 2004

The study region is thus developing a personality of its own. Its energy sector is no doubt one key area where positive change could be introduced. To make better sense of the region however one needs to examine the existing publications on the study region to enable one to have some useful information concerning the relations between the energy sector and the broader development efforts of the region. Such a task is the concern of the next chapter.

## **CHAPTER 3 : LITERATURE REVIEW**

### **3.1 Introduction**

No understanding can be made of the issues discussed in this research project without a review of the existing research publications and other government documents on the development process of Sekhukhuneland. It is important that in this chapter one pays attention to such publications to help one to evaluate the roles that have been assigned to the rural energy systems in the overall development programmes that have been pursued in the study region.

Researchers and development planners tend to interpret social and development issues to relate to their particular philosophical, theoretical backgrounds as well as the particular interests they wish to promote (Leibenberg, 1995; Johnston 1997; Leedy, 1997). It therefore needs to be noted that what the writers identified in this chapter have studied about the development and energy problems of the study region and how they chose to study them are properties of their interpretations of the development process.

From the reading of the various publications two themes could be discerned:

- publications which focus solely on the energy sector and its related environmental problems, and
- those that deal with broader regional development issues.

### **3.2 Energy studies**

Information on the development of the energy sector of the study region derives largely from the Limpopo provincial government publications on the energy policies and plans for the province (Dept of Finance & Econ Dev, 2002 & 2003).

An important issue addressed in the publications relates to the nature of changes witnessed in the governance of the energy sector in recent years. The reports indicate that during the apartheid period the energy sector was characterised by secrecy whereby the officials operating within the first economy dominated policy and development planning decisions. The underdeveloped second economy ( the former homeland sector) was not considered a key sector in the energy development plans during the apartheid period. The electricity distribution industry for example, was linked to a system of racially segregated local government system which proved incapable of providing electricity to the majority of the population who lived in the rural areas (Dept of Local Govt & Housing 2005).

Since 1994 however the publications indicate that the state has been using its resources to integrate the second economy into the energy development programmes of the whole South African economy. For underdeveloped regions such as Sekhukhuneland, the current rural electrification programme represents



an example of the role of state institutions in facilitating rural development through the energy sector. The report by Kwena (2004) of the Limpopo Department of Local Govt & Housing *The Rural electrification Programme of Limpopo Province*, is one important source where one can gain some information about the impacts of the programme. The report however provides largely statistical information concerning the households that have been connected to the electricity grid. Critical information such as the relations between the programme and poverty reduction, the environmental impacts of the electrification programme, the impacts of the electrification programme on the workload of the households affected by the programme, and on other socio-cultural issues are clearly missing in the report.

### **3.3 Environmental Impact Assessment studies**

The literature on this topic can be classified on the basis of certain criteria. First, there are those publications which examine the environmental impacts of human activities as a general developmental problem. Such publications fall under the general topic of Environmental Impact Assessment. Environmental Impact Assessment (EIA) is a popular topic in studies on energy systems (Munn, 1975; Glasson et al ,1994; Brown & Jacobs, 1996; Petts,1999; Wood 1999; Hamman, Booth & O’Riordan, 2000; Lee & George, 2000). The major deficiency with this conventional EIA model however, is the over-emphasis on impact assessments and the neglect of the underlying processes. The works of Fuggle & Rabbie (1992), and Wood (1999 ) are also of relevance because they discuss issues on the relations between the natural environment, human perceptions , and the development process.

The work of Critchley Dirk (1998) in collaboration with the University of Limpopo also needs to be mentioned. The project was about the problem of soil erosion in the Limpopo Province as a whole and how deforestation, among other factors, had been contributing to it. The second report relates to that of Shackleton (1994) who examined the need to grow more trees to support the fuelwood sector in the Limpopo province

A third research project relates to the project commissioned by the CSIR in 1986 on the status and future potential of appropriate energy technology and requirements in the underdeveloped areas of South Africa (Thompson, 1987). The reports were based on a sample of energy utilization in selected areas of the rural homeland regions, the peri-urban areas, and from farm labourers and their families on “white” owned farms in South Africa as a whole.

### **3.4 The provincial government development publications**

In addition to the above, mention can be made of the Limpopo provincial government documents on the development policies, plans, and programmes for the province. It is important to consider these documents since they help to give

one a picture of how the provincial development planning process is being pursued. Each of the provinces in South Africa has produced a 10-year strategic development plan to give indications of the nature of provincial development planned for the 10 year period.

A review of the 2004-2014 Growth and Development strategy for the Limpopo Province illustrates the emphasis that is given to sectoral development. One common feature of the provincial documents is that each sector is presented separately. Each report employs separate, if somewhat uneasy treatment of one or a few development issues thus dividing what, in effect, is indivisible. Even where obvious links exist with other sectors such links are avoided to give the impression of a development situation structured on separate departments. The plan is quite elaborate in the details it provides about each sector but weak in terms of strategies for linking the sectors to sustain the development process. The document treats education, transport, health, mining, agriculture, tourism, and the housing sectors as separate entities (Dept of Finance & Economic Dev, 2005b). The section on regional or spatial development elaborates on the development plans for platinum and chrome mining, coal mining and petrochemical, fruit and vegetable, red and white meat, tourism and forestry clusters development in specific areas of the province. It is important for one to note moreover, that the sectors dealt with in the report belong to the modern, capital intensive technology-based economies.

The section of the document which touches on poverty indicates that Sekhukhune district municipality is, indeed, the poorest region in Limpopo province. The document indicates that Sekhukhune has the highest percentage of the un-employed in the province. There is however no attempt to link the poverty situation to the dominant role of the firewood sector of the region.

Thus nowhere is there any specific mention of the need for an integrated rural energy development strategy aimed for example, at replacing the dominant firewood sector in the document. Although the on-going rural electrification programme is one scheme that has the potential to get rid of the rural firewood sector it is surprising that the programme is not discussed in such a context in the document. This neglect of the potential role of the electrification programme in the long term sustained development of Sekhukhuneland in the 2004-2014 Limpopo Provincial Growth and Development Strategy could thus be considered a serious omission.

Sector-based orthodoxy has thus characterized the existing research and the development planning processes in Sekhukhuneland. Poverty and the dominant role of the firewood sector are major problems in the rural sector of Limpopo province, and given that many of the rural population are largely linked to the firewood sector for their energy needs, one would have expected that the provincial regional development documents will give considerable attention to the relationships between these inter-related development problems. The publications however do not show such important relationships.

Unless development research in the province targets the rural energy sector as a key development problem, the full benefits that could be derived from the research process and development planning in particular could not be attained. The sector-based research and planning problematic can only be dealt with by its replacement by research and planning models guided by integration-based models. All research and planning programmes on the rural development process in the study region should be integration-based however unconsciously.

The integrated approach to conceptualization recommends that one recognises and transforms individual sectors as part of broader development processes covering simultaneously the economic, social, political, environmental and regional spheres. In the conceptual and theoretical dimensions one would thus talk of necessary relations and not about apparently discrete objects (Sayer 1992). In the research methodology dimension, one would also need to talk about the critical realist programme which is a project that relates concrete action (such as the firewood sector) to the relevant mechanisms (Bhaskar, 1975). The realist research paradigm is characterised by a concern with the transformation of concrete actions and their underlying causal factors with a view to contributing positively to the development of those concerned ( Sadler, 1987; Halbach, 1988). This means in this research, seeing poverty, the energy programmes, and the five regional/municipality development plans as the contexts for evaluating the functioning of the existing energy systems in the villages (World Commission on Environment & Development, 1987; Dept. of Environment Affairs & Tourism 1992a; 1992b). The realist approach indicates that social research, philosophy and sustainable development require partnership and collaboration (Thom, 1995; UNDP 1998, ([www.undp.org/energy](http://www.undp.org/energy))). If research on the energy sector of the study region is therefore to benefit the communities concerned, then one needs to pay far more attention to the issue of conceptualization than has hitherto been the case with the existing research projects in the area. One needs to be concerned with how processes operating in the broader five municipalities, in effect, have assigned and have to assign specific tasks to the energy sector at specific periods.

### **3.5 Three prominent development issues for investigation**

From the literature reviews above it emerges that three development issues can be summarised. These three critical issues can also be presented as the three research objectives of this research project with their corresponding theoretical, methodological, and future development planning frameworks.

The three issues are as follows:

- Firstly, one needs to understand the broad development context in which the dominant firewood energy sector has been operating.
- Secondly, one needs to identify the concrete forms of the current electrification programme in the five municipalities of Sekhukhuneland and their developmental impacts, and ,
- One needs to show how the current electrification programme could be

transformed to contribute to the future long term sustained development processes of Sekhukhuneland (Fals-Borda,1984 ; Erskine,1985; Bekker,1991).

The above three issues cannot therefore be seen as research themes that have been subjectively derived, but as real and concrete situations, research questions and development challenges that must be related to the history, geography of development, the culture and the development experience of specific communities. In this connection, one can say that it is the nature of the realities of the social experiences of the Sekhukhune communities which needs to influence the issues that shall be addressed in the objectives of this research. Research objectives must also be related to specific conceptual frameworks (Habermas, 1978; Bhaskar, 1975; African National Congress,1992; Hamman, Booth & O’Riordan, 2000). It is to the conceptual framework of this research that we thus now turn our attention.

## **CHAPTER 4: CONCEPTUAL FRAMEWORK**

### **4.1 Introduction**

In this chapter the three issues mentioned above are elaborated as research concepts which will help to identify connections and the relationships essential to the understanding of the links between the various energy systems, the environmental impacts of the energy sector and their relations with the broader development processes in the Study region (Goldblatt, 1996).

It is to these concepts which we now turn.

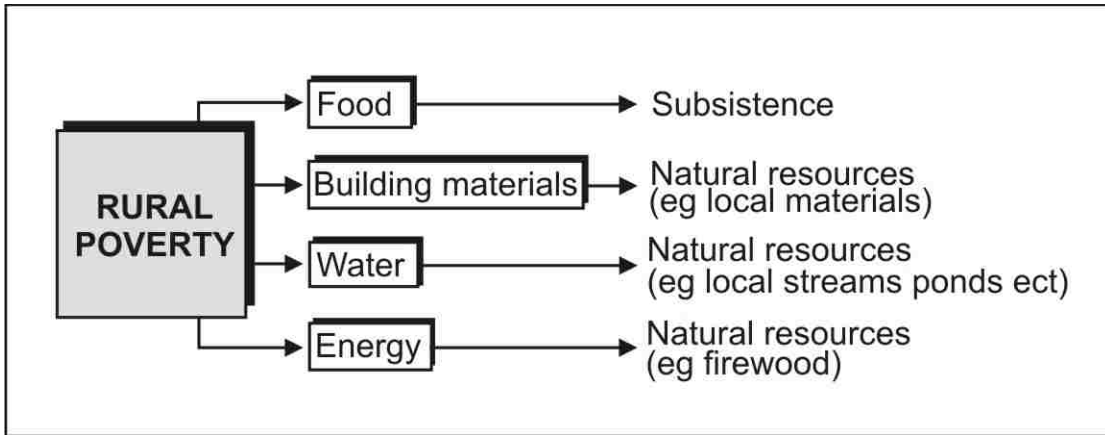
### **4.2 Concepts underlying the first research objective**

With regards to the first research objective, realist theory indicates that people always take decisions in the context of structures or mechanisms. Such mechanisms predispose people to act in certain ways.

Fig.4.1 below is a feedback loop model which outlines how one such mechanism poverty for example, can force poor rural households to continue to remove their vital tree resources for firewood to address their needs with the attendant environmental and economic problems.

Poverty has many dimensions. From the production perspective, it implies lack of resources such as capital and land to produce. From the consumption perspective, it implies lack of accessibility to food, shelter, education, and health. From the social exclusion perspective, it means denial of opportunities, entitlements, deprivation and dependency. From the security perspective, poverty will also imply lack of basic security and safety. Much of these issues boil down to the question of having less than an objectively defined absolute standard and quantity. Poverty thus has various manifestations including lack of income and productive resources sufficient to ensure sustainable livelihoods, hunger and malnutrition, ill health, limited access to education and other basic services, increased mortality from illness, unacceptable hardships such as homelessness and inadequate housing, unsafe environments, social discrimination and exclusion. Poverty is also characterised by a lack of participation in decision making, and in civil, social, and cultural life (Spicker, 1999).

There are various types of poverty such as absolute poverty defined by experts, such as the United Nations definition of < \$1 or <R7.20 a day (World Bank, 1990); relative or subjective poverty defined by communities themselves; integrated poverty, which affects people who are in salaried employment or whose poverty is concealed because they are otherwise part of existing social networks; transient/periodic/short term/sporadic/traumatic/ poverty; and chronic/structural/endemic/long term poverty.



**FIG 4.1 : The causal powers of poverty**

The absolute poverty concept is one popular definition which cuts across different nations, localities and communities. The World Bank's "universal poverty line" permits cross-country comparisons and aggregations (World Bank 1990). The \$1 a day yardstick is the bank's threshold of low income or resources marking a change in the capacity of people to meet the needs (material and social) enjoyed by society. This yardstick has its South African equivalent in rand terms, whereby current daily incomes below R7,20 implies poverty.

Appendix 2 provides some information about the different definitions and measures of poverty.

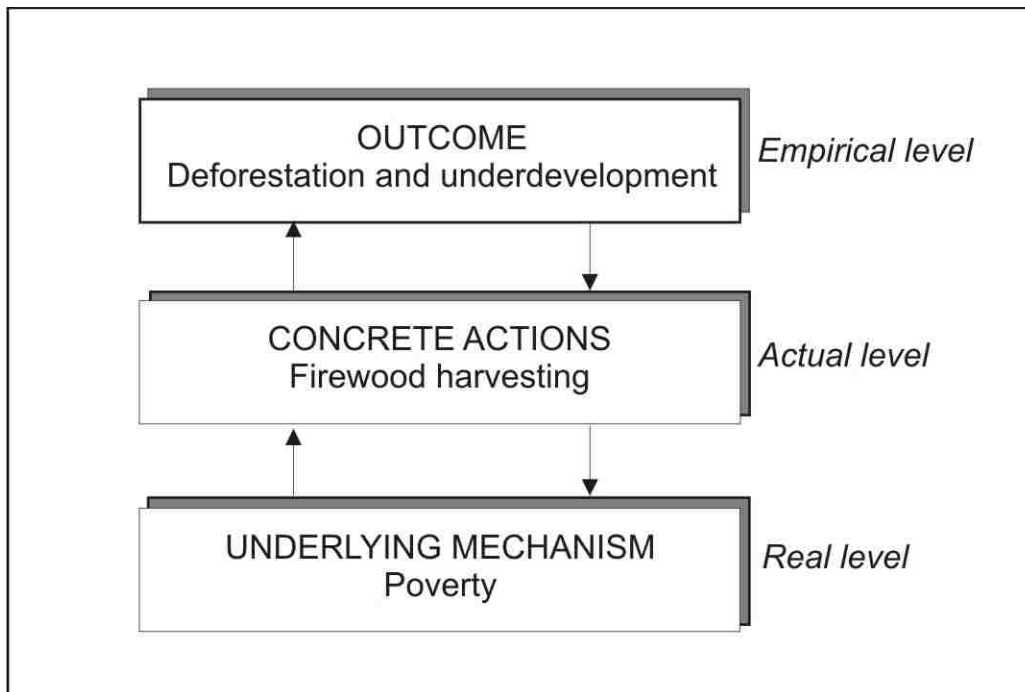
Appendix 5 provides some information concerning the measurement of The Human Poverty Index.

Poverty is a key issue in this research project because it has causal powers to produce certain outcomes such as reduced life expectancy, stress, starvation, consumption of unsafe water, limited access to education, and withdrawal symptoms, among others. For this research, poverty is commonly cited as the reason why poor rural families are forced to use firewood as fuel leading to major deforestation problems (Martinez- Allier, 1990).

Fig. 4.2 is a realist stratification model illustrating how the real, actual, and empirical levels can interact to influence adversely the rural energy systems. Fig 4.1 and Fig 4.2 indicate that the poverty mechanisms behind concrete actions can be real and can have major implications for long term development processes.

Consumption then becomes a critical factor in this study. Almost all human activities tend to put pressure on the natural environment through food consumption, housing construction, clothing demands, water consumption, and above all, energy consumption. In the study region, energy consumption or demand is thus a key issue whose impact needs to be unpacked.

The information in Fig. 4.1 above is very much rooted in the fact that rural poverty has causal powers to force poor households to engage in consumption activities which tend to have detrimental effects in their long term rural development process. Although quite aware of such negative consequences, such poor households often find themselves in a dilemma when forced to deplete some of their vital natural resources such as trees for their building materials and firewood to address their energy needs. Yirenkyi-Boateng, (2001), used the term "the poor man's dilemma" to describe such situations.



**Fig 4.2 A realist stratification model indicating the relationship between poverty, the firewood sector and deforestation**

### **4.3 Concepts underlying the second research objective**

With regards to the second research objective, the critical realist theory indicates that people in their various environments always simplify their world by making a few familiar choices to achieve certain goals, aspirations, and interests (Habermas 1978; Chambers, 1983; Sayer 1992, p.88). Thus, with regards to the current electrification programme, one expects the poor rural households to make choices/rankings regarding which of the sources of energy would be paramount in their lives (Warren, Slikkerveer &

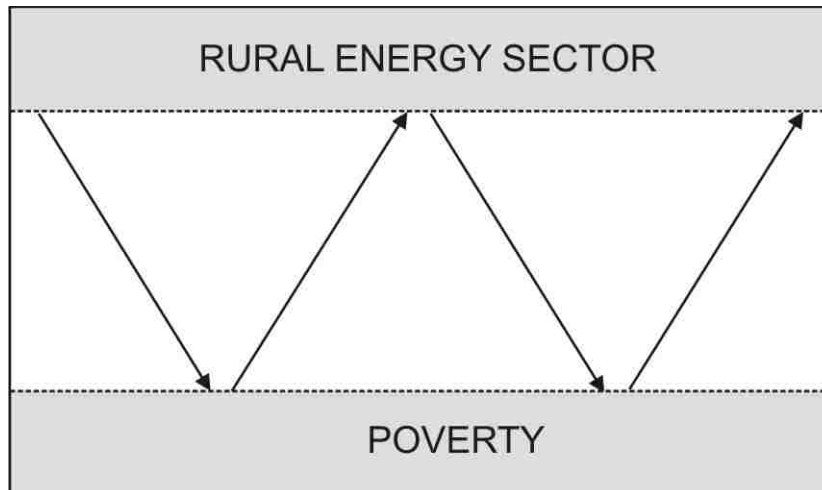


Brokensha,1995).

This would thus take the decision makers into the realm of choices in which their perceptions concerning “rationalism” would be paramount. The rural households would interpret “rationalism” from their own lenses/interests. The communities would have their own epistemologies of the solutions to poverty and its related energy system. This is what is known as designative perception which is a measure of the amount of information or knowledge which people may have about a phenomenon. From their experience, the community would learn that the energy sector selected, (eg, the firewood sector, or electricity) will have its distinct causal powers or impacts in the broader community by virtue of its nature (Boscovitch, 1966; Harre & Madden,1975; Eberhard 1992). The abstracted elements associated with the particular energy choice will therefore represent a totality of internally related parts of causes and effects, the nature of each being understood only in terms of its relationship to the other elements in the overall system.

The realist research paradigm thus requires that researchers endeavour to understand people by giving them the freedoms to explain the reasons behind their choices or actions. The approach indicates that the causes of social phenomena are related to the meanings behind the actions of individuals and groups. The paradigm shows that the empirical world is a created world of meanings and interpretations and that therefore researchers need to go beyond the empirical world and seek explanations and understanding in the intentions behind the actions of people (Johnston, 1997). This requires that researchers get close to the subjects of research, ie, the people involved in their research by immersing themselves in interaction with them, not as mere research “objects”, however. Rather, researchers need to call the research objects of study as the subjects, ie as the actors. Realist researchers thus need to describe social realities from the perspectives of such subjects and not from the perspectives of the researchers.

Since actors operate in the context of certain mechanisms, realist theory requires that a distinction is made between agency (the actors), and structure, (the mechanisms). Fig 4.3 below indicates how poverty, under certain circumstances, could constitute one mechanism providing a context for the rural households (the actors) to take energy-related decisions. The model indicates that from the structuration perspective the energy system can be ineluctably shaped by poverty which can generate unintended outcomes in the form of firewood-induced deforestation which, in turn, can form the context for future reproduction. It is this intimate connection between production and reproduction which Giddens (1984) terms the recursive character of social life.



**Fig 4.3: The rural energy sector and poverty: a structuration perspective**

Fig 4.4 below, is a further elaboration of the feedback loop concept illustrating how communities can be controlled by the routines they are used to or forced to use. The model indicates that the firewood sector can, under certain circumstances, define what issues should be considered, what questions should be asked, and what solutions should be provided (World Bank, 1986; 1989). Under such circumstances, the communities concerned can find themselves in a dilemma, operating with a routine, sector or rules which may continue to frustrate them (Claval, 1980; Boudon, 1982; Lukacks, 1978 ; Blaikie, 1985; Toyé, 1987; Martínez-Allier 1990; Stein, 1990).

The model indicates that poverty, the firewood sector and deforestation can operate jointly to worsen the prevailing situation. The illustration depicts a situation in which poverty and the firewood sector can be the cause and effect of the deforestation crisis, ie the two can produce the deforestation problem which in turn can also constitute the enabling medium via which the firewood sector can be reproduced (Giddens, 1984). Under such circumstances, the world can appear as a “closed “ or “reified” system or a structured group with little prospects for getting out of the situation or circle.

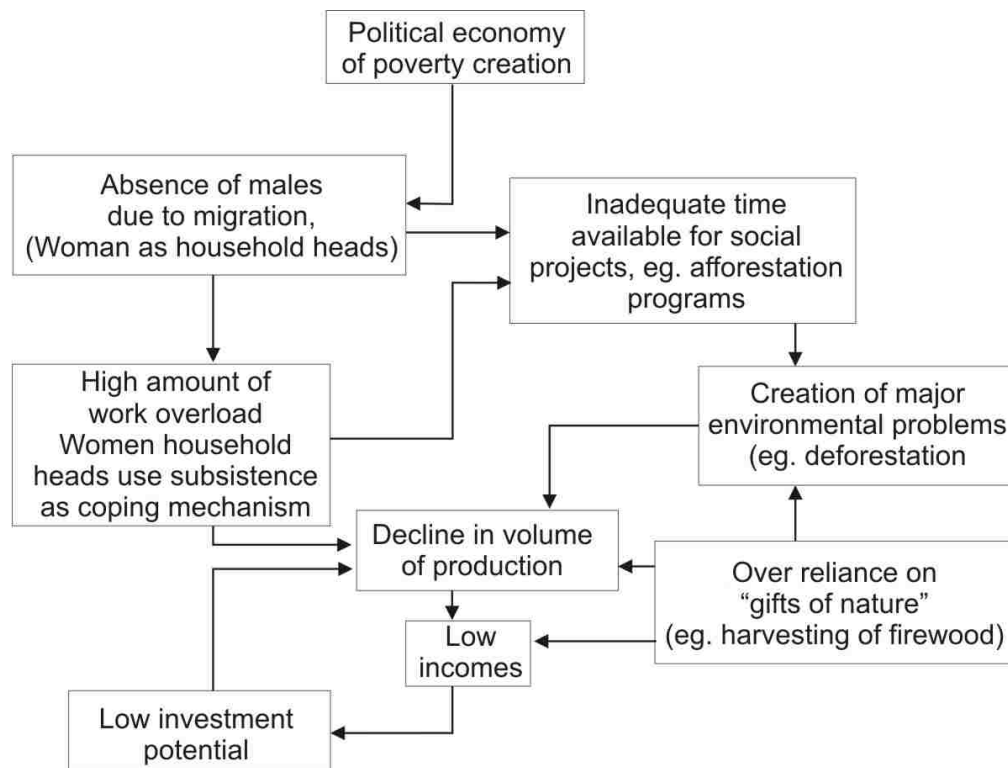
Realist and structuration theories indicate however that within the apparent

constraints set by the mechanisms at the real level, agents always have some freedoms to make choices. Thus, the same mechanism (such as the current electrification programme) can elicit different responses from the people or agents concerned thereby producing different outcomes or impacts.

#### 4.4 Concepts underlying the third research objective

Critical theory illustrates that the symmetry between objects and their concrete outcomes applies only in closed deterministic systems where constant conjunction of events occurs. This is however rare in social systems. Critical theory indicates that the concrete social activities of communities tend to occur in the context of some degrees of freedom (Toye, 1987; Halbach, 1988; Todaro, 1994; Brookfield, 1975). Within the constraints set by current realities or the status quo, critical theory therefore tells us that communities must always be given ample opportunities and the confidence to make new beginnings all the time (Habermas, 1978; World Bank, 1983; UNDP & World Bank 2003).

Good social research must therefore incorporate the critical and action-oriented perspectives. These perspectives must be capable of providing communities with new knowledge capable of getting rid of their development problems to improve their situations (Kuhn, 1970). Education is one of the tools required to introduce such positive changes (Coetzee, 1992).



**Fig 4.4 : A causal modelling of the problems associated with the rural firewood sector**

Running through the works of critical theorists such as Bhaskar (1991), and Habermas (1978) are their treatment of how to overcome the problem of reification or routinization. In the animistic sense, reification refers to situations where social relations are attributed with personified characteristics such as the concept of “fetishism of commodities”. Reification also applies to situations in which social phenomena, such as the problems of government/institutional controls in the lives of rural communities, or the dominant position of the fuelwood sector in a rural economy, are endowed with natural properties to the extent that communities find it difficult to change the situation. By becoming obsessed with their present situation, people may therefore attribute undue causal or “natural” powers to their existing systems as will be discussed below in chapter six. Under such circumstances, social structures can exert dominating influences over people. In so far as “natural” is understood as referring to conditions in which empirical reality appears to have fixed and immutable character of natural laws, it can be regarded as the principal ways in which the naturalization of the present and the empirical can be effected (Harre & Madden, 1975).

The works of Balassa (1971), Little & Mirrlees (1974), and Lal (1983), among other contemporary development theorists, indicate however, that it is possible to provide new knowledge (education) and other forms of assistance to communities to enable them to free themselves from their obsession with what they consider to be natural. For illustration purposes, one could cite the research works of some South Africans who are convinced that the leucaena tree for example, is an excellent source of firewood which needs to be introduced to the public (Munnik, 1994). From another perspective, Lumby (1996) has also identified landfill gas as a renewable energy option for the urban poor. The United Nations Report (UNEP, 1996) also illustrates how specialists from various disciplines could be brought together to work as teams to introduce new and simple forms of energy systems to accelerate the rural development process. These examples indicate that there are various forms of innovations (new knowledge) that need to be disseminated to the rural communities to expand their perceptions regarding alternative energy sources as will be illustrated in chapter seven below. Opening up communication channels is therefore one mechanism that needs to be employed to assist the development of underdeveloped communities (Erskine, 1985; ANC, 1992; Matlala, 1992).

Undue centralization of political power and development policies in the hands of a few outside-based powerful public officials has long been a major problem in the sustained development of the rural areas of the former homeland regions. Rural development programmes were over-centralized and insensitive to local needs during the apartheid period. The poverty problems, the dominance of the informal sector and the related underdevelopment problems are all social constructions. It is ironic that the majority of the people of Sekhukhuneland can be consciously marginalized and

subsequently given the labels “poor”, “unproductive” and “informal”. Instead of encouraging the rural sector to grow, the authorities almost without exception did their best to frustrate this sector by acts of omission and commission. Apartheid planning was also antithetical to external participation in the development of the former homeland regions such as former Lebowa. The rural development planning programmes operated under international sanctions thereby reducing the number of potential external stakeholders who could have assisted in the rural transformation processes.

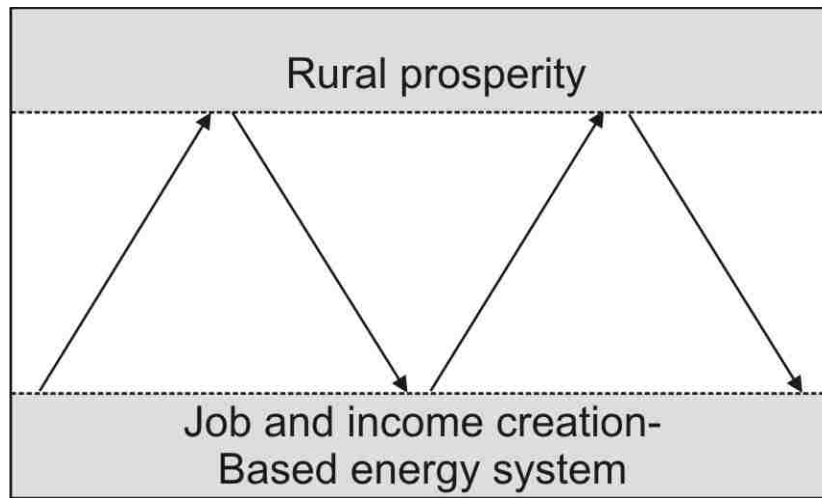
Since the onset of the new political dispensation in 1994 however, new positive partnerships are emerging between the state, civil society and the business sectors of South Africa (The Advisory Committee, 1997). The provincial and local governments in the underdeveloped rural regions of the former homelands in particular need to be encouraged to strengthen their bonds with the rural poor with a view to accelerating their development. Individual households and communities need to be shown numerous doors of opportunity to take key decisions in their local development planning processes. This therefore translates to that of changing the nature of interactions so that all potential stakeholders can come in to make maximum contributions towards the rural community development processes. More opportunities must therefore emerge in the direction of greater interactions (bonding) to counter the previous policies of separation, reductionism and top-down development planning (See Appendix 8).

Fig 4.5 and Fig.4.6 below are integrative normative models illustrating how poor rural communities could be assisted to relate their energy systems to their long term development in a sustained way.

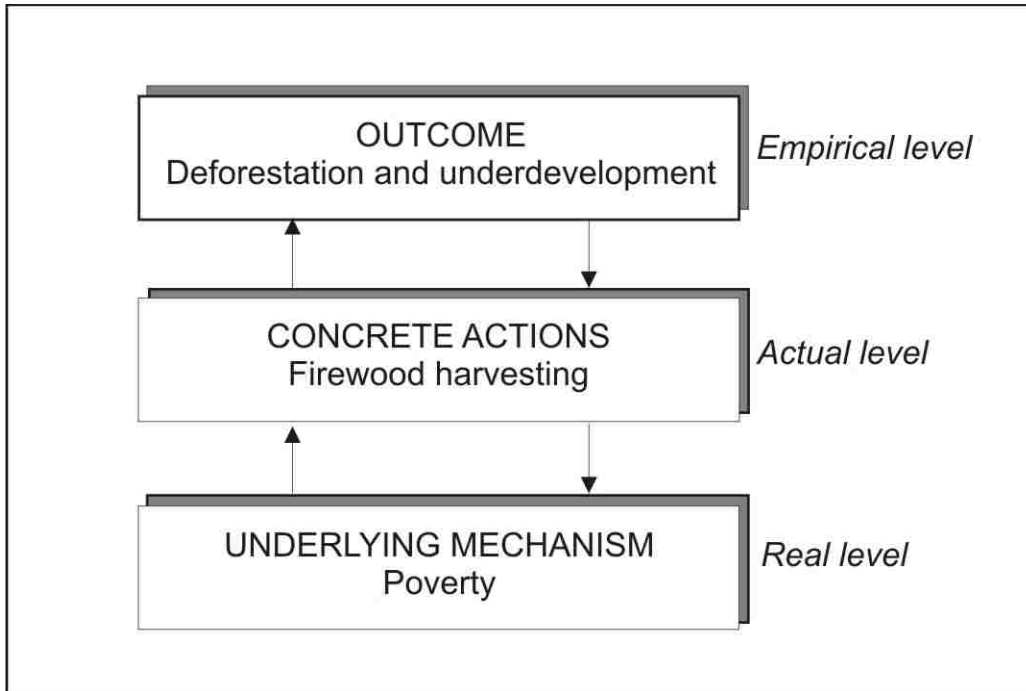
Critical theory is implied in the two models below. Critical theory is emancipatory because it seeks to free agents from the dominance of any exclusive paradigm of development. It is an ontological stance which recognises the need for opening new development planning opportunities to people all the time to integrate and to get rid of distorted development structures to improve upon their existing development situations (Mercer, 1991).

In the former Transkei homeland region, for example, the Eastern Cape Appropriate Technology Centre, with the support of the Eastern Cape government has been able to successfully introduce stoves and solar energy plants to several rural communities thereby relieving the pressures on their forestry sector (ECATU, 2000). The changes have been made through years of constant dialogue between the rural communities and post-apartheid reconstruction institutions such as ECATU (van Arkadie, 1989; Yirenkyi-Boateng, 2001).

There are numerous such examples from other parts of rural South Africa and other Third World countries in general which indicate that opportunities exist for establishing positive relations between local and outside institutions such as non-government organizations for promoting sustainable



**Fig. 4.5: Job creation and income generation as key elements of a sound rural energy system**



**Fig 4.6 : A realist stratification model for addressing the problems illustrated in Fig 4.2**

development (Coetzee,1992) .The model of integrated development planning and research as elaborated by Balassa and others above is therefore the paradigm which this research associates with. It associates with a dynamic community-driven world, a world- in-the-making, rather than a “natural” top-down world-already-made by and for others. Rather than seeing development as possessing discrete immutable and apparently closed properties, the realist model rather sees the world as one which is full of relations and positive transformations (Bhaskar,1991).

This is where the ideas inherent in contemporary development reports can also be of help ( World Bank,1986,1990, 1997). The reports stress that one needs to see current states of regional development as being always in the process of becoming other than what they are at any moment by virtue of relations; that the stage of regional development reached at any moment provides communities conditions for further interactions; that the specification of the state of affairs at any moment indicates alternative futures in terms of the constitution of objects; and, above all, that freedom from domination, obsession and reification are important keys for empowering rural communities for positive change. The reports clearly emphasize that poor rural communities need the necessary support to empower them to always have the means to learn new things, make new development partners, and find new solutions to old problems and therefore make new beginnings in their lives.

Critical realist theory has an important contribution to make in all this. The critical model envisages development plans which speak to the actors or intended beneficiaries themselves. It seeks to provide a means whereby people can solve problems which face them, and whose truth thereby is judged partially on the basis of whether or not the satisfactions which it promises are forthcoming.

Power relations, above all, are central in all this (Poulantzas,1973; Lukes,1974). The state institutions are the right candidates to mobilise resources to facilitate the local development processes.

The above models (Fig 4.5 and 4.6) thus highlight the fact that the relational perspective must constitute the theme of this research. This research cannot be concerned with energy as an isolated phenomenon. The more one tries to confine the research to the energy sector, the more one realises, in fact, that important political, economic, historical, social, environmental, and regional planning issues are all involved. Critical realist theory and research methodology thus have sufficient merit to constitute the backdrop to the research.

The main strengths of the realist project can now be summarised as follows:

- The theory can assist outsiders to understand the way others



organize their activity systems;

- Secondly, it can help outsiders to better understand the sources and the nature of the problems and contradictions associated with day-to-day developmental routines.
- Realist theory can assist to bring local underdeveloped communities and outside government and non-government organizations to work together to identify the way forward for a better future. For example, the theory can be used to indicate to the communities concerned the various rural energy forms which they may not be aware of, but which have the potential to uplift their living conditions. One key merit of the critical realist project is its stance that there is no one ontological structure, no one epistemology, and no one solution in the social world, and that therefore the search for new answers to existing problems must continue all the time through various forms of interactions.

#### **4.5 The regional concept**

Taking all of the above into consideration, it could be observed then that this research project must open a new important chapter in the research works on the rural energy systems of Sekhuhuneland. To do this, one needs also to take the concept of the development region seriously. One needs to focus attention on this district municipality to highlight the role of the region as the context for regional development analysis and planning. One needs to do so in the context of the major environmental and other development problems which the rural energy sector is creating in the district municipality.

Contemporary development theory in South Africa has become highly concerned with the region (defined in this study, in terms of the five municipalities) as the site of analysis. It is in the region that social interaction and activity occur in space-time, and as such, the region has become increasingly understood as indications of how changes take place as a result of general tendencies being played out in particular places/milieux/regions by people socialized by place. (Giddens ; Johnston, 1997). Regions indicate how people structure their social lives by setting development goals which in turn give rise to distinct patterns of regional development (Thrift & Peet, 1989) . In the contemporary development discourses of South Africa, decentralised local community development programmes, policies, plans and problems are some of the key themes ( van Arkadie, 1989; ANC, 1992). One needs therefore in this research to illustrate how the people of the Sekhukhune District Council relate their current rural energy issues in the five municipalities to their broader development imperatives to reflect what they feel their social lives must be like. Above all, one needs to demonstrate how government and other external institutions need to interact with the five municipalities (regions) to address their energy and its related problems. This means, as already mentioned, one needs to associate with the development theory which calls for increased interactions between

interested external development institutions and local communities (World Bank, 1995). One cannot therefore be interested in the locality research perspective which subscribes to the interpretivist view that “the power of the state and other externally-based organizations must be rolled far back to enable local communities to survive on their own” (Dearlove & White, 1987). One cannot also subscribe to the view that final solutions have been found for the rural energy problems of the study region. Such reductionist positions can only retard the rural development process by conceptualising the development process as being closed around limited objects in the spatial and temporal senses. Local regional development planning promoted through on-going partnerships needs to be one fundamental issue in any research projects concerning the role of the rural energy systems in the sustainable development of Sekhukhuneland (Brundlandt, 1987).

Critical realist theory will therefore provide the philosophical framework within which the specific development questions in this research will be posed and answered under specific validity conditions (epistemology), and in the context of particular construals of reality (ontology). Critical realist theory and methodology then will constitute the framework for this research (Morrow, 1994). It is to the research hypotheses associated with critical realist theory we have just examined that we now turn our attention.

#### **4.6 Research hypotheses**

Hypothesis 1: Political decisions have been and are still integral parts of the development of the Sekhukhune district municipality

Hypothesis 2: Poverty will predispose the rural communities of Sekhukhuneland to rely on cheap or free sources of energy such as firewood to address their energy needs or demands.

Hypothesis 3 :The firewood-based energy system will operate to put pressure on the rural areas to create deforestation and other related development problems.

Hypothesis 4 : Rural electrification programmes properly implemented with education programmes as part of broader regional-based development plans, will be a major solution to the current rural energy crisis of Sekhukhuneland.

## CHAPTER 5: RESEARCH METHODOLOGY

### 5.1 Introduction

This chapter indicates how data was collected and analysed to address the three objectives of this research as indicated in chapter one and as elaborated in theoretical terms in chapter 4 above.

The research design was as follows:

- **Observation.** In the first case, pilot surveys were organized to enable the author to observe the general conditions of living in the five municipalities in the study region.
- **Units of observation.** The five municipalities of the Sekhukhune District Council constitute the units of observation. As already noted, the five regions have been created under the South African constitution to perform specific local development functions by relating to the various government departments. To get access to the conditions of development at the grassroots level, information gathering was organized at the ward and tribal authorities levels.

**Classification.** This means the grouping of defined items ( eg the energy systems in relation to the socio-economic conditions of the five municipalities) which collectively make up the universe, into a number of defined energy system classes. The 4 chief characteristics of classification are as follows:

The starting point is the units, (the 195,285 households in the five municipalities) which make up the universe.

The emphasis is on the similarity of the units with regard to certain properties or relationships, that is, energy usage.

A hierarchy of classes is built up by grouping.

Reasoning is inductive, (from the particular to the general).

**Data Collection.** Data was collected to address the three research objectives mentioned in chapter one. Information was initially collected on historical overviews of the local development policies and programmes which have structured the development processes of the five municipalities. This type of information was obtained from various offices at Polokwane, and from the head offices of the 5 municipalities such as Glibersdal, and Jane Furse.

Attention then turned to the total number of settlements in the Sekhukhune District Municipality. The total number of settlements in the study region is 529 as noted in above under The study region. The total number of settlements also

constitutes the target population

Sampling from the 529 settlements thus also became critical. 4 settlements were selected from each of the five municipalities, giving a total of 20, which is about 5% of the total 529 settlements in the Study Region

The 20 settlements were sampled on the following criteria:

In each municipality, the stratified sampling method was used to select the villages. In stratified sampling the population is divided into strata which are groups of homogenous or similar individuals. Thus, the villages were classified into unelectrified, electrified, deforested villages and the very large villages. A simple random sample was then drawn from each stratum, giving a sample representative of the population (Leedy, 1997; Neuman, 1997). The process was as follows:

Selection of one unelectrified village in each municipality to find how the communities are coping without electricity.

Selection of one electrified village in each municipality to find out why the village got connected to the power system and the impacts of electricity on the communities.

Selection of the largest rural settlement in each municipality to find the relationship between population size and the supply of electricity.

Selection of one highly deforested village in each municipality to find any possible links with the firewood sector and efforts being made to address the problem.

It is important to note therefore that the 20 villages were selected to relate the current energy systems to specific development issues such as the levels of poverty, the relationship between settlement sizes and the form of energy used by the households; the relationship between electricity availability and deforestation; the reasons for the high levels of deforestation in some of the villages and the possible links with the firewood sector, if any and finally, the opinions of people regarding the effective strategies which they think can relate their energy sector to the long term development of the Sekhukhune rural communities.

## **5.2 The 20 villages sampled for the research**

On the basis of the above, the following 20 villages were selected from the 5 municipalities. The names of the villages appear below:

**Table 5.1 : Number of Houses in the 20 villages sampled for the study**

***Makhuduthamaga***

Maleseng :110

Tjatane :1200

Phokoane: 1600	Dinotsi :130	
<b>Fetakgomo</b> Mohlaletse :2100	Matlala : 81 Ga Seroka :210	Ga Radingwana:360
<b>Greater Tubatse</b> Gamashamtana: 2200	Ntswaneng: 184 Ga Mongatane: 310	Selala/Manyaka:2000
<b>Greater Marblehall</b> Mohlalaotwane: 700	Magaladi: 186 Moganyaka: 240	Kromdraai:176
<b>Greater Globblersdal</b> Tafelkop : 2050	Oorlog : 80 Mpheleng: 270	Kgobokwane: 460

Source : Field Research: Jan 2003- Aug 2004

The figures above indicate the number of houses in the villages selected for the study. It is clear that Gamashamtana (in Tubatse Municipality), has the largest number of houses (2200) among the settlements selected for this research.

#### **Selection of households from the 20 villages.**

With so many houses (target population) to contend with, it became necessary to select some of the houses as the sample for data collection. To obtain a fair representation of all the houses, it was decided to use the stratified sampling method to select 5% of the houses in each of the 20 villages indicated above. Table 5.2 below indicates the number of houses that were sampled.

**Table 5.2 : The 700 houses sampled for data collection and analysis**

<b>Makhuduthamaga</b> Phokoane : 80	Maleseng : 6 Dinotsi : 7	Tjatane: 60
<b>Fetakgomo</b> Mohlaletse : 105	Matlala : 4 Ga Seroka : 11	Ga Radingwana : 18
<b>Greater Tubatse</b> Gamashamtana: 110	Ntswaneng : 9 Ga Mongatane : 16	Selala/Manyaka : 100
<b>Greater Marblehall</b> Mohlalaotwane 35	Magaladi : 9 Moganyaka : 12	Kroomdraai : 9
<b>Greater Groblersdal</b> Tafelkop : 103	Oorlog : 4 Mpheleng: 14	Kgobokwane : 23
<b>Total Number of Houses</b> :	<b>700</b>	

**Primary Data Collection** : Data collection involved visits to the households

where face-to-face interviews were organized. The 20 villages were selected to ensure that the various critical issues such as population size, the availability or otherwise of electricity, and the levels of deforestation were all taken into account to avoid the problem of sampling bias. The data collection exercise took place between January 2003 - August 2004.

Appendix 6 shows the list of questions posed to the households. The questionnaires were pre-tested in 2002 to evaluate the likely accuracy and consistency of the responses.

The research instruments included:

Observations as in cases of major deforestation problems and the time-space prisms of the households in relation to the energy sector among others.

Face-to-face (one-to-one) unstructured in-depth interviews were held with the heads of the households (Neuman, 1997)

Focus Groups: A small number of the households, (about 8-12) were brought together from time to time in group discussion formats led by the interviewer

Delphi Technique: The inputs of acknowledged experts on the topic such as the headmen, the elderly, and government officials were deliberately included in this research.

Projective Technique: Respondents were given some tasks to complete such as the key factors needed to sustain the rural energy system.

Ethnographic Research: Long periods of time were spent with the respondents to enable them to interpret their activities to me, the author (Strauss & Corbin, 1990).

Content Analysis: The research sought to capture the percentages or content of the various energy forms in the overall development of the communities (Marshall & Rossman, 1995).

In collecting data from the rural households the ideas of Chambers (1983) helped a great deal. Chambers mentions 5 types of biases which people undertaking research are advised to avoid such as:

- Spatial bias involving the avoidance of remote villages.
- Project bias involving bias towards activities showing signs of low profitability, for example.
- Person bias involving the avoidance of people of low socio-economic status, or the deliberate inclusion of people of high socio-economic status, for example.

- Dry season bias involving the organization of research only during the favourable seasons for instance.
- Professional bias such as in cases where the researcher looks down upon non-professional respondents.

**Secondary Data** was collected from a number of government offices of the five municipalities and also from the offices of the provincial capital, Polokwane.

### **5.3 Getting internal access to the minds of the respondents**

Regarding the first two research objectives, the data collected from the various institutions and individual households connected with the rural energy systems of the 5 municipalities constitutes the actual level in critical realist research. Open-ended methods of data collection were used to enable a sample of the rural households (some 700 of them ) in the five municipalities to indicate :

- how they have selected their particular energy systems in terms , among other things, of their importance in their lives, and the underlying reasons.
- how they conceptualise their energy system in terms of the existing programmes on energy and the local development processes.
- the amounts of energy used by the households and the underlying reasons
- the impacts of the energy systems in the development of the communities.

Participation and interaction with the respondents enabled the researcher to experience the realities on the ground subjectively. Watching and listening were crucial for the researcher to gain a deep understanding of the meanings attributed to the energy sector by the respondents. By conducting the series of unstructured interviews, the researcher was able to develop emphatic understanding and gain insights into the personal circumstances to the 700 households in the 20 villages. The qualitative research approach enabled the researcher to get close to the respondents to learn the reasons behind their activities. This made it possible to describe the realities from the perspectives of the 700 respondents as subjects (Kitchen & Tate, 2000).

The analysis of objects of interest is always done in context. One important task was to ask the respondents to indicate how energy is used in income generating projects such as water pumping, for irrigation, sewing, weaving, handicrafts, agro-processing, crop and meat drying/freezing, kiln firing for pottery, welding and wood-working in the communities. In terms of social services, data was also collected to indicate how energy is used by the households for lighting at homes and community centres, for cooking, for water pumping for drinking, for operating

medical equipment in health centres, for community street lighting, and for telecommunications. The above indicate only some of the many investigations. The households were given opportunities to indicate all the other important functions played by their energy systems.

#### **5.4 Data analysis.**

To analyse data in social research, the concepts (constructs) relevant in the research is important. A concept is a generic idea formed in the mind. The idea is a combination of a number of similar characteristics of the concept. The characteristics are the variables that collectively define the concept and make measurements of the concept possible. For example, development policies, poverty, energy systems and deforestation, are key concepts that needed to be analysed in this research. Thus, these concepts that were to be measured were clearly identified, defined and then methods of measurement found. Logical integration of these concepts then provided a theoretical framework which facilitated empirical investigation of the research problem (Flowerdew & Martin, 1990; Strauss & Corbin, 1990). See Appendix 2 and 5.

Techniques such as the Likert Scale, the Repertory Grid Test and Personal Construct Theory were used to enable the respondents to rank order the sources of energy in their communities (Potter, 1984). A summated ratings scale attempts to measure attitudes or opinions, typically using a 5-point or 7-point scale to assess the strength of agreement about a group of statements. For each point on the scale, a label was developed to express the intensity of the respondents' feelings. There are several statements which typically all relate to a single concept, such as opinions about the dominant energy system. When the scales for all the statements are summed up, it is referred to as a Likert Scale.

The triangulation method was also used to address different issues. Triangulation prevents researchers from accepting too readily the validity of initial impressions; it enhances the scope, density, and clarity of constructs developed during the course of the investigation. It also has the potential to correct any biases that may be associated with the different research instruments. The interview method, for example, was used to enable the respondents to freely indicate their levels of knowledge regarding the elements that need to interact to sustain their fuelwood sector. The Projective Technique (Murstein, 1965) was used to enable the respondents to display their levels of knowledge on specific topics on their fuelwood industry by asking them to complete certain tasks which we term "The Conceptualization Test" in this research. In this test, one starts with one element of the energy sector concerned such as the firewood sector, and would expect respondents to sketch out what other elements they felt need to interact with that first element in order to sustain the whole rural energy system (Turner, 1982). The respondents were also required through interviews, to indicate what impacts/functions/roles they would like their energy system to generate in their communities. (See Appendix 6).



Where relevant, statistical techniques have been used to identify certain quantitative relationships between the variables that were collected. From the critical realist paradigm perspective, Extensive Research is concerned with such issues (Sayer, 1992; Neuman, 1997). The data so obtained was supplemented with qualitative data to obtain more insight and balance into the changing impacts of the energy sector. From the data analysis it was possible to identify trends in the impacts of the energy sector and their underlying factors in the 5 municipalities.

### **5.5 The critical dimension of the research methodology.**

On the third research objective, the respondents were required to indicate the nature of the problems which they associate with their energy systems and the solutions which have been tried to address them. This made it possible to identify the current problems and contradictions associated with the energy systems (Sayer, 1992; Yirenkyi-Boateng, 1997). The communities were then asked to indicate and justify what they think will constitute long term solutions to their energy needs (Goulet, 1989; World Bank, 1995; Dept of Minerals & Energy, 2002). (See Appendix 6).

From the opinions expressed, workshops were then organized to enable the communities in the five municipalities to interact with external-based government and non-government organizations to think through new and hitherto unknown and perhaps better energy development plans and programmes that could supplement the efforts of the government. This aspect of the research objective was very crucial since sustainable development needs to involve building partnerships (von Haren & Eberhard, 1995). There are alternative rural energy forms that need to be explored. The rural energy systems cannot be closed around the conventional electricity concept. Neither can they be closed around the firewood sector. The unknown alternatives may, in fact, hold better prospects for rural community development than the taken-for-granted conventional methods. This section of the research project was undertaken to highlight the need for networking with other institutions for new knowledge on rural energy development programmes as an on-going process (Healey, 1979; Morrow 1994).

The various steps indicated above were followed to satisfy the critical research requirement that a good social research must be empirical, interpretive, and critical (Sayer, 1992). The empirical element deals with issues such as statistics on poverty levels and the amounts of energy consumed in the villages; the interpretive element deals with how the households make choices regarding the energy options; and the critical element deals with how new knowledge and opportunities could be provided to the communities to enable them to get rid of their current energy-related development problems.

The next chapter is an outline of the findings as related to the first two research objectives and the related concepts and hypotheses.

## **CHAPTER 6: RESEARCH FINDINGS**

### **6.1 Introduction**

In keeping with the numerous references which have been made to the realist research paradigm above, the findings reported here are based on the realist principle in which the activities of agents are not considered as pre-given but as social constructions. The findings reported here illustrate that by a series of common-sense constructs, the rural communities studied have selected and do interpret their worlds in various ways to address what is relevant to them (Tesch, 1990). Thus, in this chapter, I, (the researcher), am interpreting the interpretations of the rural households to the reader so that mutual understanding, which is the goal of hermeneutics, could be achieved. As is commonly known, in the social sciences, researchers always work in the context of a double hermeneutic (Giddens, 1984). The findings reported here thus belong to the first stage of the double hermeneutic. The second stage of the double hermeneutic appears in the next chapter.

### **6.2 The political economy of poverty in Sekhukhuneland**

The field research indicated that Sekhukhuneland is one of the poorest district municipalities in South Africa. As part of the former homeland of Lebowa, the district was structured along the previous apartheid spatial division of labour to provide cheap labour to the mines and farms of “white” South Africa. The migrant labour system has left the bulk of the household activities in the hands of the women whose numerous household tasks make it difficult for them today to enter the cash economy. Production is basically for family subsistence. Family incomes thus depend solely on remittances from the migrant workers or the meagre pension monies. The rural per capita incomes are therefore low - below \$1 per day, about R7. 20 per day. The post-apartheid dispensation has not gone far enough to change the living conditions of the rural population to any great extent.

The field research indicated further that women continue to constitute the rural household heads ( Parpart, 1989). They are mostly married and aged above 50 years with little or no education. The average family size stands at 5 children. From the research, it emerged that the women have spent the bulk of their lives in the villages. Job opportunities in the formal sector are scarce in the villages for the women who are therefore forced to spend the bulk of their time attending to the family needs through subsistence activities such as crop, livestock and poultry farming. Other household activities include repairs to the homesteads, engaging in small scale handicraft activities where possible and paying social visits to neighbouring homesteads.

Table 6.1 below gives a picture of the low income levels in the study region.

**Table 6.1: Monthly imputed household incomes**

Income range	Number of households
Less than R 800	143078
R 801 – R 3200	38478
Above R 3200	13729
Total	195285

Source: Stats SA. Census 2001: Key Municipal Data : 197

Field research indicated that the agricultural sector relies largely on subsistence crops such as maize, groundnuts, beans and watermelons. Lack of crop rotation and non-use of fertilisers promote the problem of soil erosion. A review of the current Integrated Sekhukhune Development Plan ( Limpopo Provincial Government, 2004) indicates that the government departments are somehow in the process of co-ordinating their plans to empower black farmers, to support local agricultural co-operatives and the livestock farmers to rehabilitate the existing community irrigation schemes (especially along the Olifants River), to encourage dairy farming, and provide farmers with the necessary capital and technological support to raise their incomes. On the whole, however, there is increasing evidence that there is lack of commitment to such programmes. Thus, one observes that in the agricultural sector, the rural households are still very dependent on the few white commercial farmers for the basic food supplies. Rural food insecurity is therefore still a problem.

The study region is rich in minerals however. Mining activities are concentrated in the Dilokong area of the Tubatse/ Steelpoort municipality. The main mining activities relate to platinum and chrome. There are 12 existing mines and 22 potential ones.

In terms of manufacturing industries, it emerged from various sources that the study region has no major factories, hence one reason for the continuous out-migration process leaving the women, the aged, and the children to be in charge of the economic activities. There is enormous potential in the eco-tourism and adventurous tourism and other niche tourism projects in the district municipality, but again there is lack of political will to develop this important income-generating sector to its maximum (Dept. of Finance & Economic Dev, 2005b)

To address the problem of poverty, the Provincial Department of Finance, Economic Affairs and Tourism initiated a study in April 2002 on poverty alleviation. About 66 projects have been identified covering water, education, transport, health, housing and the electricity sectors among others as potential sources of economic growth. The above indicates that the some of the state institutions are realising the necessity of becoming actively involved in poverty eradication programmes in the study region. Putting up programmes for

implementation is however the missing link.

Field research indicated further that the Makhuduthamaga municipality is the poorest among the 5 municipalities of Sekhukhuneland with the population receiving less than the monthly imputed income of R800/month. The research indicated that the unemployment rate is highest in Makhuduthamaga. The information in Appendix 3 below provides vital statistics on all the 5 municipalities under *Labour Market status of those aged 15-65 years* (pages 103-109), where one observes the relatively high unemployment situation in the Makhuduthamaga municipality. Outmigration was also found to be highest in this municipality. With the potential labour force unemployed, the lowest per capita incomes, and little investment prospects, the women household heads have to rely largely on firewood as the main source of fuel. The households of Makhuduthamaga municipality therefore were found to consume the highest percentage of the firewood used in the Sekhukhune district ( 86% of the households rely principally on firewood as the main source of energy for lighting, heating and cooking). No doubt deforestation is severest in the Makhudumathaga municipality.

### **6.3 The electrification programme : A strategy ostensibly to replace firewood**

A better understanding of the rural energy system of the study region can be obtained with reference to the current rural electrification in Limpopo Province since the programme affects the use of the other energy forms directly. Since 1994, the number of households connected to the ESCOM electrification programme in the Sekhukhune District Municipality has increased considerably as seen in the table below. The electrification programme is a government initiative that, among other things, seeks to require ESCOM to provide electricity to the rural communities. ESCOM works with the municipal governments to identify villages to be connected to the national power grid. The municipalities then charge the communities subsidised electricity rates and then pay ESCOM for the service.

The Accelerated Electrification Programme of ESCOM was initiated in 1991 (National Electricity Regulator, 1997). The programme set a target of electrifying some 2.5 million households by 2000 with the responsibility being shared between ESCOM, the local governments, and the Independent Development Trust (IDT).

**Table 6.2 : Electricity Connections to Sekhukhune homes since 1995**

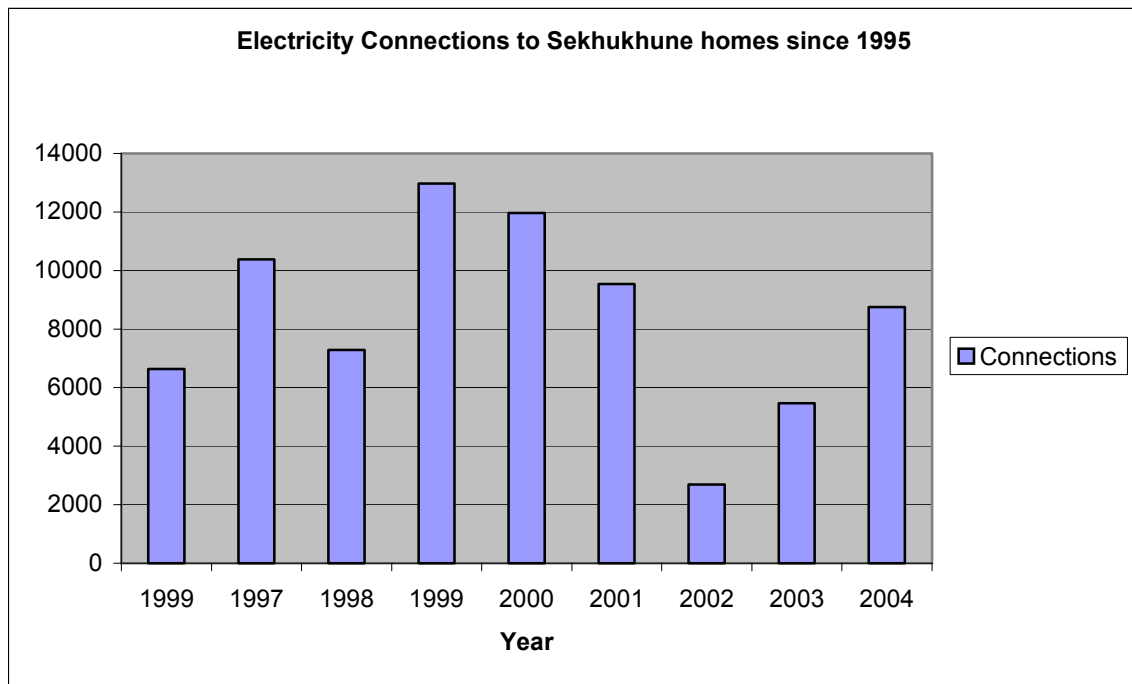
<b>Year</b>	<b>No. of connections</b>
1996	6635
1997	10381
1998	7286
1999	12974
2000	11968

2001	9543
2002	2692
2003	5463
2004	8759
<b>TOTAL</b>	<b>66942</b>

Source : Kwena, A. Dept of Local Govt & Housing, Polokwane.

Figure 6.1 below is a graph giving a visual impression of the number of electricity connections over the years.

Fig 6.1 : Electricity connections to Sekhukhune homes since 1995



To relate the above data to the objectives of this research, the researcher had to perform some analytical work by presenting the findings systematically.

- First, a 5% sample of the total number of households in the Sekhukhune District was taken which involved detailed data collection from about 700 households. One principal objective of the study was to find out to what extent the electrification programme was affecting other activities in the communities such as reducing dependence on the firewood sector as enunciated in the government White Paper (Appendix 1).
- The research carried out in the twenty sampled villages sought to find out the percentages of the households relying on the various energy forms. Generally it was observed that only 35% of the households currently depend largely on electricity for their daily activities. About 60% still depend solely on firewood with the remaining 5% relying on coal, gas, paraffin, and candles.

The research also sought to relate the electrification programme to variables such as per capita incomes of the household heads, their employment status, the levels of urbanization in the municipalities, and the statistical relations between them where necessary.

The tables below thus provide various dimensions of the findings in the 5 district municipalities - that is Greater Globlersdal, Greater Tubatse, Greater marble Hall, Fetakgomo and Makhuduthamaga. The variables examined relate to the following:

- Percentage of households with electricity at home
- Percentage of households depending principally on firewood
- Percentage of households who are un-employed
- Percentage of household heads earning less that R800/month
- Percentage of the municipality population which is rural

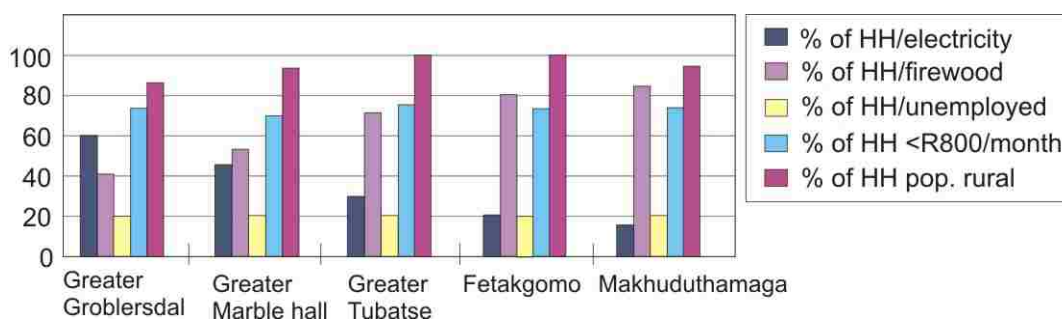
**Table 6.3 : Socio-economic status and the energy systems**

	Greater Globlersdal	Greater Marblehall	Greater Tubatse	Fetakgomo	Makhuduthamaga
% of HH/electricity	60	48	30	21	14
% of HH/firewood	40	52	70	79	86
% of HH unemployed	20	19	21	21	24
% of HH heads < R800/month	71	69	73	71	71
% of the pop. Rural	88	92	99	100	94

HH :Household head

**Source : Author 2004**

Fig 6.2 below is a graphical representation of the information in Table 6.3.



**Fig 6.2 : Socio-economic status and the energy systems**

From the above table, some questions can be posed. Have some characteristics of the settlements influenced the electrification programme? For example, were the population sizes of the villages a factor in deciding how the villages were to be systematically connected to the electricity grid ?

To find an answer to the above question visits were paid to the largest villages in each of the 5 municipalities - Phokoane( Mathuduthamaga), Mhlaletse (Fetakgomo) Ga Mashantana ( Greater Tubatse), Mhlaaotwane( Greater Marble Hall), and Tafelkop ( Greater Globbersdal) which are all electrified. It was noted that in addition to population size, political and other social considerations have also influenced ESCOM's decisions in the current phase of connecting the villages to the national grid.

The next investigation was concerned with the influence of the population sizes of the municipalities themselves on the usage of electricity. Table 6.4 below indicates the current situation. The information is based on the expectation that the percentage of households using electricity at home will be a function of the population sizes of the municipalities.

**Table 6.4 : Population size and the energy systems**

	Population Size	% of HH using electricity
Greater Globbersdal	227858	60
Greater Marblehall	80955	48
Greater Tubatse	194580	30
Fetakgomo	90713	21
Makhuduthamaga	283765	14

To test this hypothesis statistically, the correlation co-efficient between population size and the percentage of people using electricity was calculated. The co-efficient  $r$  obtained was 0.34 indicating a rather weak statistical relationship which was that the population sizes of the municipalities have not been that decisive in influencing the number of electricity users.

The next consideration was whether the levels of urbanization in the district municipality have influenced usage of electricity.

**Table 6. 5 : Levels of urbanization and the use of electricity**

	Level of urbanization (%)	% of HH using electricity
Greater Globbersdal	12	60
Greater Marblehall	8	48
Greater Tubatse	1	30
Fetakgomo	0	21
Makhuduthamaga	6	14

The correlation co-efficient  $r$  obtained was high, 0.75, indicating that the more urbanized municipalities use relatively high levels of electricity.

## 6.4 Reconceptualising the research problem

The information above has given some hints about the relevance of certain variables in the understanding of the usage of one of the energy systems. The five municipalities were used as the units of observation. Now, it is important to go further into the investigation by engaging in a more rigorous exercise involving the impacts of the current electrification programme. This was done by visiting the 20 villages and examining empirically at the household level, how life is organized around their energy systems. From such a perspective, it becomes evident that the electrified and unelectrified villages had to be studied in detail to obtain insights into how the electrification programme has produced concrete developmental impacts. It also becomes evident that the deforested villages in the study region also had to be isolated and studied to understand how poverty, for example, could be considered an important mechanism behind this environmental problem and its relationship with the energy system. Finally, the largest villages in the municipalities had to be studied to gain insights into how increasing urbanization relates to electrification (modernization), the firewood sector, and other development components to influence life in the villages.

It should thus be noted that now the emphasis is on the situation at the household levels. The household consists of a single or group of persons living together and providing for themselves jointly with food and other essentials for living (Statistics South Africa, 2004).

Table 6.6 below indicates those aspects of the households at the 20 settlements that were selected.

**Table 6.6 : The villages in relation to certain key variables**

### **Greater Globlersdal**

<i>Unelectrified Village</i>	Oorlog (80 households)
<i>Electrified Village</i>	Kgobokwane (460 households)
<i>Largest Rural Settlement</i>	Tafelkop (2050 households)
<i>Most Deforested Village</i>	Mpheleng (270 households)

### **Greater Marblehall**

<i>Electrified Village</i>	Kroomdraai (176 households)
<i>Unelectrified Village</i>	Mogaladi (186 households)
<i>Largest Rural Settlement</i>	Mohlaotwane (700 households)
<i>Most Deforested Village</i>	Moganyake (249 households)

### **Greater Tubatse**

<i>Electrified Village</i>	Selala/Manyaka (2000 households)
<i>Unelectrified Village</i>	Ntswaneng ( 184 households)
<i>Largest Rural Settlement</i>	Ga Mashantana (2200 households)
<i>Most Deforested Village</i>	Ga Mongatane (310 households)



## **Fetakgomo**

<i>Unelectrified Village</i>	Matlala-Legopane (81 households)
<i>Electrified Village</i>	Ga Radingwana (360 households)
<i>Largest Rural Settlement</i>	Mohlaletse (2100 households)
<i>Most Deforested Village</i>	Ga -Seroka (210 households)

## **Mathuduthamaga**

<i>Unelectrified Village</i>	Maseleng/Sebitulo (110 households)
<i>Electrified Village</i>	Tjatane (1200 households)
<i>Largest Rural Settlement</i>	Phokoane (1600 households)
<i>Most Deforested Village</i>	Dinotsi (130 households) Marulaneng

The analysis begins with the disclosure of the various ways in which the electrified villages have organized their energy consumption patterns in relation to their lives. The unelectrified villages will then be studied. This will be followed by the situation in the largest rural settlements in the municipalities, and finally, the situation in the highly deforested villages. It is important for such details to be analysed to enable generalizations to be made later.

### **6.4.1 The electrified villages**

The selected villages were as follows :

Tjatane	(Makhuduthamaga),
Ga—Radingwana	(Fetakgomo),
Selala/Mayaka	(Greater Tubatse),
Kromdraai	(Greater Marblehall), and
Kgobokwane	(Greater Globblersdal)

The electrified villages were studied to find out relationships between electrification and the use of firewood. Is there any evidence that as the use of electricity increases in the villages, the use of firewood decreases leading to reductions in the deforestation problem ? This is perhaps the most important research question whose findings can provide important input in terms of policy formulation for the current rural electrification programme.

Tjatane village (Makhuduthamaga)

This village has 1200 households who practise subsistence farming. Of the 60 households interviewed, about 30 are supported by pensioners, 11 by miners and industrial workers with regular incomes. Fifteen are without regular incomes. Research was organized in this village to learn about the changes brought about by the introduction of electricity to the households.

It was observed that generally electricity accounts for 95% of the households' lighting needs. The remaining 5% depend on paraffin lamps. It is expensive to use electricity for cooking and heating the homes; thus firewood and gas stoves are used for cooking by the majority of the households. On average, the

households spend between R20 to R150/month on electricity depending on the income levels. The poor families in this village continue to depend on firewood thus defeating the purpose behind the government's electrification programme. On average, such families consume about 4 head loads of firewood per month. This figure however increases dramatically during important occasions such as wedding and funeral ceremonies. Gas is also used in a few of the households – one big gas cylinder is used per month in the relatively well-off families to reduce the electricity bills. Those families relying on coal consume about 50kg per month depending on the season of the year with demand going up in winter. For those who use paraffin lamps and stoves in their homes, about 20 litres of paraffin are used per month at a cost of R50/month at the time of the research. There is also a social dimension to the energy issue. In homes where there are children, it is common to see the children being asked occasionally to go to the veld to collect firewood and cowdungs to reduce the electricity bills. There are also some houses in the village where firewood is actually sold to the public which is something that needs to be monitored.

#### Ga Radingwana (Fetakgomo)

This village has 360 households. Of the 18 people who were interviewed, 8 are supported by pensioners, and 3 by professionals. Four have no source of regular incomes except child support grants. Three are supported by workers in the factories and mines in Gauteng province.

The subsistence farmers face several problems such as difficult soils. Despite the close proximity to the Lepellane Dam the facility is not being used for irrigation. The few small scale businesses include a bakery, concrete making, poultry farming and a nursery. Unemployment is high in this village. The village is not easily accessible. It is far from the main road connecting Schoonoord to Apel. There are only 2 exit points by road to Jane Furse and Ga Oria.

Political conflicts between the local ANC and AZAPO branches constitute a problem in the village. In 1986, some houses were burnt as a result of the conflicts which involved some of the surrounding villages. The political tension has however abated over the years.

Within the energy sector it was observed that about 85% of the households use electricity for lighting their homes at a cost of about R150/month per family. It was also noted that about 13% of the families use paraffin lamps (20 litres per family) and candles. Just about 1% of the households depend on solar panels. Another 1% were found to use gas lamps (one gas cylinder is refilled per month). Trips are usually made to Jane Furse or Mohlatetse, some 20 kilometres away to purchase gas. The availability of electricity promotes TV watching at home.

For cooking it was noted that 90% of the families depend on firewood. Firewood is collected from the veld involving distances of between 15-20km. The average monthly consumption is about 4 head loads. Some houses in fact were found to be selling firewood in this village despite the fact that it is one of the "electricity

villages". Coal is used for heating the homes during the cold winter months (about 3 bags of 50kg per family per month).

Interviews with the household heads indicate that the majority of the population see electricity as the preferred energy form in the village.

#### Selala/Manyaka (Greater Tubatse)

This settlement has about 2,000 households. Of the 100 houses visited, 42 are supported by miners, 18 by pensioners, 16 were working mainly as farmers, whilst the remaining 24 had no regular income. The largely subsistence farmers cultivate crops such as maize and beans and also look after goats, cattle, sheep, and donkeys. The few white commercial farmers cultivate along the Tubatse river, growing maize, oranges, vegetables and cotton. The mines near this village pay low wages to the casual workers from this area.

The low income levels explain why electricity is still unaffordable in most of the houses. In spite of the fact that electricity is available in the village, firewood is still the main source of energy for cooking and heating the homes. The amount of firewood consumed per household was found to be about 3 head loads per month. This is supplemented by an average monthly coal consumption of 2 bags. Electricity use is confined to lighting the homes at night. The house heads indicated that it is in fact, a luxury to cook with electrical appliances. Thus, firewood usage is still dominant and deforestation, resulting from the cutting down of trees for fuel, is still very much evident in the area.

#### Kromdraai (Greater Marble Hall)

This village has 176 households. Nine households were interviewed in this village. Five of them receive and depend on pension and child support grants, six depend on people working on the surrounding white farms on which oranges, cotton, tobacco and maize are grown.

The residents of Kromdraai are largely subsistence farmers working on communally-owned farms. Those who manage to get other jobs work at places such as the Schuinsdraai Nature Reserve where the low salaries paid to the workers actually serve as disincentives to others. Migration by the unemployed youth of Kromdraai to Greater Gliblersdal for manual jobs is quite high.

With poverty and unemployment as major social problems, firewood consumption for cooking purposes is high in Kromdraai. The average monthly firewood consumption was found to be about 3 head loads per month and mainly for cooking purposes. Those who have electricity at home limit it largely for lighting at night. Paraffin heaters and coal are used for heating purposes.

#### Kgobokwane ( Greater Gliblersdal)

This village has 460 households. Situated as a cross-border village between Limpopo and Mpumalanga, this village is also characterised by poverty and unemployment. The households can travel as far as 6kilometres to collect firewood along the Elands and Moses rivers. The main source of livelihood is subsistence farming, supported by incomes from the migrant workers and the pensioners.

As is the case with the other electrified villages, firewood is the main source of energy at the homes in Kgobokwane. The low income levels and firewood consumption are therefore very much related.

One general remark that can be made at this stage is that the electrification programme has not had much influence on the consumption of firewood. Firewood continues to feature in the lives of the households. It was difficult for the author to find any concrete evidence to suggest that on the average firewood consumption for cooking in the electrified villages is clearly lower than the situation in the unelectrified villages. Virtually all the households in rural Sekhukhuneland continue to use firewood for cooking. Electricity has also not made any impacts in terms of assisting in daily chores such as in food preparation and preservation, washing, cleaning, small scale manufacturing, in the operation of kiosks and in other rural service activities.

#### **6.4.2 The largest rural settlements**

The 5 largest rural settlements in the study region are :

Phokoane	(Mathuduthamaga)
Mohlaletse	(Fetakgomo)
Ga Mashantana	(Greater Tubatse)
Mohlalaotwane	(Greater Marble hall)
Tafelkop	(Greater Globlersdal)

This part of the research was organized to examine any possible relationship between population size, the availability and consumption of electricity and the reduction in firewood consumption. Is there any evidence that population size was taken seriously by the authorities when they were deciding which villages should be electrified during the first phase, and which ones subsequently. Settlement size is of primary importance in the allocation of social services. The Central Place Theory for example, is based on the principle that population size is one key determinant for the provision of social services such as electricity and in the regional functions of settlement hierarchies (Claval,1980; Nutt,1992). One would therefore expect the large urban centres to show evidence of electricity availability, electricity usage and therefore little interest in firewood. This was not however the case particularly so far as fuel for cooking was concerned.

Phokoane (Makhuduthamaga)

This is the largest rural settlement in the municipality of Makhuduthamaga. There are 1600 households comprising of medium and low income residents such as teachers, public servants and traders. The low income residents here work on the tobacco, orange and cotton farms around Groblersdal, or on their own farms as subsistence producers. There are a few local businesses in this village such as bakeries, garages, shops (largely Indian-owned) and hair saloons.

Phokoane got electricity as late as 2003. The supply however is erratic and most homes have emergency stand-by's in the form of stoves. With the relatively high incomes, most homes can afford monthly electricity bills of about R250. Generally however, firewood is still the dominant energy source for cooking. Deforestation is high around Phokoane. The deforestation problem is aggravated by the extensive selling of grass which is used for roofing some of the houses.

The percentage uses of the energy sources by the households in Phokoane was found to be as follows : electricity (20%), paraffin (10%), coal (15%), gas (5%), solar energy (5%) and firewood (45%). At first sight, these figures might give the impression of dramatic shifts taking place in the energy consumption patterns. The reality of the situation however is that the quantities of firewood used by the families for cooking was found to be about 5 head loads per month, similar to the situation in the unelectrified villages..

#### Mohlaletse ( Fetakgomo)

This is the royal settlement of Sekhukhune where the paramount chief lives. This settlement has the highest population (about 2100 households) in Fetakgomo. With such a high political and social status, the settlement has been connected to the electricity grid.

Although there was enough evidence in Mohlaletse to indicate that the families are combining electricity, gas, paraffin, candles and coal to address their energy needs, firewood continues to be used for cooking in the households including that of the paramount chief especially on important occasions.

The high population has created a heterogeneous society in which both the poor and the high/medium income groups live side by side using various combinations of firewood, electricity, solar panels, coal, paraffin and gas stoves of varying quality. Another key feature of this royal village is the diversity – economic, cultural and traditional groups do make their presence felt here. The relatively more “modernized” tend to advertise themselves whenever the occasion demands, with visits especially during the week-ends.

One key development problem here relates to the current chieftaincy dispute which the courts are yet to settle. The paramount chiefs are entitled to annual development budgets from the government which explains why the current political tensions surrounding the chieftaincy issue need to be resolved.

Being the seat of the paramount chief is an asset which should be exploited to

attract various development organizations to this village. One tourism resource which could be exploited here relates to the statue of the late Bapedi paramount chief Sekhukhune in this village commemorating the battles he organized against the European settlers in the 19<sup>th</sup> century. The caves around the Mosego Mountain, where the locals are said to have taken refuge in the battle with the Europeans, also need to be developed as a tourist site. The employment potentials of the nearby mines also need to be exploited to raise the standards of living of the people. Such developments could make major impacts on the per capita incomes of the population and therefore on the energy system as well.

#### Ga Mashamtana (Greater Tubatse)

This is the largest rural settlement in Greater Tubatse. Ga Mashamtana has about 2200 households. Its proximity to Burgersfort (a central place town of Tubatse) attracts many people from villages such as Penge, Ntswaneng, Manyaka and Ga Mokgotho. Social integration is quite a problem in this village of different cultures.

The village is electrified. Coal consumption is quite high ( about 3 bags of coal per family per month) because of the close proximity to the coal mine at Lydenburg. Paraffin and gas are bought locally from the shops. There is evidence that solar energy is becoming popular in this village. Firewood however, as is the case with the other settlements, is the main source of fuel for cooking in the settlement.

Poverty is much in evidence in Ga Mashamtana with high unemployment among the youth. Those who decide to migrate tend to get low salaries to the extent that the average family has to depend on pension and child support funds. The local development plans have done little to raise standards of living. Poverty eradication programmes need to feature in the local business programmes.

#### Mohialaotwane ( Greater Marble Hall)

Also called Gamatlala, this settlement has 700 households. Politically this village is important since its local Kgosi is the former member of parliament of Lebowa. Not only is there electricity here, but there are also public water pipes and a locally-managed vegetable garden project. Firewood is however of importance in the lives of the households. The monthly consumption of firewood for cooking purposes was found to be about 5 head loads per household, similar to the general situation in rural Sekhukhuneland. Deforestation resulting from the removal of trees for firewood is therefore a major environmental problem.

The living conditions portray the familiar picture of poverty with many families in the habit of fraudulently registering people for child support and other welfare grants. Subsistence farming is the chief source of the average family support, with migrant workers merely supplementing the meagre income from the household.

Political factionalism is a major problem inhibiting the development of this village. This was an issue that was brought to the attention of the researcher. The problem therefore needs to be addressed to ensure the stability needed to promote development.

#### Tafelkop (Greater Globbersdal)

This village is located near the main road joining Monsterlus and Globbersdal. It is only some 20km from Globbersdal which makes it accessible. It has some 2050 households. There are lots of tenants in Tafelkop working in the farms in Globbersdal. The demand for flats by such tenants has led to the building of single cottages in Tafelkop.

Migration by the unemployed youth to Motetema, Leewfontein, Monsterlus and Goblersdal has been increasing of late. Tafelkop has electricity but no local agro-based factories to stimulate agricultural production. Subsistence farming is the principal economic activity. Beadworks are popular in this area but production is limited by the low market demand for the product. The area also has wetlands which could be the source of tourism development.

With all such potential resources undeveloped, per capita incomes are quite low. There is agitation by the community to be integrated into Mpumalanga province.

On the energy sector, the majority of the residents of Tafelkop rely heavily on firewood, the "free gift of nature", since incomes are not high enough for the people to be able to afford electricity and other relatively expensive sources of energy.

One general observation that was made about these relatively large villages is that they have the potential to attract key economic activities such as handicraft centres, shops, small scale agro-processing businesses, tourism operators, farming centres and repair shops to raise incomes, which in turn could gradually shift the attention of the families from firewood to electricity.

#### **6.4.3 The unelectrified villages**

The 5 unelectrified villages selected for this study were	
Maseleng/ Sebitulo	(Mathuduthamaga)
Matlala-Legopane	(Fetakgomo)
Ntswaneng	(Greater Tubatse)
Mogaladi	(Gretater Marblehall)
Oorlog	(Greater Globbersdal)

The unelectrified villages offer important insights into some of the research issues which were examined in chapter four since one would expect that households with no electricity would by all means make particular choices regarding their sources of energy (Warren et al, 1995; Alcock, 1997). What are these choices ?

Field research indicated that the negative impacts of the firewood sector in the unelectrified villages find expression not only in the deforestation problems seen around the villages but also in other equally important areas such as their health situation and in the night lives of the school children, among others. It needs to be mentioned that some important relationships were observed between the energy systems and the medical conditions of the households relating to the use of firewood for heating at home. It was observed for example that heating the rooms with firewood produces soot and other harmful substances linked to acute respiratory infections, chronic obstructive lung diseases and eye problems as well as low birth weights in some of the households. Extreme cold at night because of lack of electricity was also observed to be a major cause of bronchitis and flu in the houses. It was also discovered that school children in the unelectrified villages were greatly handicapped by studying at night with candles and lanterns.

Below are the individual findings. This type of reporting does not mean however that the importance of theory is being discounted in this section of the report. From the individual responses, attempts at generalization will be made later (Budd, 1978; Bryson & Roering, 1988).

#### Maseleng/Sebitilo (Mathuduthamaga)

This village has 110 households. It came as no surprise that 92% of the households depend sorely on firewood for their energy needs. On average 6 headloads of firewood are used per house per month for cooking and even for heating the homes. Firewood is of so much importance that there are always some reserves in the houses. The use of firewood is strictly controlled in the homes to avoid wastage.

It was also observed that (apart from its use as fuel) trees play a more important role in the lives of the households serving as medicinal plants, building materials, windbreaks, fodder for the livestock, and as ornamental gardens, among others. The low per capita incomes explain why the bulk of the population can only afford to depend on the trees as the major resource for addressing several household needs – on these so-called “free gifts of nature”.

Unfortunately no afforestation programmes are taking place in Maseleng with the result that deforestation is increasing at alarming proportions. Under these circumstances, firewood is being stored at the homes with cowdungs, plastics and any other available inflammable materials as supplements.

#### Matlala-Legopane (Fetakgomo)

This unelectrified village has 81 households. With subsistence farming being the main activity, per capita incomes are low. Remittances from the migrant workers constitute the main source of income.



Firewood collection is very noticeable in this village with young boys often using donkey carts to convey firewood from the veldt to address the cooking and house heating needs. With unemployment so high, the firewood business is being commercialised often involving young boys who move from house to house advertising their products. About 95% of the energy source is derived from firewood; 3% from paraffin, and 2% from coal. The average monthly firewood consumption in this village was found to be about 5 headloads.

Deforestation resulting from the firewood business is a major problem in this village. This area is well known for its cultivation of marula and other indigenous trees. The possibility of the extinction of the indigenous trees cannot be discounted. There is an obvious need for afforestation programmes, irrigation schemes, and commercial farming to raise the income levels. This could go a long way to affect the rural energy systems in a positive way.

#### Ntswaneng (GreaterTubatse)

Ntswaneng has 184 households, none of which is electrified. As is the case of the other unelectrified villages, firewood consumption is high - about 6 headloads per family per month. Subsistence farming on marginal land is a major problem. Livestock farming and firewood collection have all combined to create major deforestation problems in this village. People actually travel from neighbouring villages (some 15 kilometres away) such as Malegale and Ga Radingwana to collect firewood from Ntswaneng. Ntswaneng is therefore gradually gaining the reputation as the "firewood capital" of the Greater Tubatse municipality. It is surprisingly becoming fashionable for people in this area to associate manhood with the ability to harvest plenty of firewood. The monthly 6 head loads firewood consumption per household needs to be related to the firewood exports from this village to give a full picture of the size of the firewood sector. This is no doubt putting much pressure on the natural environmental system to the extent that deforestation and gully erosion have now become major environmental problems.

The mining companies around could offer some respite by employing the local population in the mines but they rather tend to look far for their employees. The statue of the late Bapedi paramount chief, Sekhukhune and the caves near Mosego Mountains are quite close to Ntswaneng, and could all create jobs in terms of tourism, but these potentials have not yet been exploited. Above all, the abundance of indigenous trees and fruits could be the basis of major afforestation and job creation programmes, but these are yet to take off.

Social life in Ntswaneng therefore continues to be organized around the problems of poverty, deforestation through the firewood sector and gully erosion.

#### Mogaladi (Greater Marble Hall)

Mogaladi has 186 households. The economic base of this village is organized around subsistence farming. The white-owned commercial farms around Marble

Hall provide limited employment to this village. The salaries paid are however too low to sustain the families. Pension and child support grants supplement the meagre salaries of the labourers working on the farms and nearby mines.

The low per capita incomes explain why firewood features so much as a source of energy. The average monthly consumption is quite high by any standards - between 6 to 7 headloads. The figure even increases during important occasions such as weddings and funerals. The environmental impacts of poverty working through the firewood-based activities and deforestation are thus very much evident in the Mogaladi area.

#### Oorlog ( Greater Globlersdal)

This is a small village with only 80 households. With such a small population, and facing the problem of remoteness from a major road, the residents do express concern about their poor prospects of being connected to the electricity grid. The majority of the people were very quick to relate their remoteness to the lack of electricity as a major disadvantage.

Literally every household depends on firewood for addressing their cooking and heating needs. The monthly consumption of firewood was estimated at about 6 head loads per family per month. The use of coal, gas and paraffin is very limited. Unemployment is very high in this village and outmigration is perhaps the key feature of the economy of Oorlog. The migrants however remit very little home in view of their low salaries. The pension and child support grants can also do very little to improve the poverty situation.

This little village thus finds itself in a dilemma where it cannot access electricity because of its small size, poverty, and its remoteness from a main road. Deforestation is increasing with no sign of abating.

#### **6.4.4 The severely deforested villages**

Dinotsi / Marulaneng	(Makhuduthamaga)
Ga- Seroka	(Fetakgomo)
Gamongatane	(Greter Tubatse)
Moganyaka	(Greater Marble Hall)
Mpheleng	(Greater Globlersdal)

This section of the research sought to find an answer to the question why deforestation has reached such alarming proportions in these villages and its impacts the development efforts of the communities. The objective of including these villages in this research was to find out the extent to which poverty, working through the firewood sector, accounted for the current deforestation problems. It was observed from the field research that poverty, and cultural attachment to the grasses and trees as key natural resources, played important roles in the over-utilization of the forest resources of these villages leading to widespread deforestation. The trees and grasses can be exploited free of charge

and are therefore justifiably seen by the poor households as the rational ways of addressing some of their basic needs.

From the medical perspective, it was also noted from the local clinics that failure to cook food and boil water adequately because of fuel shortages contribute to malnutrition, intestinal disorders and parasites in the children of these deforested villages in particular. Another finding was that the able-bodied women in these villages carry about 25 metric tons per year of firewood collection which tend to result in bone injuries as a result of falls, head aches, back pains, and miscarriages.

#### Dinotsi/ Marulaneng (Makhuduthamaga)

This village has 130 households without electricity. The village is close to the Lepellane Dam (tributary of the Olifants river).

Field research indicated that the deforestation problem in this village is due to the fact that trees constitute the basic natural resource used as building materials, fuel, ornamental gardening, medicine, fencing, roofing the homes, as wind breaks, and for making chairs, tables, plates, among others. It was noted that even the roots of trees are occasionally used as firewood in cases of shortages of branches and leaves. Because of this high rate of consumption, the rate of tree/grass removals must be balanced by major afforestation programmes. Unfortunately, there is little evidence of any serious community-based afforestation projects in Dinotsi. The result is widespread deforestation, with the associated problems of gully and soil erosion.

So far as the firewood sector is concerned, it emerged from the research that over 90% of the households depend on firewood, cowdungs, crop residues, and other inflammable materials for their energy needs. The firewood consumption statistics for Dinotsi was found to be about 6 head loads per family per month. The remaining 10% of the households were found to obtain their house hold energy needs from coal, paraffin and gas.

With regards to economic activities, it was observed that fishing is gradually becoming important subsistence farming is however the major activity in the village. The meagre incomes from the migrant workers, the pension and the child support grants somehow help somehow to alleviate the poverty problems in this village.

#### Ga Seroka (Fetakgomo)

This is a village with only 210 households. The social life of Ga Seroka cannot be discussed without reference to the many traditional healers (sangomas) in this village. These sangomas contribute to the deforestation problems in this village because their practices depend very much on their uprooting of plants for their roots and barks without replanting them.

Unlike Dinotsi, Ga Seroka village is electrified which somehow reduces the demand for firewood. About 61% of the households depend principally on firewood for their cooking and heating needs, using about 5 head loads per month per house. The remaining houses rely on electricity, gas (one large cylinder refilled per month/household), coal (2 bags of coal per month of 50kg weight and paraffin stoves at 25 litres of paraffin per month per household).

The search for firewood is however taking the families farther and farther into the veld to the extent that today, people can travel up to 20km by foot in search of firewood. As this process of "tree harvesting" continues, new virgin land is exposed to the elements of the weather on daily basis, leading to the spread of deforestation in all directions. The deforestation problem exists because trees are used for several projects in this village: as building materials, for fencing, for medicinal purposes, as firewood and as windbreaks. Poverty and the cultural/spiritual values of the trees in the lives of the local people explain why deforestation is continuing in this part of Sekhukhuneland. From the cultural perspective, it was noted that responsible womanhood in this village is associated with, among other things, the amount of firewood a woman can convey to the homestead.

#### Ga Mogantane (Greater Tubatse)

Ga Mongatane has 130 households. Like Dinotsi, this village is not electrified. The economic and social life in this village is almost a replica of the situation in Ga Seroka. The major difference is that this village is located in a mountainous area, removed from the main tarred road connecting Polokwane and Burgersfort.

Deforestation is much more spectacular in this village on the mountain slopes and even in the valleys. The trees and grassland in this area serve several purposes in this village as fuel, building material, in the carving industry, and as windbreaks, among others. With the bulk of the population relying on the trees and grass cover for addressing their energy and other needs, soil erosion is increasing in all directions. Asked why he is not taking the necessary measures to begin afforestation in the village to stop the deforestation crisis, the local headman indicated that his administrative powers are not respected these days by his people, in particular the youth, making it difficult for him to mobilize the households to undertake controlled removal of trees and also begin serious afforestation programmes.

There is no doubt that the Ga Mogantane community is aware of the impending environmental disaster which the firewood sector is bringing to their village. Without electricity providing an alternative source of energy, and with the problem of poverty being persistent, it is likely that the firewood sector will continue to work jointly with forest-based activities in Ga Mogantane with all the environmental and related negative developmental consequences.

#### Moganyaka (Greater Marble Hall)

This village of 240 households is electrified. The indigenous vegetation along the Olifants river has been cleared for citrus, tobacco and vegetable farms, owned largely by white farmers.

The households interviewed made it clear that the availability of electricity has not much reduced the percentage of households in the village who continue to depend on firewood for cooking. The impression was given that the average monthly firewood consumption per household seems to have stabilised around 5 head loads for a long time. The impacts of the electrification programme were explained largely in terms of the social impacts generated during the nights when the electrified homes tend to bring some amount of life in the villages through social interactions they promote.

Deforestation is thus increasing in this village because of the dominant firewood sector, from bush fires, from farming on marginal lands, and from the removal of trees for the local building industry. If the pressure on the natural vegetation is to be decreased, then the current programmes on poverty eradication need to be given far more attention than currently is the case. Farming on the marginal lands and the use of natural vegetation as building materials continue to occur because the households cannot afford to irrigate their farms or purchase the relatively expensive building materials. The lessons learnt from Moganyaka do therefore indicate that only a holistic approach to the energy problems in the rural areas studied can generate long term solutions to the underdevelopment and poverty problems experienced in the villages.

Mpheleng ( Greater Globlersdal)

This highly deforested village has some 270 households. This village is electrified. The electrification project is however not reducing the deforestation problem because the households continue to rely so much on the trees and grass vegetation for their fuel, for their building materials, and for their medicinal plants, among others. Poverty is undoubtedly one stumbling block which stands between the electrification programme and the sustained development of this village. Mpheleng is connected to the power grid yet it does not benefit fully from the gains that go with modern electricity.

From the above, one can observe that in spite of the diverse perspectives from which the electrification programme has been looked at above, one general picture emerges, which is that the on-going electrification programmes are having only limited impacts on the lives of the households. Poverty continues to operate as a hidden mechanism behind the programme preventing the households from benefiting from the many economic and other benefits that should accompany the electrification programme. Below, the analysis of the electrification programme continues from another perspective, namely from the three main functions currently being served by the energy systems.

## 6.5 Electrification for providing lights only

The role of rural electrification programmes in raising rural agricultural production levels, in laying a foundation for rural industrialization, in improving the quality of life in rural homes, and in laying the foundations for the long term attraction of investments to the rural areas is an issue which has long been acknowledged in local and international circles (World Bank 1983, 1990, 1996). The developmental impacts of the electrification programme in rural Sekhukhuneland cannot however currently be assessed from such a broad perspective. It is largely in terms of providing lights at night that one can speak of change in the lives of the people.

In terms of reducing the pressure on the natural environmental systems in the villages for example, one cannot claim that with the coming of electricity, the firewood business is disappearing very fast, and that now one can observe that the natural vegetation in the rural areas is recovering beyond expectation. In terms of economic activities, one scarcely hears in the villages the noise that often goes with modern electricity in action as reflected for example, in terms of food preparation at home, in water drainage activities, in plumbing, blasting, wiring, or in terms of small scale factories producing goods of various kinds.

The impacts of the electrification programme can only be observed at night in terms of the lights seen at the few homes usually between 6pm and 10pm. The electrification programme is thus manifested mainly in terms of lighting the homes at night. It is in this connection that one can say that the developmental impacts or manifestation of the electrification programme is only partial.

In spite of this fact, some people in the villages seem apparently excited at the thought of seeing the electric poles and wires in the villages. Even some of the government and ESCOM officials associated with the electrification programme, seem to have some sense of satisfaction since to them the "bright night lights" of modernization are evident at night in the villages. Surprisingly, about 80% of the household members in the 20 villages also associate with this rather limited view of rural electrification. Some households acknowledged the fact that the availability of street lights has assisted to improve security because of the increased visibility at night which assist in policing. Mention was also made of the fact that the availability of electricity is helping some of the households to use refrigerators to store their food and also to power their electric fans, television sets, radios and cell phones.

The above reasons are strong enough for the majority of the households to have some sense of satisfaction with the changes being witnessed in their lives. This highlights the rather limited education given to the communities regarding the objectives behind the government's electrification programme. This type of perception can be analysed within the framework of the concept of reification mentioned earlier on page 33 above which refers to the process whereby people

become so used to certain resources and/or situations to the extent of finding it difficult to get out of such obsessions. Under such circumstances, people tend to find the situations they currently find themselves as somewhat natural, as things which cannot be changed suddenly and which therefore somehow have to be accommodated for a considerable length of time. The interviews with the respondents indicated this tendency of people being used to the current electrification state to the extent of not being able to imagine or fathom what is missing in the programme.

## **6.6 Energy combinations, not replacements**

From the above discussions it could be said that the nature of the current energy systems in the villages could be summed up in terms of a combination of the traditional firewood sector and other modern energy forms such as electricity, gas and lanterns. There is no evidence that the firewood sector is fast disappearing. The households continue to hold to the idea of using firewood, seeing the coming of electricity not as a replacement for firewood as such, but merely as a supplement to the new energy forms that may be appearing. Thus, there is the common situation of the families using energy combinations at home to address their needs and not by replacing firewood with electricity. This situation is now illustrated with reference to the examples below.

### **6.6.1 Energy for lighting the homes**

It was observed that it is largely for purposes of lighting the homes that electricity is currently of relevance to the communities. And also the only sphere in which firewood is not of that much importance. The households enjoying electricity see electricity largely as a facility for providing lights at home. About 70% of the households use the electrical power (R250 per month per household) mainly for lighting purposes. Another 28%, that is those who do not have electricity, use candles (4 packets of 6 candles per household per month) to provide lights, with the rest of the households relying on paraffin (9 litres per month per household), gas (large cylinder refilled per month) and other types of lamps, as shown below. About 3% of the households had no facilities for lighting their homes at night.

Electricity (70%)  
Candles (28%)  
Gas (0.1%)  
Paraffin (0.1%)  
Other (1.5 %)

It needs to be noted the households complained of high electricity bills. They also complained of the fact that the electrical lines are often not safe. The lines cannot also withstand the strong winds, explaining the frequent power cuts during windy days. Other problems with the electrical power supply system relate to the lack of prompt repairs to the electrical faults.

## 6.6. 2 Energy for heating

Another important finding was the important role of firewood in heating the homes. As indicated below, 65% of the households were found to rely on firewood to heat their homes during the winter months. This causes tremendous amounts of in-door pollution with attendant health, safety and other hazards. Electrical power has not made much in-roads in heating the homes because of the expenses involved. Paraffin and coal stoves are other sources for heating the homes as indicated below. The average coal consumption per household for heating the homes was found to be about 4 bags of 70kg weight each per month. The paraffin and coal stoves are associated with various types of accidents in the homes. It needs to be noted that about 3% of the households had no facilities for heating their homes during the cold winters with serious health implications.

- Firewood (65%)
- Electricity (18%)
- Other (14%)
- No heating (3%)

## 6.6.3 Energy for cooking

With regards to energy for cooking, it was observed, as indicated below, that about 78% of the households rely on firewood. Electricity comes a distant third at about 8%. The use of paraffin for cooking purposes needs to be noted, occupying the second position at 10% as indicated below.

- Firewood (78%)
- Electricity (8%)
- Gas stoves (1%)
- Paraffin stoves (10%)
- Coal (1.0)
- Other (2.0%)

From the various issues discussed above, it is clear that the position of firewood in the energy systems is noticeable. Whether one analyses the energy systems from the electrified and the unelectrified villages perspective, or from the large villages and deforested villages perspectives, the strong position occupied by firewood cannot be doubted. The ideas which the households have concerning what is appropriate energy, what types of energy combinations to use at home, what their general energy problems and prospects are, what relations the energy sector can have in their lives - all such issues are largely related to the poverty-firewood problematic.

## 6.7 The energy system in a broader context

Whilst the findings reported from Sekhukhuneland no doubt reflect the decisions



of the individual households with some degrees of autonomy, it needs to be stressed however that their activities are not context-free. Their daily activities relate to concrete developments in the Limpopo province and South Africa as a whole. To put the findings in their proper context, the information at the household level in Sekhukhune will therefore now be generalised and compared with the provincial and national statistics. This will enable one to identify areas where the Sekhukhune district is perhaps doing better or worse and also identify areas where the provincial and national government functions need to relate better to the household energy systems.

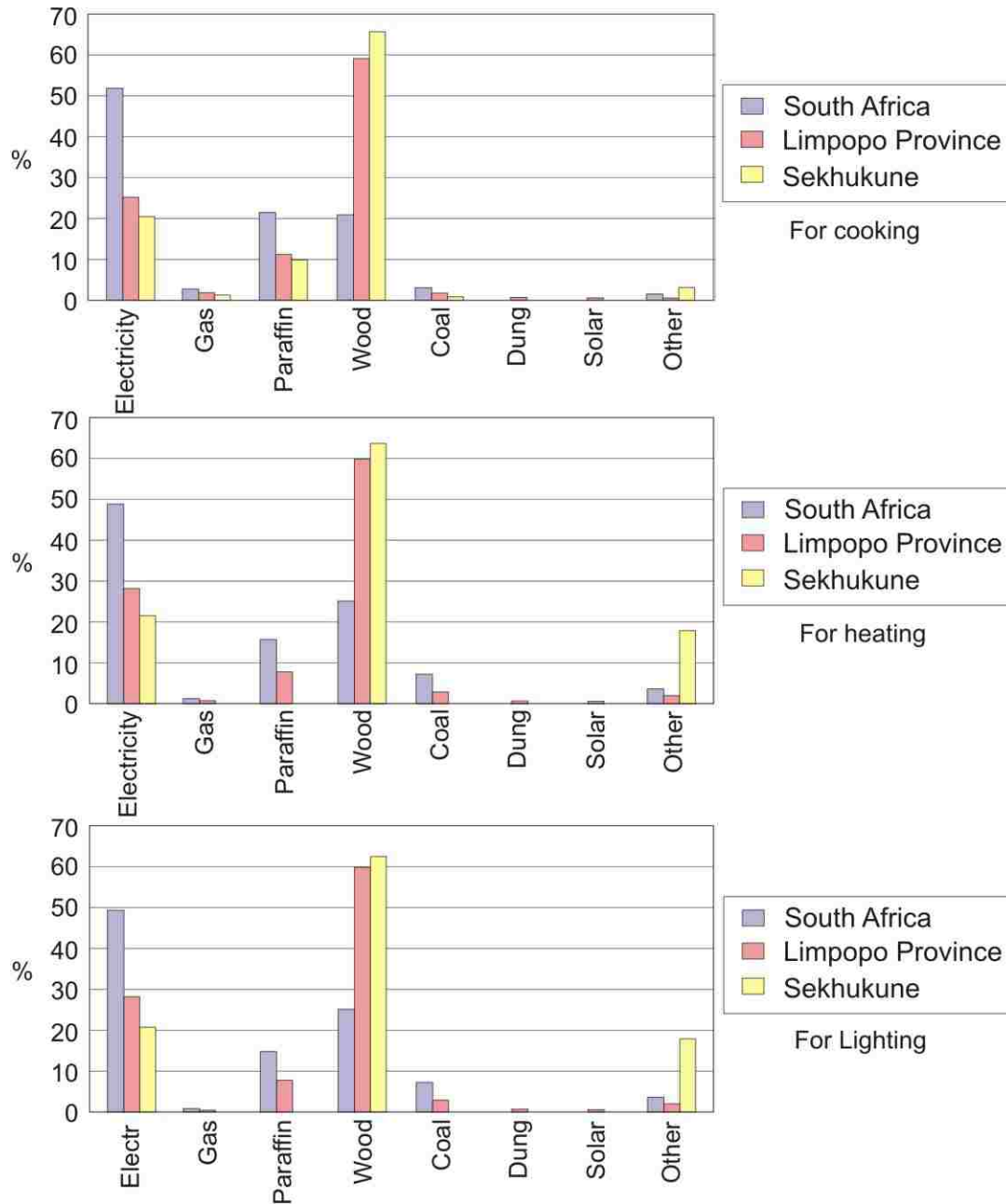
Table 6.7 below provides such a comparative information.

**Table 6.7 : Energy source for cooking, heating, and lighting in percentages**

<b>For cooking</b>	South Africa	Limpopo Province	Sekhukhune
Electricity	51.4	25.0	8.0
Gas	2.5	1.6	1.0
Paraffin	21.4	11.0	10.0
Wood	20.5	59.0	78.0
Coal	2.8	1.5	1.0
Animal Dung		0.4	
Solar		0.2	0.0
Other	1.4	0.3	2.0
Total	100.0	100.0	100.0
<b>For heating</b>			
Electricity	49.0	27.0	18.0
Gas	1.1	0.6	
Paraffin	14.6	6.9	
Wood	24.6	60.0	65.0
Coal	6.6	2.3	
Animal Dung		0.4	
Solar		0.2	
Other	4.0	2.5	14.0
Total	100.0	100.0	
<b>For lighting</b>			
Electricity	69.7	64	70.0
Gas		0.2	0.1
Paraffin	6.8	8	0
Candles	22.7	28	28.0
Solar		0.2	
Other		0.5	1.5
Total	100.0	100.0	100.0

**Source : Statistics South Africa, 2004: 127 and field research**

Fig 6. 3 below are graphical illustrations of the information on Table 6.7. The information indicates vividly the fact that in terms of energy usage for cooking, heating, and lighting, both the Limpopo province in general, and Sekhukhuneland in particular use relatively little electricity, whilst the opposite is the case in terms of firewood consumption. The above information and that from the fieldwork discussed under 6.6 above thus further highlight the dominant position of the firewood sector in the livelihoods of the Sekhukhune households.



**Fig 6.3 : Energy sources for cooking, heating and lighting**

The information from the above graphs should certainly make one to want to re-examine the data on page 5 where it emerged that some 702,428 households in Limpopo Province out of a provincial total of 1.1 million (some 60%), rely on firewood for cooking whilst 703,416 households in the province use firewood for heating their homes. It also makes one to find the need to re-examine the provincial government documents on energy development plans for the Limpopo province to find out how the firewood sector is to be addressed. The thought of over half a million households in one province depending so much on firewood to address their day-to-day energy needs in spite of the fact that electricity is being extended to them is certainly a matter that needs serious attention. The families are no doubt clearly aware of the short and long term negative impacts of the firewood sector in their communities but cannot currently afford to use better alternative energy forms. Their actions thus illustrate ordinary rural families going about their daily activities but under circumstances which are not of their own choosing.

At this stage of our discussions the role of the state needs to be brought in. The state institutions need to play a central role not only in mobilising the necessary resources for the transformation of the rural energy sector but also in the broader development planning processes at the Sekhukhune district municipality (Olson 1965; ANC, 1992; The Advisory Committee 1997; Dept of Minerals & Energy , 2002; Limpopo Provincial Government, 2004). All the findings reported on the individual households in the villages studied and all the various positions held by the households regarding their energy systems can only be changed and made to contribute positively to their development through conscious government intervention.

In the next chapter, specific recommendations will be made indicating how the various tiers of government could be mobilised with other stakeholders to link the rural energy systems of Sekhukhuneland to the long term sustainable development plans of the region. The chapter is basically concerned with the conditions that need to be satisfied to enable the rural energy systems of the study region to make the desired contribution to the sustained development not only of the households concerned but also to the broader Limpopo provincial community (Sayer, 1992).

## **CHAPTER 7: RECOMMENDATIONS**

### **7.1 Introduction**

The realist research approach has been used to provide rich information concerning the rural energy sector of Sekhukhuneland. The research findings in chapter 6 have shown how the households have been making various choices to address their energy needs. The developmental problems and shortcomings inherent in their actions were discussed. It was clear that one of the problems hindering the speedy transformation of the communities through their energy sector relates to the prevailing opinion held by the respondents that given time the current rural electrification programme could generate the desired benefits in the study region. To such people, any problems observed currently with the energy sector could be considered temporary and would be done with ultimately.

It is quite common for interpretive researchers to develop a close affinity with the people that they study to the extent of finding it difficult to disentangle their stance as social researchers from the opinions and actions of such people (Strauss & Corbin, 1990). This tends particularly to be the case with people who come from their chosen study areas where they spend the bulk of their lives. This problem of obsession with what one knows or with what one is familiar with can however be overcome through the application of the second stage of the double hermeneutic which requires a critical evaluation by researchers of the routines of the people concerned (Giddens 1984; Stadler 1995; Yirenkyi-Boateng, 2001).

If this research concludes just with a disclosure of the findings, it could justifiably be described as a conservative research merely interested in informing readers about what is going on, that is, merely interested with ending with the first stage of the Double Hermeneutic. Such a situation will tantamount to maintaining the status quo with no prospects of positive change. From the stated objectives of this research however, it is clear that this work is action-oriented. It is therefore necessary at this stage, to move to the third research objective which seeks to suggest ways in which the on-going rural electrification and other energy programmes could be made to contribute to the long term sustainable development of the Sekhukhuneland region. The recommendations that follow thus fulfil this critical element of the social research process which requires researchers to indicate actions that need to be taken to produce positive change in society ( Wolch & Dear, 1989; Bhaskar 1991; Unwin 1992).

### **7. 2 The need for the strategic planning process : A tool for positive change**

The planning mechanism is one effective instrument or development framework which can be used by the various tiers of government to mobilise resources to solve concrete development problems. A development plan indicates the number

of steps to be followed to address certain development problems and achieve certain development targets at certain stated time periods. It is a tool to indicate the conditions that need to be satisfied to achieve certain development objectives. It is therefore very much rooted in the critical realist concept of necessary relations (Thom, 1998; Sayer, 1992; Choquil, 1996).

The steps involved in the Strategic Planning process provide an important basis for making the necessary recommendations on the findings discussed in the previous chapter (Fred, 2005). Under the current local government structure of South Africa, the municipalities are expected to draw up their own strategic plans and implement them ([ww.local.gov.za](http://www.local.gov.za)). It is thus important that the key features of a strategic plan should now be outlined to examine how the current Sekhukhune Rural Energy Development Plan could be made to correspond to them.

A strategic plan is based on one interesting axiom that if you fail to plan, then you are planning to fail in the future. We therefore need to take the problems highlighted in chapter 6 above one after the other and, in a systematic way, indicate how the seven steps below must actually be applied to solve the practical problems mentioned in the previous chapter above. Solving development problems, to a large extent, boils down to looking at how far development plans correspond to the ideal 7-step procedure. If the plans are well structured, then the possibilities are strong that they can remove the problems at hand. In this connection, one needs to recognize the importance of the 7 steps, as indicated below.

There are other requirements or conditions that need to be addressed to ensure that development plans succeed to achieve their intended goals.

These are as follows:

- The plans need to be based on empirical facts (Giddens, 1984).
- The plans must be based on the needs, ideas, values, and development potentials of the people concerned (Fay, 1977).
- The natural, human and other resources of the intended beneficiaries of the plans must also constitute vital inputs in the plan (Steiner, 1979).
- The local communities must be involved in the formulation and implementation of the plans (Healey 1979).
- The plans must be flexible enough to accommodate change (Faludi, 1973; Nutt, 1992).
- The plans must be critical in the sense of being capable of producing real, positive change in the communities concerned (Flynn, 1993).
- The plans must be seen as part of future plans for the community (Kemp, 1993).
- For such plans to be relevant to the current local government administrative structures, the municipalities must be the basis for policy formulation and recommendations (Healey, 1979).

The above requirements are of such importance that one has to focus on them at

this stage and apply them to the current Sekhukhune Energy Development Plan.

The 7 steps in the strategic planning process are as follows:

- Develop a Vision and a Mission
- Perform an External Audit
- Perform an Internal Audit
- Establish long term Objectives
- Formulate a plan/strategy to address the objectives
- Implement the strategy/plan
- Measure and evaluate performance as a basis for recommending a more effective and workable plan (Fred, 2005).

With reference to this research, the outlines of a sustainable rural energy strategic plan must therefore be as follows:

**(i) Developing the Vision and Mission statements:** A vision statement indicates a possible and desirable future state of an organization or community. For the Sekhukhune community, it would denote a picture of the nature of the rural energy system which the Sekhukhune people would like to see in their area in the next 3 years for example. The vision statement is thus a form of strategic intent, dealing with the question, “What do the people of Sekhukhune want their rural energy sector to become”? The mission statement, on the other hand, is concerned with the present in accordance with the functions of the sector concerned. In this case, the mission statement should ask the question, “Why the rural energy sector exists”, that is, the *raison d’être* of the sector.

**(ii) Performing an External Audit.** This has to deal with the environment outside the energy sector, that is with activities that are not under the control of the operators of the rural energy system such as the households, and ESCOM. Opportunities and threats are usually about the external environment covering a variety of political, economic, social, technological, educational, and physical environmental forces and trends. Besides monitoring trends and events, the strategic planning team must also monitor particularly important stakeholders, especially those that may affect the sectors supply of resources, eg suppliers of energy equipment and technology. In the political sphere, the decisions of the local and provincial councillors are critical and always need to be taken into account.

**(iii) Performing an Internal Audit.** This has to do with the energy resources, local administrative cultures, and the day-to-day activities of the households and ESCOM. Performing an internal audit requires gathering, assimilating, and evaluating information about the operations/activities of such key actors of the rural energy sector. In this connection, the culture of the operators in the sector concerned need to be taken into account. Organizational culture can be defined as a pattern of behaviour developed by a community as it learns to cope with its problems of external adaptation and internal integration, and which has worked well enough to be considered valid to be taught to new members as the correct way of going about things. Remarkably resistant to change, culture can represent a major strength (eg innovativeness) or weakness (eg lack of initiative)

for a community, as in cases in which a particular culture proving effective in the past, is maintained even when change is needed. Thus, with reference to this project, one could talk of a firewood culture which can socialize households to undertake certain daily routines in certain ways. An organization's strength that cannot be easily matched or imitated by others are called its "distinctive competencies".

**(iv) Establishing long term objectives.** Clearly stated goals or targets provide a basis for allocating tasks to all stakeholders in an activity system at specific periods; they represent the basis for allocating resources; constitute a primary mechanism for monitoring future progress, and further constitute the locus of activities for bringing change to the lives of people. Thus, one can talk of short, medium, and long term development objectives. The objectives need to be quantifiable, precise, measurable, realistic, understandable, challenging, attainable, and congruent among organizational units, with each associated with a time line. Objectives basically deal with the question of where one expects the sector or activity system to be say, in three year's time. General statements therefore need to be avoided in the establishment of development objectives.

**(v) Formulating a development plan to achieve the objectives.** Having stated in clear terms the long term development goals, objectives, or targets, a plan must be formulated indicating the strategies to be used to achieve the stated development objectives. An effective plan must be technically workable, acceptable to intended beneficiaries and all other stakeholders, ethical, moral, and legal, and must not deviate from the objectives set.

**(vi) Implementation of the plan.** Plan formulation requires co-ordination among a few individuals. Plan implementation however, requires co-ordination among many individuals. Implementation implies carrying out activities that yield concrete results (outcomes) indicating the completion of the tasks set out in the development plan, eg connecting certain selected settlements to the national power grid; putting an end to the operations of firewood sector by certain deadlines; building new environmentally-friendly power plants, etc as clearly stated in the plan.

**(vii) Monitoring the extent to which the achievements relate to the planned targets.** This step is important to enable the communities and other stakeholders to learn from their mistakes in the plan implementation processes.

Among the strategic planning authorities associated with the 7 steps, the following can be mentioned: Bryson & Roering (1988); Bryson (1995); Wholey & Harry (1992); and Fred, (2005).

### **7. 3 The different applications of the strategic planning process**

The 7 steps need to be applied in various aspects of the development of the Study Region. To simplify matters however, this means that co-ordination of the

various plans will be crucial in jointly working to relate the energy systems to promote the development of the study region. Thus, it will be necessary for the planners in the various municipality departments to follow the processes of stating in clear terms the vision and mission statements first, and following that up with the remaining steps. Without the 7 steps, the planning process cannot be focussed and the future outcomes cannot be meaningfully monitored.

#### **7.4 Planning by the municipalities.**

In keeping with the above, it will therefore be incumbent on all the departments in the Sekhukhune municipalities to draw up their own micro or departmental 5-year plans within the spirit of co-ordination. Thus, notes will have to be compared, for example, on the energy plans of each of the 5 municipalities to identify how development plans based on the integration or co-ordination theme can be implemented. There should therefore be no logical or conceptual distinctions between the 5 local plans since they are supposed to integrate the developmental realities of the Sekhukhune municipalities. The integration theme must be the key feature of the 5 plans. (Refer to Fig. 7.3)

No meaningful plans can also be formulated at the municipality levels unless they are staffed by trained development planners and project managers. This issue of capacity is further elaborated below under 7.9.

#### **7.5 The Sekhukhune District Rural Poverty Eradication programme and the Integrated Development Plan**

This study has highlighted the fact that poverty is an overarching problem in the firewood and deforestation problems in the study region. Particular attention thus has to focus on the poverty situation.

The Sekhukhune Integrated Development Plan clearly states that the rural poor in the district are characterised by severe deprivation such as jobs, incomes, food, water, sanitation, health, shelter, education, and information – ie the opportunities and choices most basic to human development are denied them. Because of these conditions the report rightly observes that the communities cannot raise their standards of living in a sustained way (Dept of Finance & Econ Dev 2005b).

Because of poverty, as noted above, even the electrified homes cannot benefit fully from the advantages that go with electrification since they cannot afford to purchase essential electrical appliances such as refrigerators, deep freezers, heaters, electric fans, kitchen blenders, and electric irons, among others. One thus observes the irony of electrified homes in which electricity is used mainly for providing lights at night (usually from 6pm till 10pm).

Among the strategic plans that need to be put in place to raise the incomes of the households, land reforms and agricultural production are paramount. There are numerous struggles around the land question in Sekhukhuneland. The history of



colonial lands dispossession has ensured that the land question is central to the lives of the people in the Study Region. One thread running through the land struggles is the role of the chiefs and their relationship to the lands in the rural areas. The chiefs in the municipalities continue to mount a rearguard action in defence of their rights to allocate land which has enabled many of them to accumulate wealth. The hold of the chiefs on potential rural agricultural land is one of the major obstacles delaying the “agricultural revolution” of Sekhukhuneland. Land reform in the Study area should focus on abolishing the communal tenure system and giving support the emergence of private small-scale commercial farmers to replace the subsistence farmers. The farmers should benefit from modern agricultural education extension such as mixed farming, crop rotation, the appropriate use of organic farming methods, etc. The emergence of such innovative and enterprising farmers will create local jobs, raise the income levels, and also improve the nutritional status of the diets of the people with all the medical and economic implications. The agricultural sector should be made to focus attention on food production in particular and measures need to be taken on a strategy for the marketing of the agricultural products.

To tackle the environmental problem of development in the rural areas, land reclamation projects such as soil conservation, irrigation and afforestation programmes will be very crucial. Environmental education, supported by environmental laws will be crucial in concerning the resources of the local natural environmental systems. The education programmes should be capable of developing a population that will be aware of and concerned about the energy sector and its associated problems, and who will have the knowledge, skills, attitudes, motivations and commitments to work individually and collectively towards the solution of current problems and the prevention of new ones. There needs to be a proper forestry development strategy to make the study region self-sufficient at a stated date in addressing the forestry needs of the rural population. Certain areas in Sekhukhune also need to be fenced off as forest reserves to conserve the natural ecosystems of the municipalities. Above all, the importance of “Arbor Day” will need to be communicated to the people regularly.

Special efforts will also need to be made to link the agricultural sector to the manufacturing and commercial sectors of the regional economy as a way of preventing income and employment leakages (Boudon,1982; Todaro,1994).

In addition, the Sekhukhune Integrated Development Plan has to implement programmes to prevent the existing non-agricultural businesses such as the cafes, bakeries, fresh produce shops, butcheries, carpentry, welding works, sewing, repair shops, petrol stations, hair saloons, restaurants, entertainment and tourist establishments, etc from closing down or scaling down their operations in the Sekhukhune District Municipality. Interviews with the owners of such businesses indicate that they face major problems such as lack of capital, mentorship, entrepreneurship and management training and experience, limited market, lack of technological innovations, competition from the big firms operating in the formal sector, and limited networking and support from the government departments, among others.

The rural poverty eradication process cannot also be complete without increases in the provision of social services such as roads, water, schools, clinics, housing improvements, and others. The Integrated Development Plan needs to set up clear targets with monitoring and implementation system to ensure that the set targets are achieved (United Nations Development Programme, 1998).

There also needs to be programmes to address the issue of social security in the Study Region. This could be done by promoting the formation of community development organizations and empower such organizations to raise their own funds, so that the rural development effort can be decentralised. Such organizations could take various forms such as rural development co-operatives and be given tax incentives to encourage them to augment the funds provided by the central and provincial governments (McDowell, 1986; Parpart, 1989). A broadly-based national Rural Development Board representing government, the private sector and local interests would seem to be the most appropriate structure to support such an organization. Such a structure could also operate a Rural Development Fund so that it could receive and channel development funds from local and external, government and private sources. These recommendations would further imply that the lion's share of public sector transfers from government to the municipalities of former homelands such as Sekhukhune should be for rural development.

The Sekhukhune Rural Poverty Alleviation programme thus needs to reflect some of the key theoretical and methodological issues on poverty (Spicker 1999). The programme needs to indicate that rural poverty in the region does not just mean that the rural communities have low incomes but also that they are faced with limited opportunities and have inadequate means of taking part in political and economic life, that they are particularly exposed to risks, their human dignity is not respected, their human rights are abused and that they lack access to resources (Lustig & Stern, 2000)

In the programme it needs to be highlighted that rural poverty in the area has many different causes, rooted, not least, in economic and social deficits such as unequal distribution of wealth, inadequate power structures, poor governance and lack of gender equality and other forms of discrimination. The programme must therefore see rural poverty reduction as an eminently political task. What is needed then is the political will to take determined action against the causes of rural poverty in the region, the involvement of civil society organizations, and the mobilization of the private sector's financial and technical resources.

The programme must acknowledge that poverty does create major development problems in the Sekhukhune District Municipality. The poor must be seen as being most often exposed to the greatest environmental health risks. Living in poor houses, they endure unsafe sanitation conditions and exposure to pollution. They rely on unsafe sources of drinking water with attendant health risks. The programme must thus highlight that the desperate rural farmers in the area, who need to feed their families have no choice but to cultivate environmentally fragile

soils. Thus the councilors of the municipalities need to ensure that the rural energy sector in particular is fully integrated into the poverty reduction programmes. The programme must recognize that the rural poor must be key players; that they must be part of the development solution. Their creativity and capabilities must therefore be considered essential components in the fight against poverty. Self-help, self organization and participation on the part of poor women and men must thus become fundamental principles of the Sekhukhune poverty reduction programme. Poverty reduction must not be seen as a question of dispensing charity but rather helping to develop the productive and creative potential of the poor households of the municipality. To this end, the current development plans need to move beyond rhetoric and make concrete improvements in the rural energy system within political, economic and social regulatory frameworks of the Sekhukhune district to ensure a sustainable economy on a long term basis.

In addition to the above there is an urgent need for a provincial public relations and educational campaign aimed at tackling the poor image of the rural sector as a realm of business development (Coetzee, 1992). There are several opportunities in Sekhukhuneland where the crop production, livestock, handicrafts, tourism, forestry, small scale manufacturing, mining, and fishing, among others, can create jobs and incomes to eradicate poverty. The creation of incomes from these activities will then make it possible for the rural electrification and other modern energy systems to emerge and grow to make their maximum contributions to the overall local development efforts (Lustig & Stern, 2000).

#### **7.6 Monetising the rural economy and raising the per capita incomes of the informal and micro enterprises.**

This is another area where particular attention needs to be devoted since the bulk of economic activities in the rural areas comprise of subsistence activities and individually-owned small scale and informal activities. There needs to be strategic plans for opening up market and other opportunities for the subsistence sector to develop as a matter of urgency. There is also the need to formulate plans for assisting the informal and micro enterprises in the municipalities. The subsistence and informal and micro enterprises constitute the backbone of the economic activities of the households. The poverty eradication problem in rural Sekhukhuneland can therefore, to a large extent, be achieved in terms of empowering the second economy, ie the informal and micro enterprises, to enable it to make its maximum contribution to the broader development process (DBSA 2005a; 2005b). Such a programme must involve, inter alia, strengthening the Black Economic Empowerment and special programmes for women, encouraging the formation of co-operatives, facilitating the formation of micro credits to enable the poor households to engage in business promotion activities, developing skills training schemes, and, among others, establishing positive relations with the national Expanded Public Works Programme. Raising the per capita incomes of the people through the transformation of the subsistence sector and the informal and micro enterprises will surely make it possible for the people to afford the electricity bills to enable them to use electricity in addressing

broader activities and not just for lighting their homes at night. The mindset of the rural poor towards the subsistence sector and the micro enterprises can thus be changed by raising their incomes and thereby raising the awareness in them that they were not created to be poor.

### 7.7 The Sekhukhune District Rural Energy Programme

In the previous chapter, it was noted that in the firewood sector of the study region one can clearly see the contradictory nature of a system working towards its eventual destruction. It was noted, among other things, that the communities have very limited view about the role that electricity could play in their lives.

Numerous international publications emphasise that the coming of electricity in the underdeveloped countries in particular needs to be seen as significant milestones for transforming the very structures of their economies. Post-independence rural electrification for example, was one programme which brought about rapid rural industrialization in India leading to rural self-reliant development, reductions in rural-urban migration, and their positive multiplier effects on the whole Indian economy (UNDP & World Bank, 2003).

The impacts of the on-going rural electrification programme in Sekhukhuneland must not be confined to what the author observed in the field- that is - largely in terms of lighting the homes at night. If the rural development process of Sekhukhuneland is to be accelerated, then the rural electrification programme needs to be linked directly to the broader development problems, challenges and prospects as illustrated below.

Below are recommendations regarding the impacts which the current electrification programme must begin to have on the various sectors in the villages.

**Table 7.1 The functions expected to be played by electricity in the study region**

Sector	Recommended role / use of electricity
Agriculture	Mechanization and preservation of perishable farm produce such as fresh milk
Small scale mining activities	Quarrying and blasting activities
Small scale manufacturing	Foot-operated drilling and other related machines
Education	Providing lights at classrooms and other public places as reading rooms

	as well as in the operation of audio visual equipment
Water consumption	Warming, cooling and purifying drinking water
Tourist activities	In the running of lodges
Improvements in quality of life	Operating electrical appliances at home
Provision of services	At hair saloons, panel beaters, funeral undertakers
Arts and culture	Operating audio-visual equipment
Crime prevention	Electricity for providing street lights at night to increase visibility
Forestry-based industrial activities	The manufacture of planks
Local building construction activities	The use of small brick-making machines
Health services	Operating health equipment
Job creation and income generation	The use of simple machines for increasing output

In the absence of the activities proposed above, it will be difficult to monitor progress related to the developmental impacts of the current electrification programme. Addressing the recommendations in the above table for example would certainly help to address the current problems of unemployment, low incomes, low levels of investment, and dependence on firewood, among others.

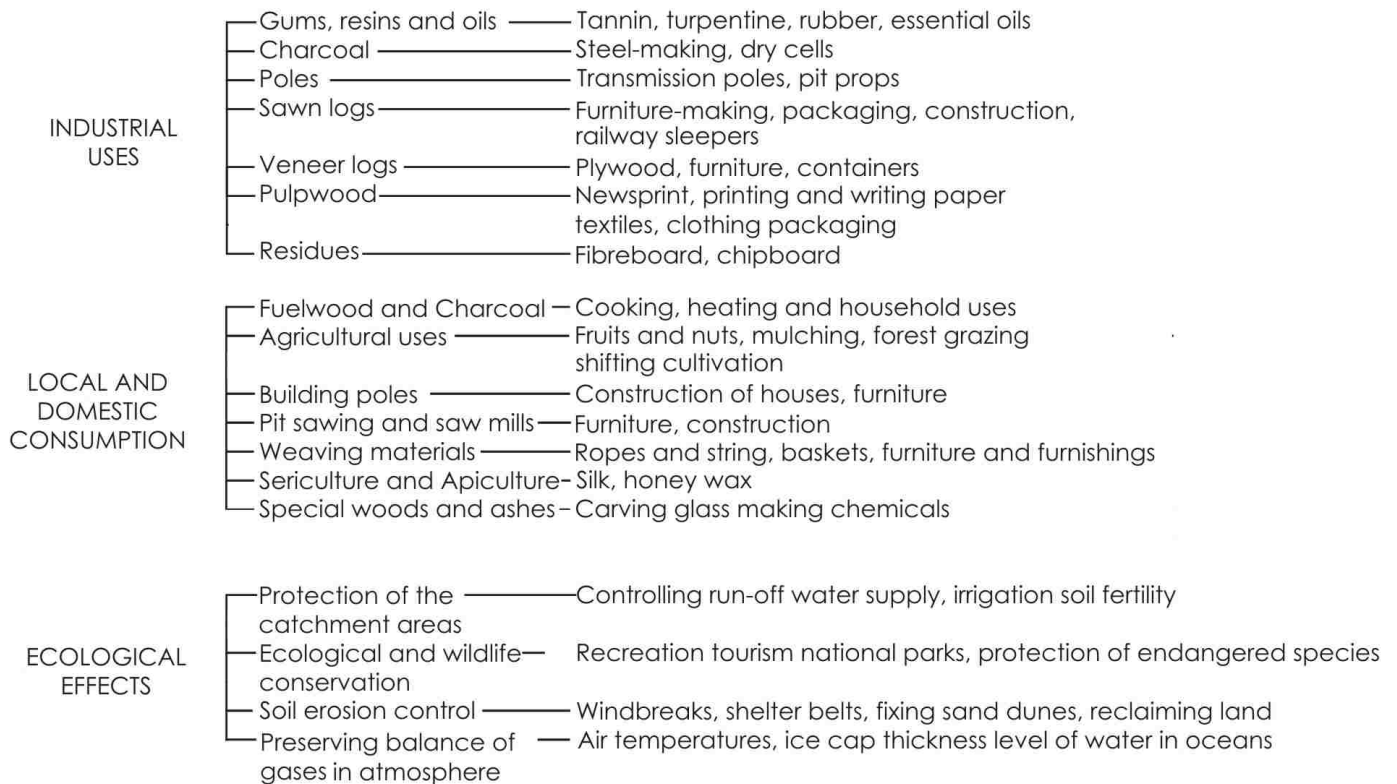
The 7 steps involved in the strategic planning process should therefore be applied to the relations between the electrification programme and the other sectors above, all of which should form integral parts of the local Integrated Development Plan.

It is highly recommended that above all, the local plans should include deadlines indicating at what date the various activities indicated in Table 7.1 above should be implemented in the villages. It is only within the framework of such a performance measure perspective that the full benefits of the current electrification programme could be assessed in the Study region.

## 7.8 The role of the forests in the development process

The forests in the Study region are important because of the many economic activities they could generate in the study region. The forests therefore need to be conserved (UN, 1993; Markandya et al, 2002). One can understand the harm which the firewood sector is causing the economy of Sekhukhuneland by examining Fig 7.1 below which indicates the importance of the forests in the development process.

Figure 12 The Contributions that the Forestry sector can make in the development process



**Fig. 7.1 The contributions that the Forestry sector can make in the development process.** Source: Shackleton, 1994

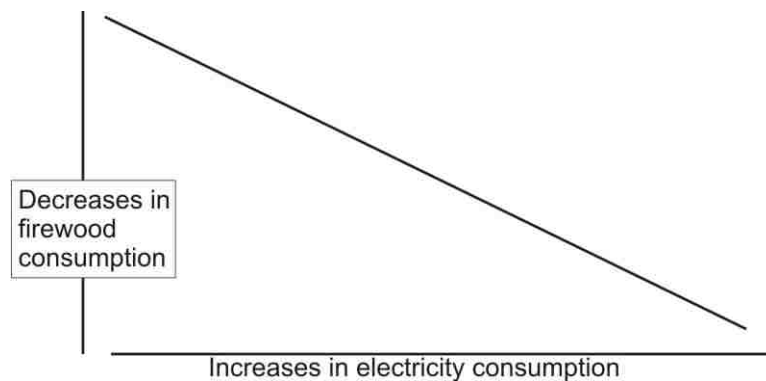
The illustration indicates that deforestation can prevent the population of the study region from benefiting from the list of 18 potential businesses and projects indicated. The model clearly indicates that, among others, the forestry resources of the villages have the potential to usher in some amount of rural industrial development which should therefore be taken seriously by the government. The firewood activities should therefore no longer be allowed to deprive Sekhukhuneland of developing its potential rural industrial base. A closer observation of the 18 individual items clearly indicates the critical role which the rural forest-based industrialization process can play – in the furniture, essential oils, packaging, containers, and even in the construction of transmission poles.

In terms of local and domestic consumption, it could further be observed that the local household needs for forest-based energy could be combined successfully with the supplies of ropes and strings, baskets, house construction materials, and furniture, among other things.

Finally, on the ecological functions of the forests, it could be observed further that the deforestation crisis needs to end in the villages so that the catchment areas the wildlife, and the soils could all be protected. Above all, the forests need to be protected to preserve the balance of the gases in the atmosphere surrounding the Study Region.

### **7. 9 The firewood sector must decline whilst the electricity sector grows in importance**

Those involved in the energy development planning programmes of Sekhukhuneland need to take seriously the fact that the firewood sector in particular, and its related negative impacts needs to decline with time otherwise the whole electrification exercise could be a fruitless exercise. One of the long term major aims behind the government's electrification programme is that at some future date the firewood sector will be give way completely to other energy forms such as electricity. This ambitious programme can however only be realised if there is a specific time-line programme to evaluate results. Thus, the 7 strategic planning steps illustrated above need to be adhered to with reference to the relations between firewood and electricity usage in the study region. Mechanisms will need to be put in place to monitor the growth rates of these two vital energy forms for the proper decisions to be taken all the time to ensure that the sort of inverse relationship between electricity and firewood, as illustrated below, will obtain.



**Fig 7.2 An ideal graphical relationship between electricity and firewood consumption**

The model above is normative indicating the ideal relationship that needs to exist between the on-going electrification programme and the firewood sector. The model indicates that the electrification programme must ultimately lead to the demise of the firewood – based energy system. A particular date thus needs to be set for the realization of this type of relationship.

To make this type of relationship possible will require various forms of intervention and education programmes to be facilitated by the government to reduce poverty. To reduce poverty and the dependence on firewood would require increasing local incomes in micro enterprises, and in the crop production, livestock, tourist, manufacturing, fishing, forestry, mining, commercial, transport and communications, handicrafts, health, and other businesses as indicated above. Rolling back the frontiers of the firewood sector will thus involve taking



major development planning decisions.

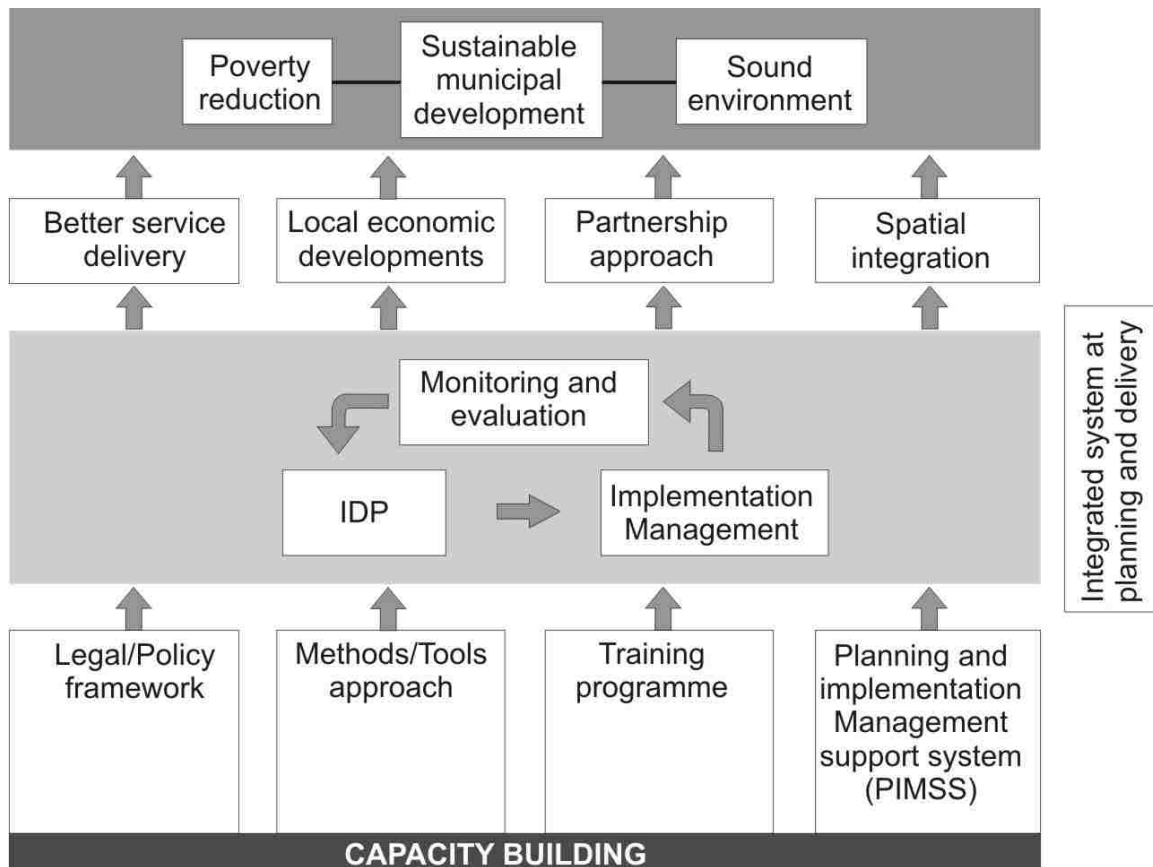
## **7. 10 Building Capacity for Decentralization and Local Governance in the Sekhukhune District Municipality**

The call for decentralization is a product of the cumulative ferment of the post-1994 era, with its emphasis on participatory development. The local communities in Sekhukhuneland must be encouraged to define a new order that will be conducive to their development and to gain control of their development. It implies that the rules of the game can no longer be viewed in traditional terms involving relations between a hegemonic centre and a dependent rural periphery. Devolution of power must be a key element of the new order. Such a new system must not however, imply a reduction of interactions, but must rather seek to increase the networking process on a new equitable basis for the benefit of the poor rural households (Olson 1965; Jeppe, 1985; Dept of Local Government, 2005).

Each of the 5 municipalities must therefore have, among others, structures that will have units for training the local people in the areas of energy research, development theory and practice, public administration, development and business plan formulation and implementation and community projects management, among others. The municipalities, the wards, and the tribal authorities with their kgosis, and the broader rural households should all be encouraged to belong to the various local parliamentary and development forums (Kemp 1993; Limpopo Provincial Govt 2004; World Bank, 1994). At the committee meetings the leaders should be able to explain to the people the changes taking place in the villages and how much more could be done in the pursuit of sustainable rural energy development.

The role of the community structures must thus grow as the former external dominating institutions decline. Brookfield (1975), The World Bank (1994), Van Arkadie (1989) and Nutt (1992) among others, have all indicated that no amount of strategic planning programmes can succeed unless the local community structures are involved both in the formulation and implementation of development programmes. Rural co-operatives in this regard, need to be encouraged in the communities to invest in various businesses. The co-operatives need to feature in the community-based integrated development programmes. To be deprived of the opportunities for political participation is to lose the chance to exercise one's powers of self-reflection and self-determination. The rural communities therefore need to be empowered politically to be able to transform their living conditions.

Fig.7.3 below is the outline of the Integrated Development Planning System as recommended by the Department of Local Government. From Fig 7.3, one can observe that capacity building in Sekhukhuneland must involve setting up local economic development structures, training programmes, legal and related mechanisms to address poverty, environmental problems and service delivery initiatives.



**Fig 7. 3 The Integrated Development Planning System**

Source: Dept of Local Govt, 2005. The Integrated Dev. Planning Guide Pack

Fig 7.3 is a model which should be familiar in the offices of the 5 municipalities. The various departments in the 5 municipalities need to see the model as a blueprint for the delivery of their various development programmes. For those involved with the energy development programmes, the model should be nothing new by now.

The model on Capacity Building indicates that the involvement of the state, business, and civil society organizations (eg the co-operatives) will all be crucial in achieving sustainable rural development (Bryson & Roering, 1988). For the

communities of Sekhukhune there is therefore the need for a radical perspective of the local government capacity building system. Fig 7.3 indicates that the ultimate legitimisation and integration of the local capacity building development processes must be through the active involvement of the state institutions.

### **7. 11 Not by electricity alone: On the Opinion Surveys**

The opinion surveys and the conceptualisation tests indicated that for the household heads, connecting their homes to the electricity power grid, as currently arranged under ESCOM, is the only means of getting out of their dependence on firewood

It emerged that the communities are aware of the financial problems of using the electricity to address their many needs. In spite of this it also emerged that the households hold the government's electrification programme in high esteem and rank it as their number one on the preference table among the list of alternative energy sources which they know.

There are certainly critical issues on the role of community education that need to be attended to. There needs to be an adult education system which will convince the household heads of Sekhukhuneland that the development environment of all societies is changing all the time and requires innovations to meet the changes.

The education system should inform the rural people that the future is unpredictable because of the non-linear behaviour of the development processes. Thus, the need for rural households to see beyond their taken-for-granted worlds. Statements such as the following could be made to feature in the adult educational programmes....

- Innovation means breaking conventions
- Innovation means looking at accepted practices from new perspectives
- Innovation means questioning orthodoxies and finding new ways of doing things
- Organizations that make a strong commitment to innovation do far better than those that do not.
- One requirement for real innovation is the courage to depart from familiar principles and take informed risk

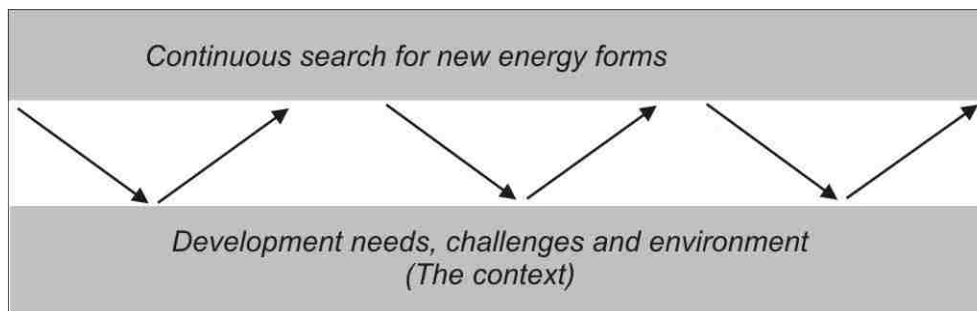
If such advertisements could be part of the community education programmes, there is no doubt that much could change in rural Sekhukhuneland.

Lalor (2001) in his publication on education and innovation referred to the following phases in the development agenda:

- (1) 1950-1960: The Age of Efficiency;
- (2) 1970-1980: The Age of Quality
- (3) 1980-1990: The Age of Flexibility;
- (4) Since 1990: The Age of Innovation

Taking Lalor's scheme as a basis for community education implies that what we take to represent our energy forms today (The Age of Innovation) should never

be taken as final and definitive appropriation and that we should rather aim at deepening and improving our tools for developing our future energy systems. This implies that there can be no fixed and final definition of energy forms only suggestions of what the forms should take in particular contexts. Energy forms should thus be seen as open-ended structures to be constantly redefined as peoples' understanding of the development process deepens and as new development challenges and problems emerge. Energy forms and the development process therefore need to interact constantly with the development situation presenting the context and the energy forms responding to the changing developmental realities as indicated below in Fig 7. 4 below.



**Fig. 7.4 : The changing development environment and energy forms : A structuration perspective**

The above normative model indicates that the community education process should indicate to the household heads that the realities of their changing development environment imply that they constantly need to up-date or revise their energy systems and forms. The households should thus be given the opportunities to explore the use of all types of energy possibilities.

Examples of energy feasibility studies that therefore need to be conducted in the study region should include the following, among others:

- The photo voltaic energy systems (Davis, 1995; Eberhard, 1984; Gosnell & Eberhard, 1998; and Lumby,1996).
- Landfill gas as a source of energy (Thompson,1987),

• Low cost solar energy plants. This is one option awaiting to be utilized. In the villages, a number of buildings could be targeted for the installation of solar cookers, solar water pumps and solar water heaters among others. The beneficiaries of such systems could be the households, schools and clinics. It is claimed that buildings could in future make power stations redundant by generating their own electricity from solar energy. Technological advances thus means that very soon solar-powered buildings (stand alone solar home systems) could generate enough energy from the sun not only to meet their own needs , but also to produce a healthy surplus of electricity that could be sold to neighbouring buildings (Green, Wilson & Cawood, 2001; Dept of Minerals &

Energy, 2002).

- Wind energy
- Geothermal energy
- Fuel- efficient stoves
- Portable small scale energy equipment
- The Multifunctional Platforms

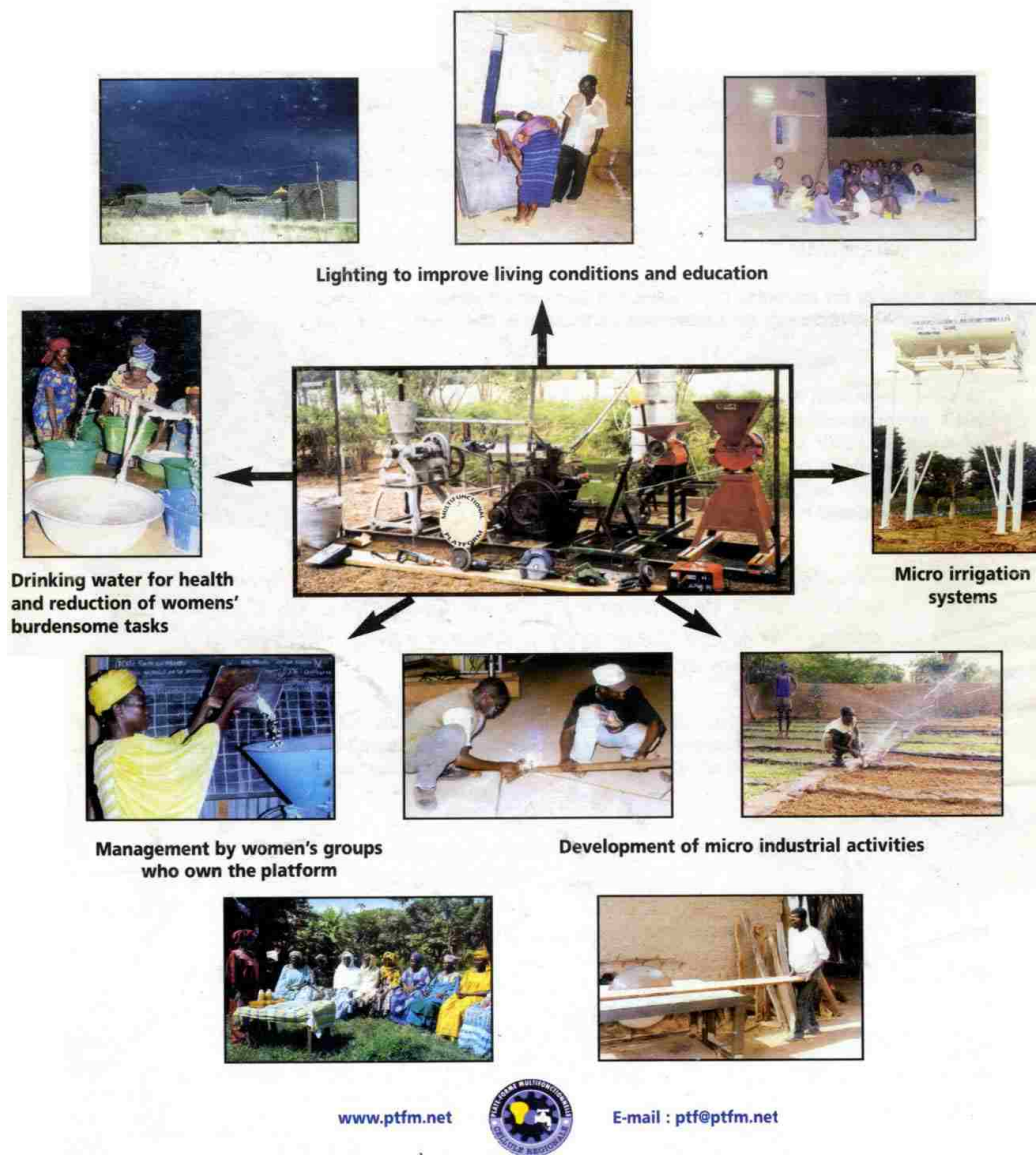
The Multifunctional Platforms (MFPs) for example, are government-sponsored rural energy programmes for transforming the lives of hundreds of thousands of households in Mali and other West African countries such as Burkina Fasso, Guinea, and Senegal. By providing cheap, simple, and robust energy sources for rural micro enterprises, the MFPs are creating income-generating opportunities for rural women and men, freeing up time for rest and other productive uses such as farming, and increasing access to education for girls. The formerly unpaid labour of women and girls is now being transformed into paid work in energy enterprises. The MFPs are creating jobs and the incomes needed to raise living conditions. This certainly, is one innovation whose development potentials need to be disclosed to the Sekhukhune rural households through various types of advertisements. Refer to Plate 7.1 below.

The government White Paper on energy (Appendix 1) lays particular emphasis on the need to develop renewable energy forms in South Africa. Efforts need therefore be made to develop this form of energy in the study region. Because some kinds of energy are continuously being created from primary sources, they are said to be recurring or renewable. These include solar energy, the energy in wind and flowing streams, geothermal energy and fuel from trees and other plants.

The renewable energy resources currently provide approximately 10% of South Africa's primary energy (Dept of Minerals & Energy, 1998). The renewable energy systems have specific advantages which include their minimal environmental impacts; the generally lower running costs and the high labour intensive technologies associated with them. Above all, the renewable energy sources operate from unlimited resource base and as such, can contribute towards a long term sustainable energy future. The Limpopo provincial government thus has to set up a committee to explore the potentials of developing all the renewable energy resources of the province.

# THE MULTIFUNCTIONAL PLATFORM

*Energy for village-level economic and social development*



**Plate 7.1 : The Multifunctional Platform**

For the firewood sector in particular serious afforestation programmes need to be introduced to replace the trees that are being lost as firewood on a daily basis. This could serve to educate the communities about the concept of renewable energy.

## 7. 12 Need for Energy Summits and Workshops

To enable the rural households to get access to the basic information and new

knowledge concerning the current state of their firewood system, there will, no doubt, be the need for regular summits, workshop, and other forms of meetings to facilitate the sharing of information (Goulet,1989; Sparknet 2003).

In such workshops, the government and other interested non-government organizations should be invited to enable them to indicate in specific terms the kind of assistance which they feel they could give to the rural households. Such types of initiatives could constitute a new chapter in the development of the Sekhukhune communities. The Limpopo provincial government therefore needs to stretch out to invite interested rural energy and other development partners to the province to contribute to the development of the rural communities of the province. At such workshops, the presence of representatives of the rural communities must be clearly seen. The traditional chiefs and their elders in particular must be invited to such workshops to enable them to witness and also contribute to all the discussions (Fazzore & Smith,1981).

The potential impacts of the current electrification and other possible new rural energy projects in raising the living standards of the rural communities need to be emphasised to the rural communities at such workshops. The current electrification infrastructure must be explained to the communities as veritable keys for creating jobs, increasing incomes, raising the investment potentials, introducing afforestation programmes, improving the quality of housing, food, education, health, and water in the villages, removing the problems of in-door pollution resulting from the burning of firewood for heating purposes at home, and putting an end to the long distances the women and children have to travel to collect firewood from the bush (Norman 1987; Parpart,1989).

For the organizations that may be interested to become partners in this type of initiative, this could also serve as venues for them to demonstrate to the public how they intend to contribute to the planning of local energy development programmes. The workshops could therefore become examples of how organizations from various sectors (academics from various disciplines, private business, government and civil society) could all work together to set energy development targets to uplift the living conditions of rural communities (Healey, 1979). Appendix 8 below gives an idea about organizations that could be consulted for possible assistance.

With targets set the annual workshops could thus become the venues where performance measurements could be assessed, and prizes awarded to those households, villages, and municipalities which can excel in terms of achieving the targets set in the district energy development targets.

### **7. 13 The Energy City Concept**

To bring home further to the villagers and the general public what it means to open up to the various forms of rural energy systems, it will be crucial for the government to support the building of Theme Parks or Ubuntu Energy Villages/

Cities in specific locations (towns or villages) in the Sekhukhune Municipality. Here, all the various energy projects could be demonstrated to the public at specific sites (eg selected houses, schools, clinics, or community centres etc) showing how the various forms of energy (hydro electricity, wind energy, coal, firewood, solar energy, etc) could be used to power rural industries, irrigation projects, welding, sewing, poultry farming, leather works, carpentry, handicrafts, etc. The advantages and disadvantages of the different energy forms could all be explained to the public at such sites (UNDP, 2002).

Fig 7.5 below gives an idea about how such a centre could look like. On special Open Days, the public could be invited to interact with energy-based organizations from various sections of society. Workshops for example, could be organized at the proposed Ubuntu Energy Villages or Energy Cities. Experts working at the proposed Theme Park could also network with overseas institutions to come to the centre occasionally to train the local communities to develop and manage their own small scale community-based energy projects.

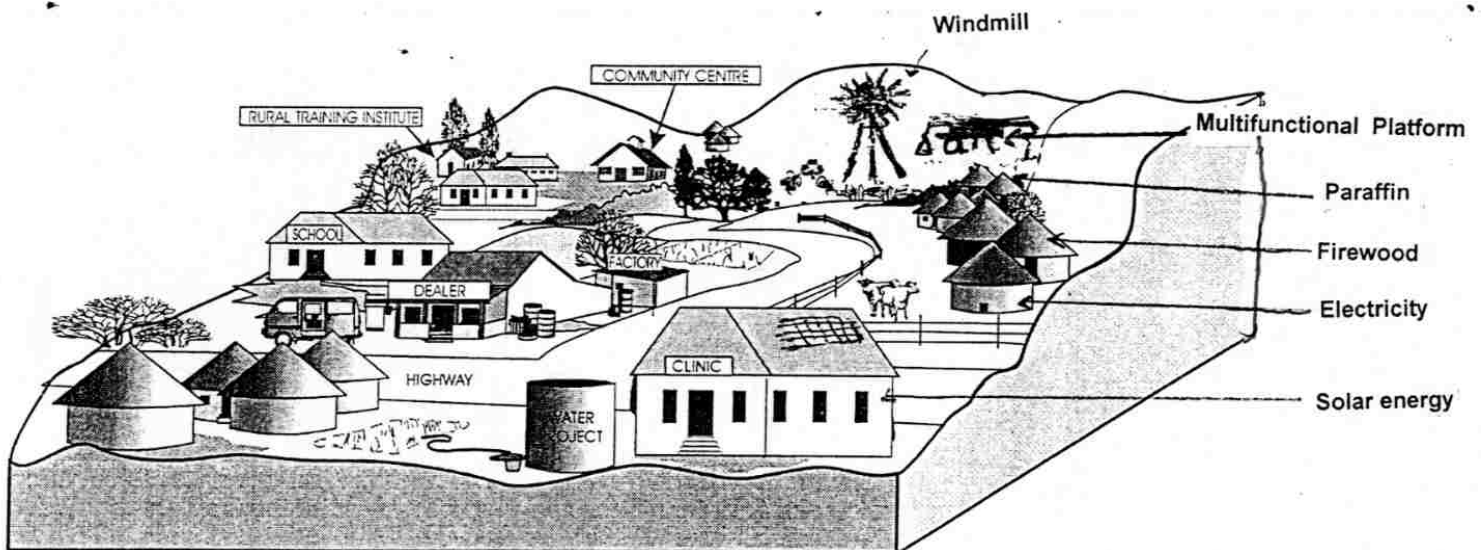
The Theme Parks could therefore become simultaneously tourist centres, training institutes, and as venues for holding meetings on rural energies, among others. The alternative forms of energy need to be displayed in such centres in Sekhukhuneland to inform the public that firewood is not the only source of energy for the rural households, and that, moreover, electricity usage in the villages cannot be confined only to the lighting of homes

The Theme Parks could welcome people with billboard advertising statements such as these:

- The long term availability of usable sources of energy and our ability to use them wisely are key factors which will be decisive in influencing the length and nature of human habitation on planet earth
- What are you doing to contribute to the search for better forms of energy?
- By providing the right answers to the rural energy crisis, you are contributing to the development of the disadvantaged rural communities of South Africa.
- By supporting this Ubuntu Energy Village, you are contributing positively to the debate on sustainable development.

Such statements could stimulate discussions on the challenges facing the communities. The statements could help raise awareness about the need for change. Through this programme, the villages could become centres for innovation diffusion. The adverts could thus be seen as important marketing and communication tools.





**Fig 7 . 5 The Energy City concept**

### **7. 14 Concluding remarks**

This research set out to investigate how the rural energy system of Sekhukhuneland has affected and ought to affect the development processes of the communities concerned. It has demonstrated how previous development policies have created rural poverty and energy crisis, which in turn, have operated jointly and continue to operate to create major problems for the rural households of the five municipalities of Sekhukhune District Council. The research has also demonstrated how the current government-sponsored

electrification programme is affecting the development efforts of the people.

A general theme of the research is that the aggregate level of activities in the communities studied is very much influenced by the demands in their energy sector. Currently, the dominant demand is for firewood which is associated with major environmental, health and other problems. The on-going electrification programme seeks to shift the current firewood-based energy demand to electricity which has the prospects of making a more positive contribution to the development of the communities concerned. Setting up the necessary mechanisms to enable the households to shift their demand to electricity is however, one of the current challenges that needs to be addressed. Because of the problems of poverty, the expected demand shift to electricity is being delayed. This indicates the need for a holistic government-backed intervention in the electrification and other new energy development programmes.

No concrete development in the study region can therefore be meaningful unless it takes explicit cognisance of the context - given, in this case, in terms of the existing government development programmes related to the development issue/sector or problem at hand. The research indicates that there is more to the issue of rural energy systems in the study region, that is, the system can be understood, analysed, and changed only within the context of the prevailing government development programmes. The research thus indicates that the existing energy system, as in the case of the other sectors of an economy, reflects the ways in which not only the households, but also the politicians interpret concrete development issues

Thus, the need for us to understand that development is a holistic process whose outcomes to a large extent, reflect the ideas of politicians. The research has reiterated the idea that development conditions are the manifestations of the prevailing political processes. Another lesson learnt from this study is that development programmes are geographically (that is regionally) specific and certainly politically defined by the power of the local politicians. The five individual municipalities relate to the development policies and programmes of the Limpopo provincial government whose programmes in turn, relate to the national development agenda. Those with political power in Sekhukhuneland therefore need to give democratic space for the rural poor and assist them in various ways to enable them to organise their energy and other development problems within a human rights perspective. The political element then, as is the case with the nation state, is the basis for the development of Sekhukhune society.

The study has also demonstrated that “nature” has not created on the one side a particular class in rural Sekhukhuneland which must be characterised by poverty doomed to survive only on firewood, and, on the other, a class of prosperity using the latest energy forms. Sekhukhune society is not one of natural or reified history, but merely the result of the political decisions of the past. Politicians have influenced the current nature of the economic, energy, and other development systems of the Sekhukhune district municipality. Hence, the key to understanding and changing the current and future living conditions of the rural communities of

Sekhukhuneland is undoubtedly the political factor. Dikgosi, the mayors, and the councillors of the municipalities thus have important functions to perform in the day-to-day activities of the five municipalities. Whether the development issue is on education, health, housing, safety and security, transport and communications, arts and culture, trade, finance, investments, water and sanitation, job creation, energy, or environmental conservation, the resources of the state are always critical in facilitating all the development issues at stake. It is in this context that this research will end by supporting the principal hypothesis of this study which is that of all the possible organizations and institutions that can mobilise resources to facilitate the regional development processes, those concerned with state institutions are the most formidable and fundamental.

It is hoped this research will make a significant contribution to a greater understanding of the development realities in the study region and that out of such understanding will come more awareness concerning the relations between the various sectors, institutions, activities and other stakeholders involved with the development transformation processes.

## APPENDICES

### APPENDIX 1: Deputy Minister's Foreword

I am confident that in this dynamic new era of the African Renaissance we shall see Renewable Energy taking its rightful place in the South African Energy Sector and playing a significant role in contributing towards sustainable development. The repercussions of a growing local renewable energy industry will be felt throughout the African Continent and the SADC region with the breakdown of trade barriers and the move towards a common policy, a move that will encourage competition and lower costs.

The global world is facing the challenge of harnessing the earth's resources effectively and efficiently. There is still a vast dependence on fossil fuels, and the use of this energy source is common to both developing and developed countries. It is well known that the excessive burning of fossil fuels does not go without a price as they release large amounts of carbon dioxide into the atmosphere.

Air pollution from using fuel wood unsustainably is still a familiar sight in developing countries, where women and children are the most affected. Research has indicated that one of the highest causes of infant mortality is from acute respiratory illness associated with the inhalation of wood smoke. Women still have to bear the problem of obtaining water and wood. This indicates that there is a need to develop efficient and safe technologies to relieve women from such a burden. Such improvements are generally part of integrated measures aimed at income generation via the pursuit of economic and agricultural development that afford women a more qualitative and productive time. However, the easier entry points for renewable energy are generally not in the remote rural areas, but in the urban household and industrial sectors. It is here that the possibilities for solar water heating, and the use of waste for power generation lie.

The African Continent is endowed with an abundance of renewable energy resources: hence this White Paper is being published to ensure that the renewable energy resources are used optimally. The present worldwide trend towards environmentally sustainable energy utilisation is a response to global climate change. This, coupled with market incentives to promote renewable energy technologies, can make this trend a reality in South Africa. Notwithstanding the legitimate needs in rural areas, commercial realities and the pressing demands made of our limited Fiscus, dictate that our initial ventures into renewable energy will be among the larger and more economically viable projects such as electricity from sugar mill bagasse and paper mill waste. It is sincerely hoped that this policy will provide certainty about our future direction and commitment.

It is in this context that the Ministry is committed to this policy document which is intended to give much needed thrust to renewable energy; a policy that envisages a range of measures to bring about integration of renewable energies into the mainstream energy economy. To achieve this aim Government is setting as its target an additional 10 000 GWh (0.8 Mtoe) renewable energy contribution to final energy consumption by 2012, to be produced mainly from biomass, wind, solar and small-scale hydro.

This policy is launched against the background of a massive campaign of electrification in

South Africa and now the start of a process of managed liberalisation of the energy sector including the transformation of the electricity distribution sector into regional electricity distributors.

Some of the main benefits of the White Paper will be renewable energy for rural communities, far from the national electricity grid, remote schools and clinics, energy for rural water supply and desalination, and solar passive designed housing and solar water heating for households in urban and rural settings. Large-scale utilisation of renewable energy will also reduce the emissions of carbon dioxide, thus contributing to an improved environment both locally and worldwide.

As part of the Presidential lead programmes promoting integrated sustainable rural development, renewable energy needs to assume a significant role in supporting economic development. The Government has brought electricity to both urban and rural areas and this has resulted in an improvement in the quality of lives of our people. It is for this reason that Government is also introducing decentralized mini-grids and hybrid systems in rural areas that will also promote the development of small medium and micro enterprises (SMMEs).

Government is committed to the introduction of greater levels of competition in electricity markets. Promoting renewable energy will contribute towards the diversification of electricity supply and energy security. In doing so, Government will create an enabling environment to facilitate the introduction of independent power producers that generate electricity from renewable energy sources. To complement these reforms, I would like to see a greater investment by the private sector in renewable energy power producers, and in the commercialisation and local manufacturing of renewable energy technologies.

Within the renewable energy sector I would like to see human capacity building programmes being strengthened both at formal and informal levels. This policy document is intended to support the development of training centres with the objective of enhancing human resource development and thus promoting socio-economic development. Government is also in the process of launching integrated energy centres that will bring technologies and energy services closer to disadvantaged communities, as well as disseminate information and create awareness about renewable energy.

Finally, it cannot be over-emphasised that South Africa is faced with pressing social problems such as poverty and the HIV/Aids epidemic. The utilisation of renewable technologies, particularly in remote rural areas, where clinics and households will depend upon solar electricity for their power, have a potentially important role to play in tackling these important social issues.

**S SHABANGU**  
**DEPUTY MINISTER OF MINERALS AND ENERGY**

Source: Dept of Minerals & Energy. *White Paper on the Promotion of Renewable Energy and Clean Energy Development*. August 2002. Pretoria.

## APPENDIX 2 : Defining and Measuring Poverty

Three broad approaches to the measurement and study of poverty can be distinguished: the quantitative money metric approach, the capability approach, and the participatory poverty assessment approach.

### *The Money Metric Approach*

The money metric approach to poverty, which is the most dominant measure used by academics and development practitioners, has several determining parameters. Under this approach, the first step taken towards measurement is to agree on a relevant measure for the standard of living. A relevant standard for countries in the developing world is per capita consumption expenditure (including the consumption of own production). In advanced countries it is income that is taken as the relevant measure of the standard of living. Given agreement on the measure of the standard of living, there are a number of methods to determine the threshold below which a person can be identified as poor. This threshold is commonly known as the poverty line.

There is general agreement that the relevant method for determining poverty lines for developing countries is the cost of basic needs. This method involves identifying a typical diet for the poor that is necessary for leading a healthy life. Healthy life is defined in terms of nutritional requirements using WHO and FAO nutritional requirements (recommended daily allowances, e.g. 2,500 calories per adult per day). Required quantities of the goods supplying the required calories are appropriately priced to arrive at a monetary value defining a food poverty line. By adding to this amount the cost of other requirements needed by individuals to live in a social context (e.g. the cost of clothing, shelter, education and medicine) an overall poverty line can be estimated.

Third, while the international debate has been conducted in terms of a fixed poverty line (e.g. \$1 per day) applied to all countries and over time, there is increasing realization that poverty lines should vary among countries depending on the level of development. Allowing the poverty line to change with the standard of living has been the practice in Europe in contrast to the practice in the US where the poverty line was held fixed for a long period of time.

Having obtained the poverty line, an immediate measure of poverty is the ratio of the poor thus identified to the total population in a given society. This is

the well-known head-count ratio. It is the most widely used, and easily understood, measure of poverty. Thus, for example, the international development goal on poverty is to reduce the head-count ratio to half its current level by the year 2015. The head-count ratio measures the spread, or incidence, of poverty in a given society. Another useful poverty measure is the poverty-gap ratio, which takes into account the extent to which consumption of the poor falls below the poverty line. It measures the depth of poverty in a society.

To be able to identify the poor, information on the distribution of consumption expenditure, or income, in the society is needed. For Africa such information has only recently been made available for a limited number of countries. In general, any poverty measure could, thus, be expressed as depending on mean consumption expenditure in society, the poverty line and on a measure of the underlying inequality in the distribution of consumption, usually taken as the Gini coefficient (see Box 3.6). The dynamic interrelations between these three parameters are such that as per capita consumption increases, other things remaining the same, poverty declines. Similarly, as inequality in the distribution of consumption expenditure declines, other things remaining the same, poverty declines.

### *The Capability Approach*

While the money metric approach to poverty is the dominant measure, use is often made of aggregate correlates of poverty such as life expectancy at birth (as a proxy for health status in a society) and school enrolment ratios (as a proxy for educational achievements). The use of these aggregate measures can be justified on a theoretical basis by resorting to Professor Sen's concepts of entitlements, capabilities and achievements. In contrast to the dominant approach to the measurement of poverty, which takes per capita consumption as the relevant indicator of the standard of living, the capability approach takes various kinds of freedom as the relevant indicators of the standard of living. In this perspective, poverty must be seen as the deprivation of basic capabilities rather than merely the lowness of incomes. Deprivation of elementary capabilities can be reflected in, among others, premature mortality, under-nourishment, morbidity and illiteracy. An example of applying such an approach is to be found in the Human Development Index of the UNDP.

In its relation to the dominant approach to poverty

analysis, it is perhaps important to note that the capability approach does not deny that deprivation of individual capabilities can have close links to the lowness of income. First, low income can be a major reason for illiteracy and ill health as well as hunger and malnutrition, and second, better education and health help in the earning of higher income. This type of relationship between the two approaches prompted the observation that they are complementary.

### *The Participatory Approach*

The third approach to the study, but not necessarily the measurement, of poverty is the participatory approach to poverty assessment. This approach was popularized largely by the work of development practitioners who were involved in assessing development projects at the field level. The basic premise underlying this approach is that the poor know more than anybody else about their realities, priorities and most of all the remedies to get out of the poverty trap. As a result, the information collection process differs substantially from that of representative household surveys on which the money metric approach relies. Thus under this approach it is the poor who are involved in providing non-quantitative information about poverty in the selected community through graphic presentation, anecdotes, social mapping, case stories, life histories, and local history.

Perhaps the most extensive application of this approach was the study undertaken by the World Bank in preparation for the "World Development Report 2000/2001: Attacking Poverty". The study brought together experiences of over 60,000 poor women and men from 60 countries around the world. Despite the richness of the participatory approach to poverty assessment, however, a careful reading of the selected quotations from poor people around the world would show that material deprivation was central to the perceptions of poor people about the nature of poverty. In a technical sense, therefore, the social, physical, psychological, insecurity, and lack of freedom of choice and action dimensions of poverty can be viewed as functions of the standard of living as summarized by mean per capita consumption in a given society. Also given the close interrelations between income and other aggregate correlates of poverty, it can be argued that poverty measured by the head-count ratio screens these correlates.

Source: World Bank. 1996. *Poverty Assessments: A Progress Review*.  
World Bank : Washington DC.

## APPENDIX 3 : Information on the 5 municipalities

### CBDC3: Sekhukhune District Municipality

Information on individuals				Information on households*			
<b>Population group by gender</b>				<b>Population group and gender of household head</b>			
	Male	Female	Total		Male	Female	Total
Black African	426 120	532 474	958 594	Black African	76 924	115 880	192 804
Coloured	331	396	727	Coloured	98	90	188
Indian or Asian	285	223	508	Indian or Asian	114	24	138
White	3 692	3 684	7 356	White	1 756	398	2 154
<b>Total</b>	<b>430 428</b>	<b>536 757</b>	<b>967 185</b>	<b>Total</b>	<b>78 892</b>	<b>116 393</b>	<b>195 285</b>
<b>Age group</b>				<b>Monthly imputed household income</b>			
	Persons				Households		
0-1	44 518			None - R 800	143 078		
2-5	98 428			R 801 - R 3 200	38 478		
6-14	254 642			R 3 200+	13 729		
15-17	84 681			<b>Total</b>	<b>195 285</b>		
18-35	247 216						
36-65	183 684						
66+	54 015						
<b>Total</b>	<b>967 185</b>						
<b>Educational attendance of those aged 5-24 years</b>				<b>Type of housing unit</b>			
	Persons				Households		
Not attending	96 758			House or brick structure on a separate stand or yard	143 333		
Pre-school	15 946			Traditional dwelling	32 121		
School	384 528			Flat in block of flats	1 395		
College	1 056			Town/cluster/semi-detached house	936		
Technikon	533			House/flat/room in backyard	3 785		
University	359			Informal dwelling/shack in backyard	3 916		
Adult ed. centre	334			Informal dwelling/shack NOT in backyard	7 605		
Other	598			Room/flatlet not in backyard but on shared property	1 644		
<b>Total</b>	<b>500 112</b>			Caravan/tent/private ship or boat	550		
				<b>Total</b>	<b>195 285</b>		
<b>Highest level of education of those aged 20+</b>				<b>Tenure status</b>			
	Persons				Households		
No schooling	185 760			Owned and fully paid off	111 877		
Some primary	52 840			Owned but not yet paid off	9 315		
Complete primary	19 897			Rented	8 921		
Some secondary	107 671			Occupied rent-free	65 173		
Std 10/ Grade 12	48 873			<b>Total</b>	<b>195 285</b>		
Higher	20 482						
<b>Total</b>	<b>435 522</b>						
<b>Labour market status of those aged 15-65 years</b>				<b>Access to water</b>			
	Persons				Households		
Employed	70 620			Piped water			
Unemployed	110 111			in dwelling or yard	39 779		
Not economically active	334 849			within 200 metres	28 730		
<b>Total</b>	<b>515 581</b>			more than 200 metres away	42 906		
				Borehole	13 781		
				Spring	4 546		
				Rainwater tank	984		
				Dam/pool/stagnant water	10 066		
				River/stream	43 681		
				Water vendor	2 321		
				Other	8 490		
				<b>Total</b>	<b>195 285</b>		
<b>Sector of work of the employed aged 15-65 years</b>				<b>Percentage of households using electricity as main fuel</b>			
	Persons				Households		
Formal	44 911			Lighting	63,6		
Informal	15 233			Heating	21,0		
Farming	8 256			Cooking	19,3		
Temp. absent	2 220						
<b>Total</b>	<b>70 620</b>						
<b>Mode of travel to school or place of work</b>				<b>Toilet facilities</b>			
	Persons				Households		
On foot	435 434			Flush toilet (connected to sewerage system)	9 100		
By bicycle	1 745			Flush toilet (with septic tank)	1 595		
By motorcycle	1 300			Chemical toilet	4 011		
By car as a driver	8 135			Pit latrine with ventilation (VIP)	18 866		
By car as a passenger	11 785			Pit latrine without ventilation	127 331		
By minibus/taxi	14 404			Bucket latrine	1 313		
By bus	13 298			None	33 070		
By train	1 352			<b>Total</b>	<b>195 285</b>		
Other	1 241						
<b>Total</b>	<b>488 674</b>						
				<b>Refuse removal</b>			
					Households		
				Removed by local authority at least once a week	10 335		
				Removed by local authority less often	1 123		
				Communal refuse dump	1 797		
				Own refuse dump	146 371		
				No rubbish disposal	35 660		
				<b>Total</b>	<b>195 285</b>		

\* These tables only cover households in housing units.  
No collective living quarters are included.

### CBLC3: Greater Marble Hall (Marble Hall)

#### Information on individuals

Population group by gender

	Male	Female	Total
Black African	54 466	64 207	118 673
Coloured	67	73	140
Indian or Asian	42	37	79
White	1 191	1 244	2 435
<b>Total</b>	<b>55 766</b>	<b>65 561</b>	<b>121 327</b>

Age group

Age group	Persons
0-1	5 711
2-5	12 058
6-14	29 969
15-17	9 942
18-35	32 902
36-65	24 048
66+	6 699
<b>Total</b>	<b>121 327</b>

Educational attendance of those aged 5-24 years

	Persons
Not attending	13 591
Pre-school	1 896
School	44 103
College	146
Technikon	67
University	48
Adult ed. centre	33
Other	78
<b>Total</b>	<b>59 962</b>

Highest level of education of those aged 20+

	Persons
No schooling	21 711
Some primary	8 689
Complete primary	3 109
Some secondary	14 395
Std 10/ Grade 12	7 175
Higher	2 456
<b>Total</b>	<b>57 535</b>

Labour market status of those aged 15-65 years

	Persons
Employed	15 665
Unemployed	12 734
Not economically active	38 494
<b>Total</b>	<b>66 893</b>

Sector of work of the employed aged 15-65 years

	Persons
Formal	9 392
Informal	2 433
Farming	3 392
Temp. absent	448
<b>Total</b>	<b>15 665</b>

Mode of travel to school or place of work

	Persons
On foot	55 438
By bicycle	290
By motorcycle	164
By car as a driver	1 510
By car as a passenger	1 827
By minibus/taxi	1 713
By bus	3 197
By train	204
Other	522
<b>Total</b>	<b>64 865</b>

#### Information on households\*

Population group and gender of household head

	Male	Female	Total
Black African	10 290	13 100	23 390
Coloured	19	17	36
Indian or Asian	22	-	22
White	604	135	739
<b>Total</b>	<b>10 935</b>	<b>13 252</b>	<b>24 187</b>

Monthly imputed household income

	Households
None - R 800	16 904
R 801 - R 3 200	5 477
R 3 200+	1 808
<b>Total</b>	<b>24 189</b>

Type of housing unit

	Households
House or brick structure on a separate stand or yard	17 734
Traditional dwelling	3 827
Flat in block of flats	311
Town/cluster/semi-detached house	103
House/flat/room in backyard	761
Informal dwelling/shack in backyard	589
Informal dwelling/shack NOT in backyard	607
Room/flatlet not in backyard but on shared property	188
Caravan/tent/private ship or boat	69
<b>Total</b>	<b>24 189</b>

Tenure status

	Households
Owned and fully paid off	14 231
Owned but not yet paid off	995
Rented	1 120
Occupied rent-free	7 843
<b>Total</b>	<b>24 189</b>

Access to water

	Households
Piped water	
in dwelling or yard	9 979
within 200 metres	2 526
more than 200 metres away	3 536
Borehole	1 395
Spring	589
Rainwater tank	104
Dam/pool/stagnant water	1 443
River/stream	2 975
Water vendor	426
Other	1 213
<b>Total</b>	<b>24 186</b>

Percentage of households using electricity as main fuel

	Households
Lighting	82,4
Heating	35,0
Cooking	26,4

Toilet facilities

	Households
Flush toilet (connected to sewerage system)	2 641
Flush toilet (with septic tank)	247
Chemical toilet	871
Pit latrine with ventilation (VIP)	3 378
Pit latrine without ventilation	13 785
Bucket latrine	121
None	3 147
<b>Total</b>	<b>24 190</b>

Refuse removal

	Households
Removed by local authority at least once a week	3 030
Removed by local authority less often	142
Communal refuse dump	208
Own refuse dump	17 103
No rubbish disposal	3 706
<b>Total</b>	<b>24 189</b>

\* These tables only cover households in housing units. No collective living quarters are included.

## CBLC4: Greater Groblersdal (Groblersdal)

### Information on individuals

#### Population group by gender

	Male	Female	Total
Black African	97 470	120 823	218 293
Coloured	96	109	205
Indian or Asian	72	49	121
White	1 060	1 070	2 130
<b>Total</b>	<b>98 698</b>	<b>122 051</b>	<b>220 749</b>

#### Age group

	Persons
0-1	10 150
2-5	22 299
6-14	56 398
15-17	18 803
18-35	58 106
36-65	42 436
66+	12 558
<b>Total</b>	<b>220 750</b>

#### Educational attendance of those aged 5-24 years

	Persons
Not attending	22 379
Pre-school	3 343
School	85 776
College	425
Technikon	172
University	117
Adult ed. centre	124
Other	151
<b>Total</b>	<b>112 487</b>

#### Highest level of education of those aged 20+

	Persons
No schooling	46 194
Some primary	11 155
Complete primary	4 228
Some secondary	22 779
Std 10/ Grade 12	12 386
Higher	4 684
<b>Total</b>	<b>101 426</b>

#### Labour market status of those aged 15-65 years

	Persons
Employed	20 166
Unemployed	23 918
Not economically active	75 261
<b>Total</b>	<b>119 345</b>

#### Sector of work of the employed aged 15-65 years

	Persons
Formal	11 407
Informal	4 912
Farming	3 207
Temp. absent	640
<b>Total</b>	<b>20 166</b>

#### Mode of travel to school or place of work

	Persons
On foot	97 683
By bicycle	828
By motorcycle	328
By car as a driver	2 330
By car as a passenger	2 731
By minibus/taxi	5 274
By bus	3 976
By train	341
Other	273
<b>Total</b>	<b>113 764</b>

### Information on households\*

#### Population group and gender of household head

	Male	Female	Total
Black African	18 069	26 486	44 555
Coloured	25	31	56
Indian or Asian	26	3	29
White	493	167	660
<b>Total</b>	<b>18 613</b>	<b>26 687</b>	<b>45 300</b>

#### Monthly imputed household income

	Households
None - R 800	32 317
R 801 - R 3 200	9 501
R 3 200+	3 482
<b>Total</b>	<b>45 300</b>

#### Type of housing unit

	Households
House or brick structure on a separate stand or yard	33 243
Traditional dwelling	6 902
Flat in block of flats	554
Town/cluster/semi-detached house	278
House/flat/room in backyard	1 105
Informal dwelling/shack in backyard	755
Informal dwelling/shack NOT in backyard	1 596
Room/flatlet not in backyard but on shared property	785
Caravan/tent/private ship or boat	82
<b>Total</b>	<b>45 300</b>

#### Tenure status

	Households
Owned and fully paid off	24 625
Owned but not yet paid off	1 440
Rented	3 151
Occupied rent-free	16 084
<b>Total</b>	<b>45 300</b>

#### Access to water

	Households
Piped water	
in dwelling or yard	12 548
within 200 metres	5 606
more than 200 metres away	8 410
Borehole	4 359
Spring	1 370
Rainwater tank	217
Dam/pool/stagnant water	3 092
River/stream	6 566
Water vendor	927
Other	2 206
<b>Total</b>	<b>45 301</b>

#### Percentage of households using electricity as main fuel

	Households
Lighting	85,5
Heating	25,2
Cooking	22,9

#### Toilet facilities

	Households
Flush toilet (connected to sewerage system)	2 615
Flush toilet (with septic tank)	463
Chemical toilet	708
Pit latrine with ventilation (VIP)	3 719
Pit latrine without ventilation	34 905
Bucket latrine	375
None	2 516
<b>Total</b>	<b>45 301</b>

#### Refuse removal

	Households
Removed by local authority at least once a week	3 056
Removed by local authority less often	392
Communal refuse dump	934
Own refuse dump	32 891
No rubbish disposal	8 027
<b>Total</b>	<b>45 300</b>

\* These tables only cover households in housing units.  
No collective living quarters are included.

Census 2001: Key municipal data





## CBLC5: Greater Tubatse (Burgersfort/Ohrigstad/Eastern Tubatse)

### Information on individuals

#### Population group by gender

	Male	Female	Total
Black African	119 923	147 564	267 487
Coloured	142	175	317
Indian or Asian	131	115	246
White	1 060	1 012	2 072
<b>Total</b>	<b>121 256</b>	<b>148 866</b>	<b>270 122</b>

#### Age group

Age group	Persons
0-1	12 708
2-5	28 209
6-14	72 348
15-17	23 629
18-35	71 199
36-65	49 540
66+	12 489
<b>Total</b>	<b>270 122</b>

#### Educational attendance of those aged 5-24 years

	Persons
Not attending	29 526
Pre-school	5 081
School	106 709
College	217
Technikon	148
University	106
Adult ed. centre	95
Other	183
<b>Total</b>	<b>142 065</b>

#### Highest level of education of those aged 20+

	Persons
No schooling	47 792
Some primary	15 622
Complete primary	6 066
Some secondary	33 076
Std 10/ Grade 12	12 010
Higher	4 943
<b>Total</b>	<b>119 509</b>

#### Labour market status of those aged 15-65 years

	Persons
Employed	19 188
Unemployed	30 672
Not economically active	94 509
<b>Total</b>	<b>144 369</b>

#### Sector of work of the employed aged 15-65 years

	Persons
Formal	13 392
Informal	3 704
Farming	1 428
Temp. absent	665
<b>Total</b>	<b>19 189</b>

#### Mode of travel to school or place of work

	Persons
On foot	118 588
By bicycle	295
By motorcycle	385
By car as a driver	2 332
By car as a passenger	3 825
By minibus/taxi	4 284
By bus	4 797
By train	400
Other	307
<b>Total</b>	<b>135 213</b>

### Information on households\*

#### Population group and gender of household head

	Male	Female	Total
Black African	22 758	30 382	53 140
Coloured	46	35	81
Indian or Asian	57	15	72
White	478	79	557
<b>Total</b>	<b>23 339</b>	<b>30 511</b>	<b>53 850</b>

#### Monthly imputed household income

	Households
None - R 800	39 451
R 801 - R 3 200	10 445
R 3 200+	3 954
<b>Total</b>	<b>53 850</b>

#### Type of housing unit

	Households
House or brick structure on a separate stand or yard	37 495
Traditional dwelling	9 897
Flat in block of flats	375
Town/cluster/semi-detached house	220
House/flat/room in backyard	548
Informal dwelling/shack in backyard	1 436
Informal dwelling/shack NOT in backyard	3 366
Room/flatlet not in backyard but on shared property	322
Caravan/tent/private ship or boat	191
<b>Total</b>	<b>53 850</b>

#### Tenure status

	Households
Owned and fully paid off	30 284
Owned but not yet paid off	3 666
Rented	2 140
Occupied rent-free	17 761
<b>Total</b>	<b>53 851</b>

#### Access to water

	Households
Piped water	
in dwelling or yard	9 176
within 200 metres	8 190
more than 200 metres away	16 091
Borehole	2 345
Spring	595
Rainwater tank	165
Dam/pool/stagnant water	1 018
River/stream	13 387
Water vendor	578
Other	2 306
<b>Total</b>	<b>53 851</b>

#### Percentage of households using electricity as main fuel

	Households
Lighting	46,6
Heating	16,8
Cooking	16,1

#### Toilet facilities

	Households
Flush toilet (connected to sewerage system)	2 475
Flush toilet (with septic tank)	496
Chemical toilet	1 294
Pit latrine with ventilation (VIP)	5 742
Pit latrine without ventilation	29 547
Bucket latrine	343
None	13 952
<b>Total</b>	<b>53 849</b>

#### Refuse removal

	Households
Removed by local authority at least once a week	3 623
Removed by local authority less often	325
Communal refuse dump	251
Own refuse dump	35 081
No rubbish disposal	14 570
<b>Total</b>	<b>53 850</b>

\* These tables only cover households in housing units. No collective living quarters are included.

## NP03A2: Makhuduthamaga (Ngwaritsi)

### Information on individuals

#### Population group by gender

	Male	Female	Total
Black African	113 937	148 811	262 748
Coloured	21	34	55
Indian or Asian	38	22	60
White	22	18	40
<b>Total</b>	<b>114 018</b>	<b>148 885</b>	<b>262 903</b>

#### Age group

	Persons
0-1	12 005
2-5	26 953
6-14	71 210
15-17	23 886
18-35	62 820
36-65	49 576
66+	16 454
<b>Total</b>	<b>262 904</b>

#### Educational attendance of those aged 5-24 years

	Persons
Not attending	23 300
Pre-school	4 145
School	109 782
College	154
Technikon	114
University	68
Adult ed. centre	48
Other	137
<b>Total</b>	<b>137 748</b>

#### Highest level of education of those aged 20+

	Persons
No schooling	51 417
Some primary	12 567
Complete primary	4 780
Some secondary	27 751
Std 10/ Grade 12	13 068
Higher	6 005
<b>Total</b>	<b>115 588</b>

#### Labour market status of those aged 15-65 years

	Persons
Employed	10 746
Unemployed	32 333
Not economically active	93 203
<b>Total</b>	<b>136 282</b>

#### Sector of work of the employed aged 15-65 years

	Persons
Formal	7 048
Informal	3 222
Farming	172
Temp. absent	304
<b>Total</b>	<b>10 746</b>

#### Mode of travel to school or place of work

	Persons
On foot	121 447
By bicycle	197
By motorcycle	300
By car as a driver	1 335
By car as a passenger	1 929
By minibus/taxi	2 651
By bus	792
By train	298
Other	93
<b>Total</b>	<b>129 042</b>

### Information on households\*

#### Population group and gender of household head

	Male	Female	Total
Black African	18 691	34 422	53 113
Coloured	6	8	14
Indian or Asian	9	3	12
White	10	7	17
<b>Total</b>	<b>18 716</b>	<b>34 440</b>	<b>53 156</b>

#### Monthly imputed household income

	Households
None - R 800	40 886
R 801 - R 3 200	9 205
R 3 200+	3 065
<b>Total</b>	<b>53 156</b>

#### Type of housing unit

	Households
House or brick structure on a separate stand or yard	39 996
Traditional dwelling	8 804
Flat in block of flats	100
Town/cluster/semi-detached house	316
House/flat/room in backyard	1 187
Informal dwelling/shack in backyard	813
Informal dwelling/shack NOT in backyard	1 596
Room/flatlet not in backyard but on shared property	285
Caravan/tent/private ship or boat	58
<b>Total</b>	<b>53 155</b>

#### Tenure status

	Households
Owned and fully paid off	30 982
Owned but not yet paid off	2 191
Rented	1 444
Occupied rent-free	18 539
<b>Total</b>	<b>53 156</b>

#### Access to water

	Households
Piped water	
in dwelling or yard	5 715
within 200 metres	8 718
more than 200 metres away	9 952
Borehole	3 965
Spring	1 923
Rainwater tank	437
Dam/pool/stagnant water	4 220
River/stream	15 911
Water vendor	337
Other	1 978
<b>Total</b>	<b>53 156</b>

#### Percentage of households using electricity as main fuel

	Households
Lighting	62,2
Heating	16,9
Cooking	16,9

#### Toilet facilities

	Households
Flush toilet (connected to sewerage system)	918
Flush toilet (with septic tank)	289
Chemical toilet	969
Pit latrine with ventilation (VIP)	4 650
Pit latrine without ventilation	37 446
Bucket latrine	372
None	8 512
<b>Total</b>	<b>53 156</b>

#### Refuse removal

	Households
Removed by local authority at least once a week	307
Removed by local authority less often	156
Communal refuse dump	274
Own refuse dump	46 895
No rubbish disposal	5 523
<b>Total</b>	<b>53 155</b>

\* These tables only cover households in housing units. No collective living quarters are included.

Census 2001: Key municipal data

Census 2001: Key municipal data

## NP03A3: Fetakgomo

### Information on individuals

#### Population group by gender

	Male	Female	Total
Black African	40 325	51 069	91 394
Coloured	4	4	8
Indian or Asian	-	-	-
White	358	320	678
<b>Total</b>	<b>40 687</b>	<b>51 393</b>	<b>92 080</b>

#### Age group

	Persons
0-1	3 946
2-5	8 911
6-14	24 717
15-17	8 420
18-35	22 189
36-65	18 083
66+	5 817
<b>Total</b>	<b>92 083</b>

#### Educational attendance of those aged 5-24 years

	Persons
Not attending	7 963
Pre-school	1 481
School	38 158
College	115
Technikon	32
University	20
Adult ed. centre	35
Other	47
<b>Total</b>	<b>47 851</b>

#### Highest level of education of those aged 20+

	Persons
No schooling	18 646
Some primary	4 806
Complete primary	1 715
Some secondary	9 670
Std 10/ Grade 12	4 234
Higher	2 395
<b>Total</b>	<b>41 466</b>

#### Labour market status of those aged 15-65 years

	Persons
Employed	4 856
Unemployed	10 455
Not economically active	33 382
<b>Total</b>	<b>48 693</b>

#### Sector of work of the employed aged 15-65 years

	Persons
Formal	3 671
Informal	962
Farming	58
Temp. absent	164
<b>Total</b>	<b>4 855</b>

#### Mode of travel to school or place of work

	Persons
On foot	42 278
By bicycle	135
By motorcycle	123
By car as a driver	628
By car as a passenger	1 455
By minibus/taxi	482
By bus	537
By train	109
Other	46
<b>Total</b>	<b>45 793</b>

### Information on households\*

#### Population group and gender of household head

	Male	Female	Total
Black African	7 116	11 490	18 606
Coloured	3	-	3
Indian or Asian	-	-	-
White	171	10	181
<b>Total</b>	<b>7 290</b>	<b>11 500</b>	<b>18 790</b>

#### Monthly imputed household income

	Households
None - R 800	13 519
R 801 - R 3 200	3 850
R 3 200+	1 420
<b>Total</b>	<b>18 789</b>

#### Type of housing unit

	Households
House or brick structure on a separate stand or yard	14 865
Traditional dwelling	2 690
Flat in block of flats	55
Town/cluster/semi-detached house	20
House/flat/room in backyard	183
Informal dwelling/shack in backyard	323
Informal dwelling/shack NOT in backyard	439
Room/flatlet not in backyard but on shared property	64
Caravan/tent/private ship or boat	149
<b>Total</b>	<b>18 788</b>

#### Tenure status

	Households
Owned and fully paid off	11 755
Owned but not yet paid off	1 022
Rented	1 066
Occupied rent-free	4 945
<b>Total</b>	<b>18 788</b>

#### Access to water

	Households
Piped water	
in dwelling or yard	2 362
within 200 metres	3 690
more than 200 metres away	4 917
Borehole	1 717
Spring	70
Rainwater tank	60
Dam/pool/stagnant water	294
River/stream	4 841
Water vendor	52
Other	787
<b>Total</b>	<b>18 790</b>

#### Percentage of households using electricity as main fuel

	Households
Lighting	39,2
Heating	16,5
Cooking	17,8

#### Toilet facilities

	Households
Flush toilet (connected to sewerage system)	452
Flush toilet (with septic tank)	100
Chemical toilet	168
Pit latrine with ventilation (VIP)	1 377
Pit latrine without ventilation	11 648
Bucket latrine	102
None	4 943
<b>Total</b>	<b>18 790</b>

#### Refuse removal

	Households
Removed by local authority at least once a week	318
Removed by local authority less often	107
Communal refuse dump	129
Own refuse dump	14 401
No rubbish disposal	3 834
<b>Total</b>	<b>18 789</b>

\* These tables only cover households in housing units. No collective living quarters are included.

#### **APPENDIX 4 : : EXPLANATION OF TERMS**

**Household** refers to a single person or a group of persons who live together, and provide themselves jointly with food and/or other essentials for living.

**Housing unit** is a unit of accommodation for a household, which may consist of one structure , more than one structure, or part of a structure. Examples of each are a house, a group of rondavels, and a flat.

**The employed** are those who performed work for pay, profit or family gain in the seven days prior to the household survey interview, or who were absent from work during these seven days, but did have some form of paid work during this time.

**Community-based organizations (CBO's)** denote membership-based organizations established to represent a particular interest group or locality ( or organizations established to represent a particular interest group or locality or conglomeration of interest groups and/or localities.

**Non-Government Organizations (NGO's)** refer to service -delivery organizations comprising of professionally trained staff that perform dedicated functions to achieve the specific purpose of the given organizations. These are distinctly non-membership and therefore make interventions on the basis of principles, values, objectives, etc as opposed to their representative status.

**State Organizations** refer to national, provincial, and local institutions which are tasked to perform specific functions.

**Donor Agencies** belong to non-government organizations often involved in financial, technological, and other development activities.

## APPENDIX 5: THE HUMAN POVERTY INDEX

### Computing the human poverty index for developing countries

The human poverty index for developing countries (HPI-1) concentrates on deprivations in three essential dimensions of human life already reflected in the HDI—longevity, knowledge and a decent standard of living. The first deprivation relates to survival—the vulnerability to death at a relatively early age. The second relates to knowledge—being excluded from the world of reading and communication. The third relates to a decent living standard in terms of overall economic provisioning.

In constructing the HPI-1, the deprivation in longevity is represented by the percentage of people not expected to survive to age 40 ( $P_1$ ), and the deprivation in knowledge by the percentage of adults who are illiterate ( $P_2$ ). The deprivation in a decent living standard in terms of overall economic provisioning is represented by a composite ( $P_3$ ) of three variables—the percentage of people without access to safe water ( $P_{31}$ ), the percentage of people without access to health services ( $P_{32}$ ) and the percentage of moderately and severely underweight children under five ( $P_{33}$ ).

The composite variable  $P_3$  is constructed by taking a simple average of the three variables  $P_{31}$ ,  $P_{32}$  and  $P_{33}$ . Thus

$$P_3 = \frac{(P_{31} + P_{32} + P_{33})}{3}$$

Following the analysis in chapter 1 of this Report and technical note 1 in *Human Development Report 1997*, the formula of the HPI-1 is given by:

$$\text{HPI-1} = [1/3(P_1^3 + P_2^3 + P_3^3)]^{1/3}$$

As an example, we compute the HPI-1 for Egypt.

#### STEP ONE Calculating $P_3$

Country	$P_1$ (%)	$P_2$ (%)	$P_{31}$ (%)	$P_{32}$ (%)	$P_{33}$ (%)
gypt	13.0	48.6	13	1	15

$$P_3 = \frac{13 + 1 + 15}{3} = \frac{29}{3} = 9.67$$

#### STEP TWO Constructing the HPI

$$\begin{aligned} \text{HPI-1} &= [1/3(13.0^3 + 48.6^3 + 9.67^3)]^{1/3} \\ &= [1/3(2,197.0 + 114,791.3 + 904.2)]^{1/3} \\ &= [1/3(117,892.5)]^{1/3} \\ &= (39,297.5)^{1/3} \\ &= 34.0 \end{aligned}$$

### Computing the human poverty index for industrial countries

The human poverty index for industrial countries (HPI-2) concentrates on deprivations in four dimensions of human life, quite similar to those reflected in the HDI—longevity, knowledge, a decent standard of living and social exclusion. The first deprivation relates to survival—the vulnerability to death at a relatively early age. The second relates to knowledge—being deprived of the world of reading and communication. The third relates to a decent living standard in terms of overall economic provisioning. And the fourth relates to non-participation or exclusion.

In constructing the HPI-2, the deprivation in longevity is represented by the percentage of people not expected to survive to age 60 ( $P_1$ ), and the deprivation in knowledge by the percentage of people who are functionally illiterate as defined by the OECD ( $P_2$ ). The deprivation in a decent living standard in terms of overall economic provisioning is represented by the percentage of people living below the income poverty line set at 50% of the median disposable personal income ( $P_3$ ). And the fourth deprivation, in non-participation or exclusion, is measured by the rate of long-term (12 months or more) unemployment ( $P_4$ ) of the labour force.

Following the analysis in chapter 1 of this Report and technical note 1 in *Human Development Report 1997*, the formula of the HPI-2 is given by:

$$\text{HPI-2} = [1/4(P_1^3 + P_2^3 + P_3^3 + P_4^3)]^{1/3}$$

As an example, we compute the HPI-2 for the United States.

Country	$P_1$ (%)	$P_2$ (%)	$P_3$ (%)	$P_4$ (%)
USA	13.0	20.7	19.1	0.5

#### STEP ONE Constructing the HPI-2

$$\begin{aligned} \text{HPI-2} &= [1/4(13.0^3 + 20.7^3 + 19.1^3 + 0.5^3)]^{1/3} \\ &= [1/4(2,197.0 + 8,869.7 + 6,987.9 + 0.125)]^{1/3} \\ &= [1/4(18,034.7)]^{1/3} \\ &= (4,508.7)^{1/3} \\ &= 16.5 \end{aligned}$$

Source: World Bank. 1997. *Human Development Report*. Washington DC

## **APPENDIX 6: RESEARCH QUESTIONS POSED TO THE HOUSEHOLDS TO ADDRESS THE SECOND RESEARCH OBJECTIVE**

Below is a copy of the questionnaire on the data collected from the field, (ie the households in Study Region) to address the **second research objective**

Interviewer

Date

Location

Name of respondent

### **SEKHUKHUNE RURAL ENERGY SYSTEM SURVEY**

Good morning/afternoon. We are involved in a research concerned with the rural energy system of the Sekhukhune Region. The findings are to be used to relate the rural energy systems in this province to the rural development processes in a more sustained way..

Please help us to answer some questions which will be treated in the strictest confidence

#### **SECTION A : Personal Particulars**

*Answer each question by ticking the appropriate box or write down your response in the space provided*

A1 What is your gender ?  
1 male  
2 female

A2 What is your age ?

A3 What is your highest educational qualification ?

A4 What is your marital status ?

A5 Is your partner staying with you ? If not, why?

A5 How many dependants do you have ?

A6 Are these dependants staying with you presently ? If not, why?

A6 Do other members of the household contribute to the monthly income?  
Please provide details

A7 What is your occupation ?

A8 For how long have you been in this occupation ?

A9 For how long have you been staying in this location ?

A10 If you moved to this location from elsewhere, could you please provide information about the circumstances which made you to move to this location?

SECTION B : To **classify** the households according to their relations with the rural energy systems.

B1 If you think about the energy sector of this location, how many sources of energy come into your mind ?

B2 How did you obtain information about these sources of energy?

B3 If you were given the chance or free choice to select from these sources of energy which of them would you like most to use in your household ?

B4 Please rank order your preferences for the sources of energy in this household

B5 What are the reasons behind your ranking?

B6 If you are not currently using this ideal energy choice/preference of yours, state the actual sources of energy used in this household

B7 What are the reasons why you make use of the energy you have mentioned?

B8 Please provide details about the source of your energy supply

eg. If you use firewood,

Quantity used in this household per month

Are they purchased or harvested from the bush?

(Please give details for the answer above)

Type ( Names) of tree species used

How they are obtained from the veld

Where they are obtained from ( ie ,Distances covered)

Other uses of the tree as a natural resource

B9 What are the ideal conditions which, in your opinion, can sustain this source of energy for this community? Please refer to the Test below:

**Conceptualization Test:**



Give the diagram to the respondent . Ask the respondent to look at the model which appears on the paper.

I would like you to think about the variable which is indicated on the paper, eg firewood( If that is your source of energy)

. Mention one variable which is needed to enable households in this village to obtain firewood on a regular basis. Label that variable with the alphabet **A**. Next, mention a second variable , **B** , which is necessary in order to sustain variable A. Next, mention a third variable which is necessary in order to sustain variable B.

Please, continue this naming or identification exercise until you have exhausted all the possible variables needed to sustain the supply of firewood on a regular basis in this village.

B10 The answer you have given on the paper represents a model of the ideal conditions needed to sustain your energy system. If all the conditions you have indicated obtain, what, in your opinion will be the relationship between your energy sector and the broader development process in this village?

B 11 Do these conditions actually obtain in this village?

If not, then please rank in order of importance, the factors responsible for your answer under the following headings: Economic, political/administrative, and social factors In the next section, ie Section C please give details about the problems facing your energy system under the Economic, Political and Social factors

SECTION C : To identify the **problems** affecting the energy systems in the villages.

The problems are to be analysed under 3 sections, ( C1, C2 and C3) This section (C1) requires you to concentrate on the economic factors affecting your energy sector.

C1 Enumerate the economic factors which, in your opinion, have given rise to the problem of your energy sector.

How have you been coping as a household ?

How effective have been your coping mechanisms?

How do other households see the future of this problem?

What forms of assistance has this community obtained to deal with the problem?

Do you think that the energy used by you is good for you, economically speaking?

What do you think are the 3 best things about your energy system,

economically speaking?

What do you think are the 3 worst things about your energy system economically speaking ?

C2 Enumerate the political/administrative factors, which in your opinion have given rise to problems in your energy sector

C3 Enumerate the social/cultural factors which, in your opinion, have given rise to problems in your energy sector

## **APPENDIX 7 : RESEARCH QUESTIONS RELATED TO THE THIRD RESEARCH OBJECTIVE**

1 Please indicate any attempts you know of which have been made to address the above problems ( In each case indicate the organizations and individuals concerned,; the impacts that the programme had on the energy sector, etc.)

2 How would you assess or evaluate the successes and failures of those programmes ?

3 What, in your opinion, needs to be done to sustain the energy sector of this village? ( Please list your points in order of importance)

4 What are the reasons for the above views?

5 Do you know of any rural energy programme outside this community ? If so, please tell me what you know about it.

6 What lessons do you think your community can learn from other regions with similar energy problems?

### **7 OTHER SOURCES OF DATA**

In addition to the rural households of Sekhukhune , information pertaining to the above, was also collected from public servants, academics, non-government organizations , among others, who have intimate knowledge about the topic.

**APPENDIX 8 : LIST OF ORGANIZATIONS THAT COULD ASSIST WITH THE PROVISION OF NEW KNOWLEDGE AND OTHER FORMS OF ASSISTANCE IN THE DEVELOPMENT OF THE ENERGY SECTOR OF THE SEKHUKHUNE STUDY AREA**

**Indo-South African Programme of Co-operation in Science & Technology**

**International Science Liaison, at The National Research Foundation, Pretoria**

**The German, Swedish, Dutch and other European-based Development Foundations**

**Department of Trade & Industry, Pretoria**

**The Centre for Environmental Economics Policy in Africa (CEEPA) at the University of Pretoria.**

**The Engineering Departments of the South African Universities**

**The United Nations Industrial Development Organization ( UNIDO)**

**The Department of Energy Research, University of Cape Town.**

**South African Society of Engineers.**

**The Appropriate Technology Foundation of India**

**Rural Foundation. Stellenbosch.**

**Institute of Natural Resources, University of Natal. Pietermaritzburg**

**The National Training Directory of South Africa. DTI. Pretoria**

**Department of Water Affairs & Forestry. *Training and Capacity Building Directory.* Pretoria.**

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