

*THE IMPACTS OF RURAL LAND USE ON THE  
NATURAL ENVIRONMENT IN DILOKONG  
DISTRICT*

*RESEARCH REPORT BY PADIANYANE ANSIE MAHLAKE*

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Padianyane Ansie Mahlake

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# CHAPTER 1

## INTRODUCTION

### 1.1. Background to the study

In South Africa like in most parts of the world, natural and agricultural resources are being depleted to such an extent that serious doubts exist whether it will be able to sustain human existence for much longer in the future. Some of the well-known observable changes due to this pressure on land include soil erosion, land and ecological degradation, decreases in biological diversity, population pressure and poverty. This land degradation causes losses in agricultural production, declining soil fertility and volume, reduced grazing pastures and deforestation. The effects of such losses are more severely felt on small, marginal and fragmented land holdings in South Africa's former homelands and other densely populated rural areas.

Rural communities are dependent on the natural resources in their areas of jurisdiction to ensure a sound foundation for social and economic development. Those who live amid concrete, plastic and computers can easily forget how fundamentally our well-being is linked to the land but residents of rural communities, by contrast, suffer no such lapses (Myers 1985:106).

Food is only the most obvious link between people and the land. The poorest half of humanity requires wood for cooking, heating and construction. Land has been man's habitat and living space. It has been a matter of life and death for survival or starvation, so that the use of land is of major importance to man, is therefore, not surprising (Mather 1986:1).

The social and economic failings that permit hunger to persist are also indirectly undermining the earth's ability to support human activity. Many people in the rural areas are trapped in a tragic poverty cycle causing ever increasing land degradation. Their lack of either fertile land or decent paying jobs forces them to scratch a living from marginal lands where soils cannot sustain intensive cultivation.

People are destroying the basis of their future welfare, not out of ignorance, but because their circumstances give them little alternative. A hungry family is not apt to worry much about forest and wildlife and soil erosion. A family without fuel will strip live trees if necessary (Myers 1985:22). Although land has been used to meet people's needs, this has always been at the expense of the natural environment as soil erosion, deforestation, desertification and food shortage are the obvious impacts of land use on the natural environment, and as these impacts increase, the rural residents are the first to suffer (Chambers 1995: 28).

The deterioration of the environment is not only dependent on the land-use aspects, but also on the nature of the environment itself (Leopold 1956:34). Some environments are inherently stable, whilst others are fragile and susceptible to change. Resilient environment reverts to the original form after stress from a given land-use regime is discontinued (Hill 1975:25), while fragile environments have lesser abilities to do so.

Sustainable natural and agricultural resource use and land care, particularly in the rural areas and former homelands have not been systematically addressed. The drive to address environmental problems have been mainly state-led and primarily focused on the commercial farming sector. Residents in the disadvantaged rural areas, particularly small-scale farmers, women and youth have been excluded from mainstream agriculture and agribusiness and were not targets for conservation initiatives. Inevitably therefore, these rural residents are not the drivers of environmentally sensitive resource management programmes.

The *Black Land Act*, 1913 (Act 27 of 1913) sought to implement the policy of segregation by the delimitation of areas for black occupation on a national scale. This has forced conglomeration of black people in confined, highly sensitive areas. It was implicit in the Act that a commission would be appointed to determine the areas to be reserved permanently for whites and blacks respectively.

The *Land Act*, 1936 (Act 18 of 1936) was proclaimed to ensure that black people are designated to small patches of unproductive land. These patches of land were characterized by scarcity of water, poor soils and highly erodable terrains. Land which was unproductive to whites, was eventually given to blacks.

Proclamation of the *Black Authorities Act*, 1951 (Act 68 of 1951) established Black Tribal Authorities with regard to native law and custom and in consultation with every tribe and community concerned. The functions of the Tribal Authorities were that of administering the affairs of the tribe in conjunction with the chiefs and advising the government regarding the material, moral and social well-being of the residents including the development and improvement of the land.

The latter was never implemented because of the deliberate segregation policies of the regime. *Regulation R188 of the Physical Planning Act*, 1967 (Act 88 of 1967) which was aimed at designating land for different uses was never applied in practice since the early eighties. Hence these rural areas which are the products of forced removals are clustered with poor infrastructure and highly dependent on the utilization of natural resources. The planning system has been fragmented and haphazard along the following number of lines:

- Ethnic line: the creation of different ethnic homelands and so-called “independent states” e.g. Venda, Lebowa, Ka-Ngwane etc. led to different administrative systems.
- Race line: historically different race groups have operated under different planning systems.
- Geographical line: particularly urban and rural areas have historically operated under entirely different administrative systems.
- Jurisdictional boundaries line: different land planning and allocation systems operated in areas under traditional and tribal leadership (*Green Paper on Development and Planning* 1999:5-6).

Given the challenges of a rural set-up, it is imperative to understand the community dynamics and forces which have shaped the present day impacts on the environment which eventually impacts negatively on the quality of human life.

## 1.2 Study area

The study confines itself to Dilokong Transitional Local Council “TLC” jurisdiction. It is situated approximately fifty-five kilometers north of Burgersfort and one hundred and twenty kilometers southeast of Pietersburg, and covers approximately 780 square kilometers.

The area is a communally occupied land and includes a large number of rural settlements administered by twenty-three tribal authorities. Most of the settlements are products of forced removals from Lydenburg and Badplaas which are seventy-five and ninety kilometers respectively southeast of Dilokong. People scattered in many directions when these fertile areas were declared white areas. The first palace of Chief Sekhukhune I, King of the Bapedi was in Dilokong until its demolition by the British Army in 1879.

Dilokong is surrounded by the Leolo mountain ranges which forms a greater part of the Drakensberg escarpment in the Eastern highlands. Figure 1 in Appendix 2 depicts the mountain ranges. Across the Leolo mountains lies a bushveld igneous complex which support mining houses with platinum and chromite from the Marensky and UG-2 reefs respectively. Other mineral deposits include kaolin clay, black granite, magniside, vanadium and andulsite.

The Leolo mountain range is a vital catchment area for the Olifants river (which form the northern boundary of Dilokong) and the Steelpoort river (which form the Southeastern boundary). The mountains support a forest vegetation, whilst the flat plains are now classified as Savanna due to land use changes. The soil type is predominantly black clay hence the name ‘Dilokong’ which means clay area.

Dilokong is one of the under-developed and highly populated areas stemming from the apartheid era. The area was neglected since the Sekhukhune battle of 1789 and the situation worsened during the 'reign' of the defunct Lebowa 'homeland' government. The provision of infrastructure service, particularly water, roads and electricity were absent until the new ANC government took over in 1994. The villages in the area collect water from boreholes or rivers.

There is one major surfaced tarred road which pass through Dilokong (R37) from Pietersburg to Burgersfort. All other roads are gravel and are in a very poor state (See Map 2 in Appendix 1). A quantification study in relation to electricity supply and the number of stands per village in the area have not yet been completed except for a few villages which were electrified after the inauguration of the new government in 1994.

There are no planned and serviced sites while housing settlement is taking place haphazardly. Sanitation and refuse disposal is not yet seen as issues which warrants attention. The prevailing system of land administration and tenure is archaic and does not reflect the need for public control over the use of land and tenure security. The local government of Dilokong, therefore, has a lot to do to fulfill its constitutional obligations.

### 1.3 Problem statement

Environmental degradation associated with rural land-use has taken place for a very long time in South Africa and is directly and indirectly linked to colonial rule. It is believed that before colonization, herder-farmers roamed the country as they wished in their quest to meet basic needs. There was no significant impact on the natural environment because the carrying capacity of the land was high. Confinement of many people into homelands and the so-called "independent states" by the *Black Land Act*, 1913 (Act 27 of 1913) resulted in increased pressure on the carrying capacity of the land. This was exacerbated by the increased rate of population growth in the area.

Land-use planning and management were not considered as important issues; such that people occupied and utilized land indiscriminately. Ecologically sensitive and erosion prone terrains were settled in high densities resulting in undesirable environmental impacts.

Land development in this area, especially the demarcation of planned sites had never taken off despite the existence of proclamation R188 of 1969. Deliberate neglect of planning and environment related policies led to poor land management. The traditional knowledge to care and conserve the environment was never recognized and to a large extent has been compromised by survival pressure. The natural environment of Dilokong is currently in a state of deterioration and is characterized by soil erosion features, over-grazing, deforestation and soiled rivers.

Equitable exploitation of mineral deposits and tourism opportunities are not undertaken. Sustainable development which delivers basic social and economic services without threatening the potential of the natural, built and social environments upon which these services depend is not realized. Against the background of this scenario, the following research objectives were set for this study.

#### 1. 4. Research objectives

This study was directed at achieving the following:

- To determine and assess the impacts of rural land-use on the natural environment of Dilokong.
- To identify the immediate causes of the impacts.
- To identify the institutions which will be responsible for land use planning other than the present shared approach.
- To identify and evaluate the implementation of environment-related policies by government and private sector.
- To make recommendations towards resolving the environmental problems in the Dilokong area.



## 1. 5. Research questions

The following research questions were linked to the above-mentioned objectives:

- What are the impacts of present rural land use on the natural environment?
- What are the causes of the impacts?
- Which government policies related to land-use and environmental management are currently practically implemented and how are they implemented?
- How effective are these policies to ensure that land-use and environmental management practices are ecologically sound?

## 1. 6. Hypotheses

The following hypotheses served as departure points for this study:

- (a) High population density is one of the main causes of undesirable environmental impacts in the Dilokong area.
- (b) The present land-use practices in Dilokong area have negative impacts on the natural environment;
- (c) The present implementation of government policies related to the natural environment and land-use is ineffective;
- (d) Land tenure reform is a prerequisite to the resolution of the environmental problems in the Dilokong area.

## 1.7. Methodology

The following methods of investigation were applied in this study:

### *1.7.1. Research design*

The aim of the study was to determine the impact of rural land-use on the natural environment. Accordingly, the study entailed a process of data gathering, analysis and interpretation, designed on the one hand to consider the observed environmental issues and on the other hand, to subject all the formulated hypotheses to rigorous testing. Data sources included documentation obtained from different government offices, direct observations and data obtained through questionnaires and interviews. Although documentary sources mostly provided valid and reliable information, it was unfortunate that most of it was not up to date.



Leaders of community structures completed questionnaires. Data obtained from them was considered to be valid and reliable because they are mostly representing their respective communities in development forums and meetings. The free services they render to their communities confirm their loyalty and honesty. Data from interviews complemented the information obtained from the structured questionnaire. Provision of alternative answers to questions has managed to reduce bias and subjectivity. This was further enhanced by comparison of observed and questionnaire data.

### *1.7.2. Data Collection*

A non-probability sampling strategy, purposive sampling was employed in selecting the sample. The participants included the leaders of various community structures in Dilokong such as South African National Civic Organisations (SANCO), development forums, youth and women organizations, political and apolitical structures, traditional structures and relevant state departments (e.g. Agriculture, Minerals and Energy, Environmental Affairs and Local Government). These participants were regarded to be reliable sources of information by the communities.

In order to ensure the reliability and the validity of the chosen sampling method, the following limitations were considered:

- Due to the vastness of the study area, it would have been difficult to get cooperation from each and every member of the community.
- The low levels of literacy and poverty have a direct bearing on information flow. Poverty stricken people are mostly interested in responding to projects which alleviate their poverty and are reluctant and sensitive to share information easily.
- Concerns about land-use and environmental degradation occupy no position on their priority list.

The community leaders are considered to be custodians of knowledge and information in every rural set-up. They are mostly open and literate which enhances their objectivity. As people who are always involved in the welfare and development of their communities and as people who grew up in the same vicinities, the validity and reliability of the information they share is therefore unquestionable.

The following methods of data collection were used:

(i) Questionnaires

A structured close-ended questionnaire was compiled in English. Administration of the questionnaires was done by the researcher and assisted by four fieldworkers. The questionnaire copy is filed in Appendix 3. The field workers were social science graduates who had training in research methods. However, in order to ensure objectivity and suitability of the fieldworkers they were workshopped to understand the dynamics of communities. They were also tasked to translate the contents of the questionnaire in cases where respondents did not understand English.

Out of one hundred and fifty distributed questionnaires, at least one hundred and thirty completed questionnaires were received and twenty were not received. Questionnaires were distributed to thirty villages of Dilokong and each village was given five questionnaires which were completed by various leaders. The close-ended format of the questionnaire facilitated answering and made it easier to code and classify responses.

The following problems were encountered in completing the questionnaires:

- Illiteracy - some participants were unable to read or write English properly. In such cases, formal or structured interviews were used. The researcher attached a schedule to the questionnaires explaining some concepts which she thought might be difficult to understand, but there were still some concepts which were not clearly understood, for examples "mine dumps". Such cases, however, were not very common, so it did not impact significantly on the quality of the results obtained from the questionnaires.
- Submission of questionnaires - there was a late submission of questionnaires. They were distributed on the 26 July 1999 and the return dates were 15 and 22 August 1999. The last bundle was received on the first week of September 1999. This, however, only influenced the time-frame planning of the research, and not its reliability.

## (ii) Interviews

Interviews were used in instances where the participants were unable to either read or write English. Interviews conducted were neither biased nor subjective because they were confined to the structured questionnaire. Interview data have been recorded on the questionnaires as the interview proceeded. The method of coding responses was found to be satisfactory. The method was even used in conducting the social survey to the Plowden Report in the UK where satisfaction was also confirmed (Soer 1995: 26). Interviews were often time consuming.

## (iii) Observation

The study area was visited three times to observe the existing land use impacts on the natural environment and other related issues. Photos and field notes were taken (see Appendix 2). Field visits were undertaken at the closed and existing mines, ploughing fields, soil conservation areas and degraded land.

## (iv) Documentary Sources

Available literature on land, agriculture and mining in other African countries was studied. The Land Development Objectives Report was received from Dilokong Transitional Local Council (TLC) which assisted in mapping land-use practices in the area. State departments such as Minerals and Energy, Environmental Affairs, Agriculture and Local Government provided documentation with regards to Acts and policies.

### *1.7.3. Data Analysis and Interpretation*

Data analysis was done through the help of a computer statistical package. The analyzed data was then used in an interpretive process to test the hypotheses in terms of their validity and reliability. This data analysis and interpretation is presented in Chapter 3 and 4 respectively. Interpretation of the findings was simple to discuss since the computer revealed the correlations. It was through this discussion that the research questions were answered.

#### 1.7.4. Recommendations and dissemination of research findings

Recommendations are presented in Chapter 5 of the research report. The research findings will be disseminated in two different meetings. The first meeting will be held with all the research participants including the relevant local state departments. The second one will be held with the relevant provincial government departments including the departments of Land Affairs, Minerals and Energy, Environmental Affairs and Agriculture, Local Government and Traditional Affairs, Public Works and other interested sectors.

#### 1.8. Definition of key concepts

Within this study, the following definitions of key concepts were used:

(a) *Environment* refers to the surroundings within which humans exist and that are made up of:

- (i) the land, water and atmosphere of the earth;
- (ii) micro-organisms, plants and animal life
- (iii) any part or combination of (i) and (ii) and the interrelationships among and between them; and
- (iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being (*National Environment Management Act* No. 107 of 1998: 8).

(b) *Natural resources* simply refer to any resource provided by the biophysical environment (*Environmental Management Systems (EMS) -- ISO 14000* 1994: 13).

(c) *Environmental impact* refers to any change to the environment, whether adverse or beneficial, wholly or partially resulting from activities, products and services of the organisation (*Environmental Management Systems ISO 14 000* 1994: 13)

(d) *Rural land-use* refers to the practice of how rural people utilize their land.

- (e) *Environmental Management Systems* refer to those aspects of the overall management function of an organization (including planning) that develop, achieve, implement and maintain its environmental policy and objectives (*Environmental Management Systems - ISO 14000* 1994: 14).
- (f) *Environmental policy* is a statement by the organization of its intentions and principles in relation to its overall environmental performance which provides a framework for action and for the setting of its environmental objectives and targets (*Environmental Management Systems-ISO 14 000* 1994: 14).
- (g) *Ecosystem* means a dynamic system of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit (***National Environmental Management Act No. 107 of 1998: 8***).
- (h) *Development* is a process for improving human well-being through a re-allocation of resources that involves some modification of the environment (*ISO 14 000* 1994: 14). *Development* is also defined as the modification of the bio-sphere and the application of human, financial, living and non-living resources to satisfy human needs and improve the quality of human life (*World Conservation Strategy* 1980: 1).
- (i) *Sustainable development* refers to the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations (*The National Environmental Management Act No.107 of 1998: 10*).
- (j) *Integrated Environmental Management (IEM)* is a code of practice ensuring that environmental considerations are fully integrated to achieve a desirable balance between conservation and development (*Introduction to Integrated Development* 1996: 2).



### 1.9. Significance of the study

The significance of this study can be described on a number of levels.

- (i) The study will benefit the TLC of Dilokong by providing them with information about the status of land-use and its impact on the natural environment.
- (ii) Dilokong TLC will then understand the challenges of executing the environmental functions to be devolved to them once the province is convinced that they have the capacity and resources to execute such functions.
- (iii) The study will enhance the spatial planning process of the TLC of Dilokong which is a requirement of the proposed Land use Planning Policy.
- (iv) The local schools could adapt some of the aspects raised in the research into their environmental education lessons.
- (v) Non-government organizations (NGOs), community-based organizations (CBOs), and provincial and local governments could use this research for environmental awareness in Dilokong.

Through all of this, the people of Dilokong may benefit in terms of long term sustainable development, and a medium and short term improvement of their quality of life, health and well-being.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1. Introduction

Sustainable development in rural areas is seen as development that delivers basic social and economic services without threatening the viability of the natural environment upon which these services depend (Rural development task team and the Department of Land Affairs 1996: 34). It is however, unfortunate that our rural areas are characterized by environmental degradation, which is destroying the hope to survival as well as quality of life.

A literature review undertaken has shown that considerable research projects associated with land-use and environment were based on specific land-use aspects rather than on all aspects collectively. Land-use aspects investigated included the following: agriculture and the environment; ranching and environment; human settlement and environment( Chanda & Kalabamu: 1995).

For the purpose of this research much focus will be put on the land-use aspects collectively and their impacts on the natural environment. This approach aligns itself with the principle of integrated development which forms the fundamental base of sustainable development. It also aligns itself with the concept and approach of Integrated Environmental Management (IEM) which centralizes environmental issues.

In order to highlight the shortcomings of a sectoral or single factor analysis of the relationship between land-use and environment, three examples of this kind of study were discussed. The first case study focused on William Rugumamu (1990: 57)'s study of the impact of small holder land use practices on sustainable land productivity in semi-arid Tanzania; the second one on the evaluation of land resources for planning sustainable production by David J. Radcliffe (1988: 81); and the third one on the analysis of rural land use and environmental training at Ga-Sekgopo by (Visser: 1997) The above mentioned case studies formed the base of the research study. Each case study is discussed in detail below.



## 2. 2. Case Study No.1

*The impact of small holder use practices on sustainable land productivity in semi-arid Tanzania* by William Rugumamu (Natural Resource Conservation and Management in the SADC Region, Report No: 37, May 1995).

In this study William Rugumamu investigates the impact of land use practices on land productivity and its sustainability in the Busongo village area in Tanzania. For the purposes of this research, the researcher will trace Rugumamu's description of the geographical and geomorphical features of Busongo village. The researcher will then give an overview of his analysis of the environmental impact of land use practices at Busongo village, as well as the recommendations that he makes in this regard. The researcher will also indicate the relevance of Rugumamu's study to this research. For the purposes of this overview, the researcher does not make use of particular references, except when it may be necessary to indicate points by Rugumamu himself.

### *2.2.1. Geographical and geomorphical features of Busongo, Tanzania occupied by Sukuma agro-pastoralists.*

Busongo village has an estimated area of 49 km<sup>2</sup>. The village is underlain by calcareous unconsolidated alluvial lacustrine deposits situated on the central plateau of about 1100 m mean sea level Busongo village appears dome shaped. It displays a flat to u-cutting topography dissected by intermitted streams draining radially into the Tungu and Mhurfvu rivers.

Located in a semi arid zone, the village is characterized by scanty and unreliable rainfall. The mean annual rainfall ranges between 400 and 800 mm. Prolong drought also occurs impacting negatively on pasture and on crops resulting in livestock deaths and famine. The growing period is short, averaging to less than 90 days with an unreliable onset. The area is characterised by undulating soilscapes and three major types arised out of that spatial variation.

- The interfluvial soils have a low potential have moderately high potential for crops production under good management practice.
- The midslope soils have a low potential and have an unstable structure that makes them to be erosion prone and
- The manmade soils around homestead characterized by humus accumulation from domestic refuse and low-dung have a very high agricultural potential.

By 1990 the village's population was estimated at 1468 bread over, 287 households. Traditional systems of land ownership and allocation are still practiced in Busongo. Grazing land is communally owned and utilized. Lack of proper land-use planning couple with traditional farming systems has contributed to degradation of the local environment.

#### *2.2. 2. Impact of land use practices on environment*

Within the limits of above ecological setting the Sukuma agro-pastoralists have evolved land use types that have so far supported their livelihood as a community and at the same time contributed to national development. They produce maize and beef cattle for the local market and cotton, hides and skins for export.

Following the FAO (1983) methodology, five land use types have been identified. It is contended that each component of the land use types has a unique husbandry system as well as a unique impact on the economy and environment, and that land use types are all interlinked over time and space.

The following land use types were identified (Rugumamu 1991):

- smallholder rainfed farming with intermediate technology based on cotton production.
- smallholder rainfed farming with intermediate technology based on maize production.

- smallholder rainfed farming with improved indigenous technology based on the production of intercropped cereals.
- smallholder livestock keeping with improved indigenous technology based on free-range livestock production (cattle, goats, sheep and donkeys) together with crop production.
- smallscale rangeland reclamation with intermediate technology based on mechanical and biological soil conservation.

In essence the contemporary Sukuma agricultural land management practices can be grouped into the first four-land use types while the fifth one is exogenous.

It is important to note that each use has different requirements in terms of land qualities and is therefore limited in a different way by them, falling short of optimum production. Further, each type of use has different possibilities to improve the land qualities to meet the requirements.

When the three major land units are assessed in terms of traditional livestock keeping and cultivation a number of key land management issues may be discerned, namely:

- intensity of use of each unit through the year;
- difference in use type for each land-unit over time;
- multiplicity of use types per land-unit over time;
- fallow period in a year for each land-unit;
- within village transhumance;
- and transhumance to neighbouring regions.

In all the land use units, especially as the dry season sets in and harvesting is completed in July, the privately owned fields are left unattended. During this dry spell both stubble and fallow grazing supplemented the scanty livestock feed. Cattle, goats and sheep then become the dominant agents of erosion on arable land. During this time the surface soils are trampled, ridges are destroyed, the soil structure is pulverized and hence, the soils become vulnerable to wind erosion.

Overgrazing the stubble, however, saves the farmer's time and energy for seedbed preparation in the following farming season as the farmer either chooses to sow on the remaining low ridges or on the flattened ones which assume a form of 'sesa'. This poorly managed practice, however, facilitates some sort of nutrients replenishment in the soils through livestock droppings. With reference to the fallow regeneration rate, stubble grazing impedes fallowing and has, therefore, negative impact on sustainable land use under indigenous technology.

The interfluvial unit is also beset by over-cultivation. According to Rugumamu, the need for reintroducing fallow in the contemporary farming systems in this unit cannot be overemphasized. Given the pressure of the population on the available land resources the fallow period could be planted with trees or grass lay thus introducing an agro-silvi-pastoral land use complex. The use of cowdung and crop stalks for fuelwood instead of soil amelioration reinforces the need for the above technology.

According to Rugumamu, improvements on the existing ridge technology in controlling surface run-off and increasing water and nutrient availability to crops should be made. Small tied ridges capturing a smaller volume of storm water are better than high ones which spill larger water volumes to lower members of catena thus causing gullies and floods. Furthermore, the small ridges call for less human labour to construct. Unfortunately the HASHI project which is tree-planting biased in its land conservation strategy has yet to address the problem of declining productivity of arable land in this unit.

The soils on the gentle midslope were rarely used for cultivation. Due to population pressure on the interfluvial arable land, however, these soils have recently been put to extensive cultivation. Currently the crop stands of especially sorghum, cowpeas and bulrush millet are mediocre. The ploughing of these soils should be strictly based on the contour if soil erosion is to be controlled and crop yields improved.

The midslope land-unit normally communally owned is mainly under grassland with scattered Acacia bushes. The major economic activity is free range grazing of livestock. These are the areas also traditionally reserved as Ngitiri.

This indigenous pasture conservation system has largely collapsed due to commercialization of agriculture. Generally two types of Ngitiri exist - household and communal reserves. Whereas household reserves are privately owned, communal ones belong to the village government and are heavily guarded against outsiders. These Ngitiri's are now characterized by non palatable grasses, weeds and shrubs grazed by calves, lactating mothers and sick in view of the livestock population boom (Rugumamu, 1990).

Overgrazing of the pastures in this unit leaves the topsoil exposed in most areas at times in the dry season (Figure 2). During this season except along seepage zones where grass production is adequate, the trampled and pulverished clay loams are blown away by wind resulting in erosion crusts. Rugumamu recommended that wind-breaks, preferably fodder producing trees, should be grown on farm edges to act as shelter belts and prevent wind-born erosion. This state of affairs gives rise to surface run-off and results its attended sheet, rill and gully erosion.

Cattle routes to the seasonal rivers on the lowest member of the catena normally dissect this unit. These routes develop into rills and deep gullies depending upon the frequency of use, the intensity and amount of rain. Gullies as deep as 50cm forming natural water-ways were observed and formation of badlands is becoming imminent in the unit.

Furthermore, roads and footpaths in this gently sloping land unit do also accelerate the formation of rills and gullies during the rainy season. As these tracks become unusable due to slip, new ones parallel to the old do emerge. When this process repeats itself haphazardly several times in different places, the development of rills and gullies become commonplace and badlands features become widespread.

The lowest member of the catena is a flatland or a depression commonly known as mbuga with soil popularly referred to as black cotton soils. Being hard when dry, sticky when wet and seasonally water-logged, these heavy textured soils are further characterized by seasonal deposition of silt-size and clay-size materials as well as accumulation of subsurface lateral soil water materials.



The heavy textural composition of these soils makes them difficult to till either with handhoe or an oxen-driven plough. Under good management, mainly drainage of excess water in the rooting zone, these soils have a medium to high potential for sweet potatoes, vegetables, sugarcane and pasture. The unit also serves as seed storage for the next farming season.

In view of this quality the land-unit is usually subjected to excessive defoliation of pasture plants during the regenerating phase which coincides with the wet season. Large populations of different types of livestock have accelerated the degradation process. For example, cattle and sheep prefer herbaceous plants while goats browse on shrubs and trees. Overgrazing deprives the land-unit of a substantial period of rest during the wet season, and leads to flooding, causing asphyxiation and hence loss of soil productivity.

Valley bottoms also provide reliable sites for watering points. The unit is therefore subjected to cattle trampling, which accelerate river bank erosion and causes water pollution. It also reduces the area of the land unit through time and subsequently silts the river bed.

Like the upper member of the catena, this unit also experiences rill formation resulting from the ever-shifting cattle tracks and roads during wet season. Roads are a common feature across all the land units, and road construction should include adequate drainage systems, preferably supported by culverts.

The degree of damage to the environment resulting from the contemporary agricultural technology of the agro-pastoralists cannot be accurately assessed given the movement of people and livestock within the village soilscares and between the village and neighbouring villages, districts countries in search of water and pasture. The extent of the erosion hazard, however, could be rapidly assessed from both remotely sensed data and field experience.

### *2.2.3. Conclusion and Recommendations*

Rugumamu's study has demonstrated the extent to which key contemporary agricultural technologies employed by Sukuma agro-pastoralists in Busongo village are able to sustain and or degrade the productivity of their environment. In the struggle for survival, the land productivity has been threatened by almost all the technologies in use albeit at varying degrees.

In view of the complexity of the problems, Rugumamu proposed that the starting point for planners and policy makers in propagating sustainable agricultural land-use practices should involve the correction of inappropriate husbandry methods and tenure policies. Rugumamu has called for sustainable effective involvement of the land-users to utilize their land and to participate in land policy formulation through:

- i. applying soil ameliorants such as farm yard manure in order to improve soil productivity and yields.
- ii. protecting unique ecosystems (such as catchments) with protective forest cover from excessive fuelwood exploitation.
- iii. applying soil-water management techniques such as the popular contour ridges and the ridges for all ecologically suitable crops.
- iv. practicing livestock production under the current zero grazing campaign instead of livestock keeping based on transhumance.
- v. supplementing livestock feed with cotton cake thus integrating livestock production with agricultural mechanization and transport.
- vi. adopting fuelwood energy saving techniques and other alternative energy sources (e.g. biogas from (v) above) instead of the present use of crop residues and cow-dung.
- vii. Undertaking a more intensive farming system involving crops, livestock and forestry.
- viii. participation in the design of the village land-use plan, land policy formulation and implementation. Finally the above proposals should inform the design of a land conservation and management strategy for semi-arid and arid areas.



The above recommendations underscore the fact that some of the technologies have the potential for refinement and subsequent adaptation and implementation to other agro-pastoralists who experience similar socio-economic and ecological problems and potential. Following the philosophy of sustainable development of deserts and arid lands of the first African Ministerial Conference on Environment (AMCEN), held in Cairo in 1985, pilot villages and stock raising zones should form ecodevelopment nuclei. In Tanzania, for instance, Busongo village merits to be such a technology center. The village's environmental rehabilitation project which government financed and is now foreign supported has the potential to play this role.

#### *2.2.4. Relevance to the main study*

This case study has considerable similarities with the main study and its relevance and appropriateness is discussed below.

The case study underscored the impact of smallholder land use system on the sustainability of both agriculture and the physical environment. Agriculture is one of the land use aspects investigated in the main study and its impact measured or evaluated on the natural or physical environment. Agriculture in both contexts includes crops and livestock farming.

- Both studies focused on a rural terrain of a communally owned land. Land is allocated by tribal authorities.
- Dilokong and Busongo are located in semi arid zones which are characterized by scanty and unreliable rainfall. The growing period is short and average to less than 90 days and starts from October to January.
- Environmental degradation was experienced in both cases with soil erosion topping the list.
- Revisiting of the tenure and agricultural policies implementation is fundamental to both studies.

It should be mentioned, though, that Rugumamu focused mainly on land use practices as they can be related to agricultural activities. What the researcher focuses on this study of Dilokong, are all of the activities taking place in the area, as well as the impact of land tenure and a wide range of policies pertaining to land use. In Rugumamu's study, this wider scope was unfortunately neglected.

### 2.3 Case study No. 2

In the second case study, the researcher would like to discuss about the evaluation of land resources for planning sustainable production by David J. Radcliffe (*Natural Resource Conservation and Management in the SADC Region*, Report No.37 May 1995). The case study covered eight pages.

For the purpose of this research, the researcher will first of all give a sketch of Radcliffe's conception of sustainable agricultural production and why he deems it important to evaluate land resources within this context. She then proceed with an overview of Radcliffe's utilization of the FAO'S model of land resource evaluation, followed by an exposition of Population Support Capacity (PSC) as used by Radcliffe. In the concluding section of the discussion, the researcher points out that Radcliffe's study only addressed the issue of physical sustainability in agricultural production. In the study, however, the researcher makes use of references where she would like to draw particular attention to points made by Radcliffe.

#### 2.3.1. Sustainable agricultural production

According to Radcliffe sustainable production is essential to human survival. Virtually all sustainable production systems are dependent to a greater or lesser extent, on land resources, which are becoming increasingly scarce due to mounting pressure of population associated degradation of the environment. The relationship between land resources and agricultural production systems are the most vulnerable to the pressures of competition and degradation. The small farmer, frequently operating at the margins of subsistence, faces the greatest risks.

In many parts of the world, these pressures are such that traditional systems of resource management and land husbandry are rapidly breaking down and often no viable alternatives are available for their replacement.

In such circumstances, the objectives of development and conservation converge in the concept of sustainability. Sustainability implies that humanity meets the needs of the present generation without compromising the needs of future generations. Planning sustainable production entails balancing long-term demand with the ability of the resources to produce. A corollary of this is that the natural resources on which production depends must be maintained in a satisfactory condition so that they can maintain the required level of production, either in perpetuity or at least within a long term perspective.

Evaluation of land resources for sustainable production implies that both the productivity and conservation needs of these resources are assessed. This study investigates how existing methods of evaluating land can meet the challenges posed by sustainability, and provide an adequate basis for long term planning decisions.

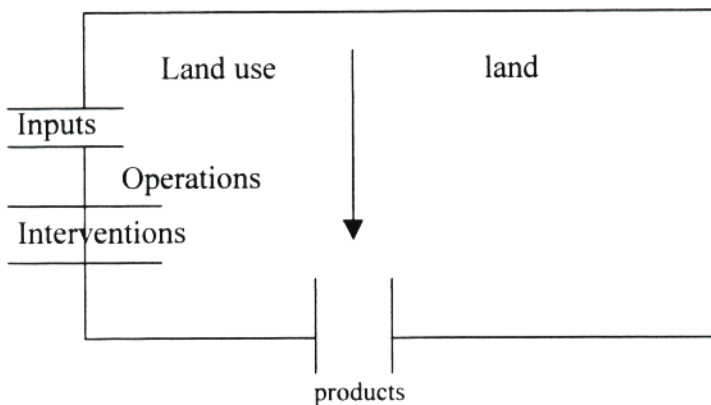
### *2.3.2. Land Resource Evaluation*

According to the Radcliffe, planning for sustainability production must be based on an understanding of how production systems operate and on their interaction with resources on which they are based. While land capability classification (Klingebiel and Montgomery, 1961) is conservation based, and implies physical sustainability of the use that the land is capable of, such a system cannot analyze the interrelationships between the inputs and outputs of various land use options and their impacts on the economy, the community and the environment.

The FAO Framework for land evaluation (FAO, 1976), which was published in 1976 and has now been adopted and widely used in many countries provides the basic concepts for Radcliffe's analysis of land sustainability for sustainable production systems.

Land evaluation is matching the requirements of a specified type of land use against the properties of a defined area of land, and rating the land in terms of its ability to satisfy the requirements of the land use. This is essentially ecological concept provides an analytical framework for assessing impacts, not only land, but also of interventions in the production system. Model 1 illustrates the land use system, which is the basic unit for evaluation.

Model 1. The land use system



Source: FAO (1976).

Evaluation of land resources, in terms of comparative performance under specified types of use, provides a rational basis for decisions and management of land. Normally, each land units is allocated a “land sustainability class”, which reflects its performance on land.

Through evaluating a variety of land uses over a range of land units, land suitability maps can be assembled which can guide the land use planner in allocating the optimum use to each area, within the context of the objectives of the land users and the government.

According to Radcliffe (1995: 117) a sustainable system should exhibit a positive trend in output and should be relatively resilient to adverse impacts of transient conditions. Land evaluation must therefore generate qualitative information of the outputs of the system, and this information should preferably be analyzed and presented in a dynamic way so that trends and risks can be quantified.

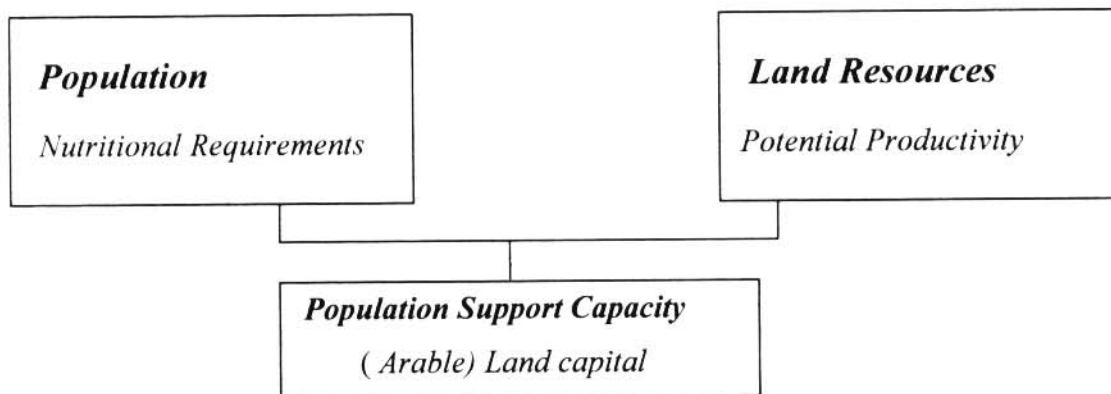
Additionally, the description of the land use must be structured in such a way as to allow analysis of impact of its various components on the system. Simulation modelling is proposed as an appropriate methodology with which to address such questions. Radcliffe (1995: 118) described four relevant components of such an approach, of which the researcher will discuss one. These components are:

- characterization of land uses
- risk analysis
- modelling of land degradation, soil erosion and associated productivity losses
- population support capacity modelling.

### *Population Support Capacity (PSC)*

PSC modelling is an inherently less detailed, holistic approach which can be readily applied to assessing the sustainability of production systems. The overall methodology involves the prediction of production from data on land suitability, and the matching of this production data with demand calculated according to per capita food requirements (Model 2).

#### Model 2. The Structure of PSC Model



Source: FAO (1978)

According to Radcliffe the methodology for this assessment grew out of the agro-ecological zones approach (FAO, 1978) and was initially developed for use at a continental scale.

The real usefulness of PSC modelling as a planning tool lies in its application at more detailed levels over smaller areas where data sets are more uniform and the production systems can be more precisely defined. So far, FAO have carried out country assessments for Kenya and Bangladesh and have applied a similar methodology in the master land use plan Ethiopia (FAO, 1989) and at still more detailed levels to village units in the same country.

PSC modelling is a logical extension of land use system analysis, but provides information directly useful to the land planner concerned with design and implementation of sustainable production of crops, although the contribution of animal products to the diet are included in the nutritional calculations. Similar modelling techniques can be applied to livestock and to fuelwood. It is important to build the effects of land degradation into models, and additional factors such as cropping and income derived from off farm activities can also be included where significant.

### *2.3.3. Additional issues affecting sustainability*

Sustainability is a comparatively recent criterion for evaluating development programmes and projects and its widespread adoption demands a radical reappraisal of some of the traditional techniques by which these developments are appraised. Discounted cash flow analysis has been a standard method for project appraisal for at least the last two decades and it is based on the sound economic principle that benefits realized today are inherently more valuable than gained in ten or twenty years time.

However, population increase will generate increasing demand for agricultural commodities (particularly food), and the increasing pressure on land will inevitably lead to reductions in arable area, either due to soil erosion or to allocation to non agricultural uses. Inclusion of the capital value of land resources in the analysis puts a different economic perspective on evaluating sustainable production systems.



A recurrent theme in Radcliffe's study has been population. Sustainable production must not only meet existing demands but must respond to the increased demands generated by population growth, which can be considered. Indeed it is estimated that demand will need to rise at a faster rate than population growth to improve and maintain nutrition and health and enhance the self-reliance of resource-poor land users (FAO, 1991). In the SADC countries projected population growth rates vary from 2.9% in Lesotho to 3.8% in Zambia and Tanzania, indicate a population doubling time of between 25 and 19 years.

Meeting these steadily increasing demands places a tremendous burden on land resources, and makes it imperative that conservation based land use options which are sustainable in the long term are adopted. Evaluation of land resource must take account of these needs.

Defining the spatial and temporal limits of the land use system is essential in determining its sustainability. Although some simple physical systems, such as fish extraction from a pond, can be regarded as closed systems, most land use systems interact with other land use systems and with the environment.

The impact of an improvement of the performance of one system may effect other systems or environments. A clear example may be development of an upland catchment, which may increase siltation rates and reduce reservoir life for an irrigation project downstream.

The environment frequently suffers from agricultural development, either through loss of plants, wildlife species or habitats, or through pollution. Assessment of environmental impact and impacts on other land use systems must be considered in planning sustainable production. The temporal dimension is crucial to determining sustainability and is particularly relevant to the estimation of tolerable levels of soil erosion and the population issue.



Now, valuable as these additional observations about sustainability are, it should be mentioned on a critical note that Radcliffe's study has only addressed the issue of physical sustainability. Broader concepts of global sustainability include issues of resource substitution, technological advances or social reorganization as resource stocks become exhausted and a more equitable distribution of resources is required as there becomes progressively less to share around.

Acknowledging that even the most ambitious land evaluation specialist would not attempt to tackle these issues, the researcher in this study make use of a conception of sustainability that is focusing on more than just the physical characteristics of Dilokong.

#### ***2.3.4 Relevance to the main study***

In conclusion, the researcher would like to make the following observations about the relevance of Radcliffe's study for her purposes:

- Radcliffe's study focused on the evaluation of land resource for planning sustainable production which is similar to the main study that attempts to evaluate the land use impacts on the natural environment of Dilokong.
- The main focus of Radcliffe's study was on the land use assessment scale which is captured in a model form. This approach was of vital importance to land use assessment of Dilokong.
- Aspects explored in Rasdcliffe's study includes:
  - characterization of the land use
  - modelling of the land degradation
  - population support capacity.

The above mentioned aspects form the core of the main study.

## 2.4. Case Study No.3

This case study is about *rural land-use and environmental training at Ga-Sekgopo* (Dries Visser: 1997). The case study covers at least ten pages.

### 2.4.1 Introduction

This study is based on a series of workshops held at Ga-Sekgopo in the Northern Province. Bohlweki Environmental (Pty) Ltd. and the Department of Agriculture, Research Council in 1997 facilitated the workshops. The purpose of the investigation was the establishment of a sustainable land-use plan for Ga-Sekgopo and its implementation.

The community participants consisted of representatives from local RDP committees, political parties, the constituency office and the youth structures. This study was undertaken without the involvement of the TLC because of capacity related issues and some political disagreement with the council.

### 2.4.2. Background

The following points relating to the situation to Ga-Sekgopo are important to consider and understand:

- A rural community of 32 000 people live on a total land area of about 32 hectares
- Basic infrastructure such as schools, clinics, roads, and water reticulation has been provided by the provincial government but poorly maintained.
- Except for teaching and health staff, no other formal employment opportunities exist. Building of basic infrastructure through public works programmes only creates temporary work opportunities.

The most important natural resources in the community are the following:

- Communal land along a river which is used for subsistence farming. It is not a perennial stream, but opportunities for water storage during rainy seasons do exist.
- As a result of the local traditional land tenure system and lack of agricultural knowledge, the most productive land is being used for the most basic subsistence farming. However, not enough food is being produced on any individual allotments to even provide for a family of four for the whole year.
- Over-grazing by free roaming domestic animals has caused serious soil erosion and bush encroachment of the best grazing lands.
- Human resources audits have revealed an abundance of academically skilled, semi-skilled and unskilled unemployed workers. Most of the persons trained to a post-matriculation level were teachers from the nearby Modjadji Teachers College.
- Previous basic skills training had no impact due to lack of employment opportunities.

The aims and objectives of Dries Visser's study were formulated as follows:

- To establish a self-sustainable rural community through appropriate training and suitable land use.
- To negotiate an appropriate land tenure system with the traditional authorities that will ensure security for land users.
- To recruit and train a work force from the local population to perform development tasks. Illiterate workers will first receive literacy skills training to enable them to compete on an equal footing with other potential recruits.
- To provide families with sustainable income which will enable them to become self-sufficient through agricultural development.
- To ensure that trained and experienced managers act as competent human resources who are able to initiate similar projects elsewhere in the Northern Province should the need arise.

It was furthermore stated that the training and development project should comply with all the legal requirements pertaining to environmental, agricultural and occupational health and safety aspects applicable to this type of project.

#### *2.4.3. Land use setting*

An initial inspection and evaluation of the potential land use zones prior to the workshops identified four broad categories, namely:

- a housing and services zone comprising of schools, clinics and small businesses
- a grazing zone for domestic animals.
- an intensive agricultural zone
- a natural zone comprising of mountains and hills with magnificent views and natural attributes. The latter can provide hiking trails and eco-tourism opportunities.

#### *2.4.4. Scoping results*

The study has revealed the following aspects:

- the carrying capacity of the area is eleven hectares per person, which is relatively low for a rural set-up. The land capacity decreases as the people and animal numbers increases.
- there is a direct and indirect impacts of land use on the natural environment such that the area is characterized by dongas, soiled rivers, unproductive soil, eroded catchment areas and overgrazing.
- lack of poor planning resulted in the occupation of ecologically sensitive areas.
- provision of services by government, especially the upgrading of existing structures was not done, let alone development of new projects.
- policies related to environment and land use were never implemented during the defunct Lebowa government. This included Regulation R188 for land use planning and *Lebowa Nature Conservation Act of 1979*.

#### *2.4.5. Proposed Training Contents*

Based on the outcome of the scoping process, the following were recommended for training and implementation:

- basic agriculture and development
- water supply and sanitation
- land management
- occupational health and safety
- project management
- environmental monitoring and auditing
- legal and administrative requirements
- tourism development
- fruit farming
- crop farming
- dairy farming
- leather training
- cattle ranching.

#### *2.4.6. Enhancement of Existing Small Enterprises*

At Ga-Sekgopo, there are already existing small enterprises making a meagre living from the local market. The following are examples of opportunities to benefit local small business:

- The local nursery could be contracted to supply suitable vegetation and herbicides for soil conservation works and bush eradication.
- The existing hardware shop could supply the work teams with picks, spades, wheelbarrows and other rudimentary equipment.
- The local garage could provide tractors and other vehicles for rental.
- Existing home industries could supply the workers with prepared food.
- The workforce will probably spend most of their income at the shops thereby contributing significantly to their turnover.



#### *2.4.7. The relevance of the third case study to the main study*

The third case study on rural land use and Environmental Management Training at Ga-Sekgopo is aimed at maximizing rural land use whilst meeting the already existing environmental management challenges which have manifested themselves as soil erosion, deforestation, denuded catchment areas and declining agricultural production. These challenges are equally shared by the people of Dilokong.

The environmental setting and land-use problems of this area similar to those of the main study. Both areas are rural and communally occupied. Land use zones are similar and are influenced by the same Drakensberg escarpment. Both areas also have been under the defunct Lebowa government and as such subjected to the same policies of environment and developmental governance.

#### **2.5. Reconciliation and relevance of the above-discussed case studies to the main study.**

Land use aspects pursued by the main study includes agricultural ranching, human settlements, mining, land tenure and the use of other natural resources and the related impacts on the environment.

The first case study reviewed the impact of smallholder land use practices on sustainable land productivity. Its relevance to the study is discussed below. The study sought to underscore smallholder use systems impact on the sustainability of both agriculture and the physical environment on communally owned land as a basis for rational planning and informed policy formulation. It is built on the premise that people's desire to increase livestock population coupled with effects of dry and land farming and pressure on woody vegetation for browsing and fuel, and exacerbated by drought, have triggered land degradation and declining food and energy production in the region of Busongo-Shinyanga.

The first case study focused on a rural terrain of a communally owned land, which is similar to the terrain of the main study. The relevance of using the first case study is to inform policy formulation related to that of the main study to an extent, even though the main study intends to evaluate the implementation of policies related to land use and environment.

The second case study on the evaluation of land resources for planning sustainable production is a study by the food and agricultural aid of the United Nations. The seminar focused on land-use assessment scale criteria, which is captured in a model form. The following aspects are explored because they form fundamental base of the model:

- characterization of land use
- risk analysis
- modelling of land degradation
- population support capacity modelling.

The above- mentioned factors or aspects inform the direction of the main study so as to consider holistically and put them on an assessment scale. Characteristics of land uses and modelling of land degradation are the core aspects of the main study. Risk analysis and population support capacity modelling open up the possibility for the main study to overcome stereotypical approaches and identify novel aspects to be considered in the recommendations of the study.

Two considerations of FAO are shared by the main study and are as follows:

- Development and conservation plans must be formulated with full participation of the communities affected.
- Planning and implementing sustainable production to accommodate increasing human demands and safeguard the environment is a fundamental challenge.

The third case study on rural land use and Environmental Management Training at Ga-Sekgopo is aimed at maximizing rural land use whilst meeting the already existing environmental management challenges which have manifested themselves as soil erosion, deforestation, denuded catchment areas and declining agricultural production.

The environmental setting and land use problems of this area are similar to those of main study. Both areas are rural and communally occupied. Land use zones are similar and are influenced by the same Drakensberg escarpment. Both areas have been under the defunct Lebowa government and as such subjected to the same policies of environmental and developmental governance.

Stemming from the reviewed literature, this research project was deliberately holistic in approach, that is, collectively focusing on all land use aspects and natural resource use and their related impact on the natural environment. Review of the past and present government policies, which are related to land use and environment, has been done and their implementation has been assessed. Solutions and mitigating factors to encountered problems will be suggested. Lastly, a strategy based on policy requirements, economic needs and environmental challenges will be proposed.

## **CHAPTER 3**

### **DATA ANALYSIS AND PRESENTATION**

#### *3.1 Introduction*

This chapter includes findings from the distributed questionnaires which were completed by 150 leaders of various community structures in Dikolong area. Out of the 150 distributed questionnaires, 130 were received back and 20 questionnaires were not returned.

Dilokong as a whole has 49 villages (LDO: 1998). Villages were grouped to form 27 bigger villages to suit the survey. Each village was given 5 questionnaires which were completed by 5 leaders from different community structures.

The researcher ensured that all the wards were represented in the sample. Each ward councilor has completed the questionnaire. At least the respondents from the 4 villages who did not return the questionnaires were represented by their ward councilors. The strategy ensured a representative sample.

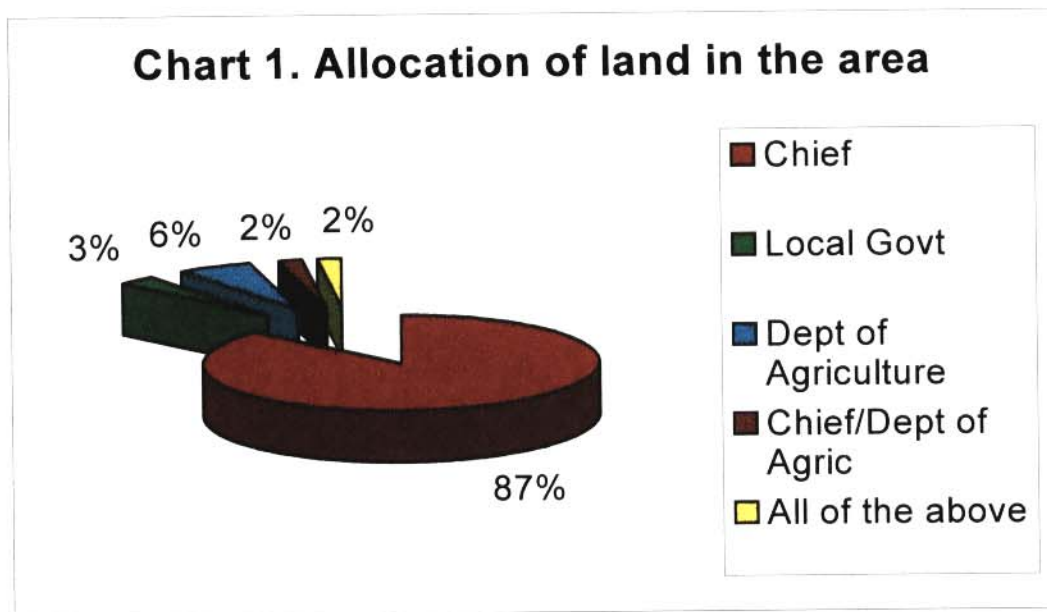
Two field visits were undertaken, one was with the researcher's supervisor, and the other one with an environmental scientist from the provincial Department of Minerals and Energy Affairs. The supervisor was given an orientation of the study area to enable him to understand the extent and the context of the research issues. Field observations have assisted the researcher in structuring the questionnaire and also in assessing the reliability of the collected data. Site specific photos were taken and are presented in Appendix 2.

An Environmental Scientist (1999) from the provincial Department of Minerals and Energy Affairs was interviewed to understand the impact of the smoke from ASA Metals Ferrochrome Smelter mine on the health of Ga-Maroga people.

The Chief Executive Officer of Dilokong TLC and Agricultural Extension Officers were interviewed about the planning of the area. The researcher wanted to understand the present efforts of planning of the area. The text below presents the analyzed data. In the following analysis Q stands for questions and R for responses.

### 3.2. Settlements, Infrastructure and Land tenure aspects

Q: Who allocates land in your area?



R: See Chart 1 above.

Q: What type of village are you staying at?

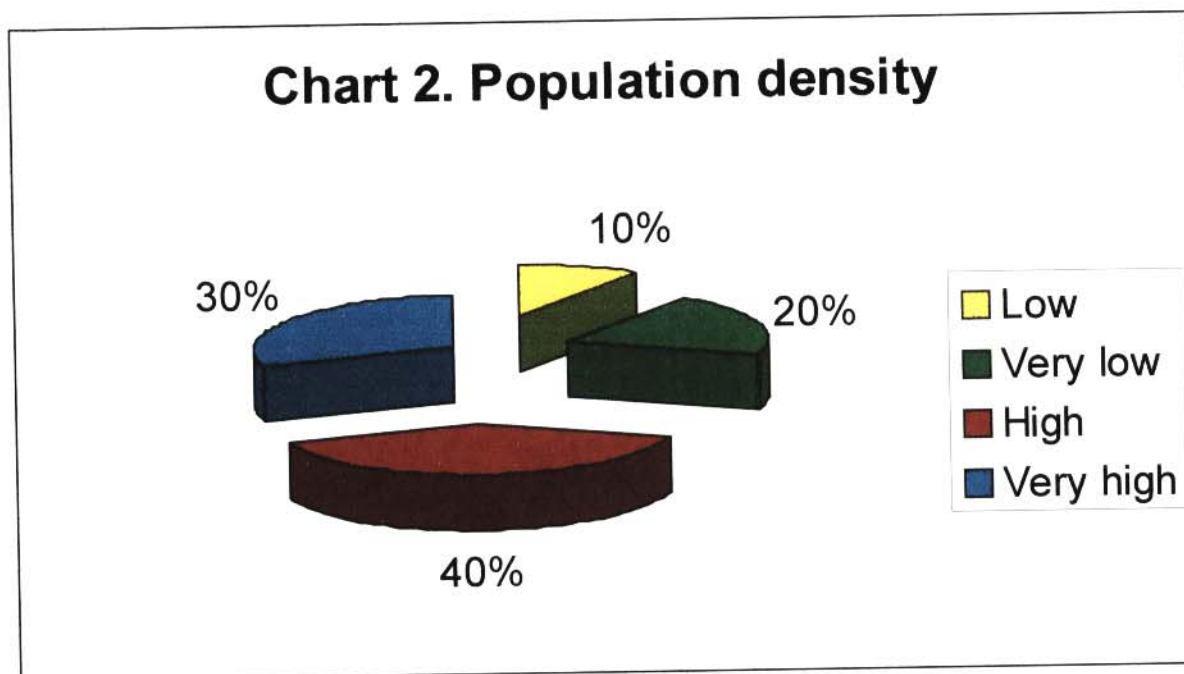
R: Out of the 100% of the questionnaires analyzed; 13% of the respondents stay at planned, 16% at partly unplanned, 70% at unplanned villages and 1% does not know the type of villages they are staying at.

Q: How is the population density in your area?



Q: How is the population density in your area?

R: See Chart 2 below.



Q: Do you have a need for more space for housing settlement in your area?

R: 70% of the sample is in need of more space for housing settlement in their area.

This 70% is from the two groups of respondents (30% and 40% respectively) who indicated above that their population density is very high and high, whereas the 30% who did not show any need for more space is from the two groups (10% and 20% respectively) which have indicated very low in the above chart.

Q: If yes, how much space do you need?

R: The minority of the respondents (2%) indicated the space of smaller than 1 hectare; 5% 2-3 hectares; and another 5% 3-5 hectares; 6% 5-10 hectares; 15% 10-20 hectares; 32% 20-50 hectares and 29% did not respond. The researcher assumed that the hectare measurement was not well understood by the 29% non-respondents, even though she tried to explain what a hectare is in a schedule of explanation of concepts attached to the questionnaire.

Q: How is the settlement arrangement in your area?

R: 5% of the respondents mentioned that the settlement arrangements in their area is very dense, 45% dense, 47% scattered, 2% very scattered and 1% non-response.

Q: Do you have power in your household?

R: 65% no and 35% yes.

Q: If yes, what do you use it for?

R: 9% of those with power in their households use it for lights only, 3% for cooking only; 22% for both lights and cooking and 66% non response. The researcher assumed that the non-response is for those who use power for other purposes which were not specified in the questionnaire though were asked to specify other uses or they might be using it for all the required electrical purposes.

Q: Where do you get water you use in your household?

R: 78% get the water they use in their households from boreholes; 10% fetch it directly from the river; 6% get it from both the boreholes and the rivers and another 6% of the respondents did not specify where they get their water. An interviewed officer from the Department of Water Affairs and Forestry indicated that water both from the river and the boreholes is not purified.

Q: Is there water-piped system in your area?

R: The study revealed that 72% of the sample has water-piped systems in their areas whereas 28% does not have them. It was observed that most of the water taps are not located within the households, but centrally placed within walking distances. Communities who are serviced by the established Water Schemes often spent days without water because of diesel shortage. Residents are still reluctant to pay for water services.

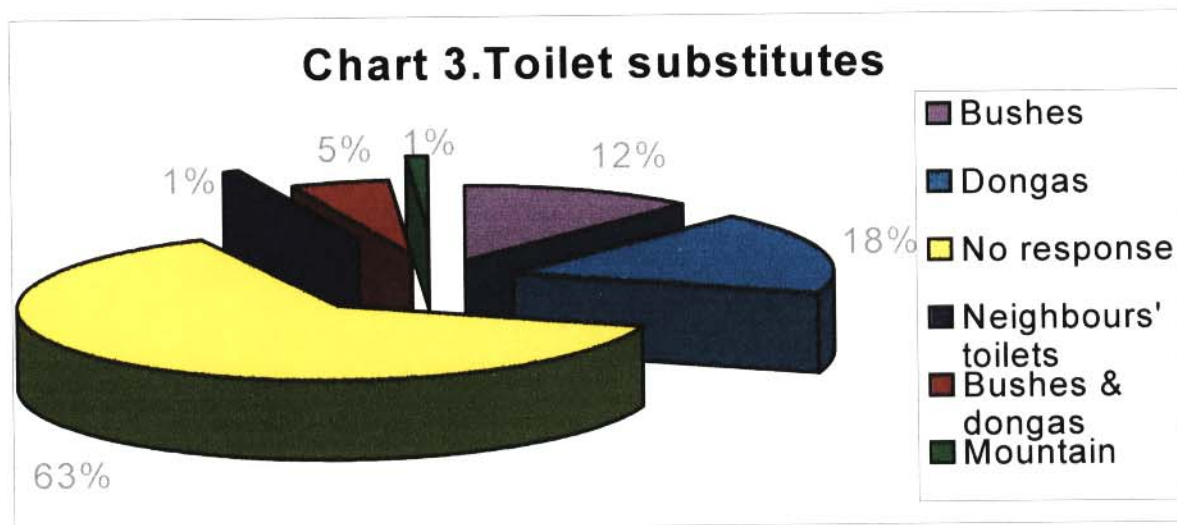
Q: Do you have a toilet in your household?

R: 63% have toilets in their households; whereas 37% of the sample is without them.

Q: If yes, what type of toilet?

R: 55% use pitlatrine; 6% use water flushed and 2% use both pitlatrine and water flushed. It was observed that those using both pitlatrine and water flushed toilets are those who encounter water problems as it was indicated that water is only available on certain days of the week. The researcher also observed that water-flushed toilets are only available to the residents staying at the old closed mine houses of Ga-Maroga and Mooihoek villages. There were non-respondents of 37%. The researcher assumed that non-respondents are those who are without toilets and were ashamed to indicate that; and this resulted to their failure to specify types of toilets they are using in their households.

Q: If no, what do you use as a substitute for toilet?



R: Chart 3 above indicates toilet substitutes in use.

The 63% non-response as indicated in the chart above is assumed to be for those who are ashamed of indicating the already mentioned toilet substitutes.

Q: Who is responsible for infrastructural development of your area?

R: 34% indicated Chief, 50% local government, 7% both Chief and local government and 9% no response.

Q: Who is responsible for the planning of your area?

R: 39% of the sample indicated that the Department of Agriculture is responsible for the planning of the area, 15% local government, 35% Chief, 7% both the Department of Agriculture; local government and the Chief, 2% both local government and another 2% both the Department of Agriculture and Chief.

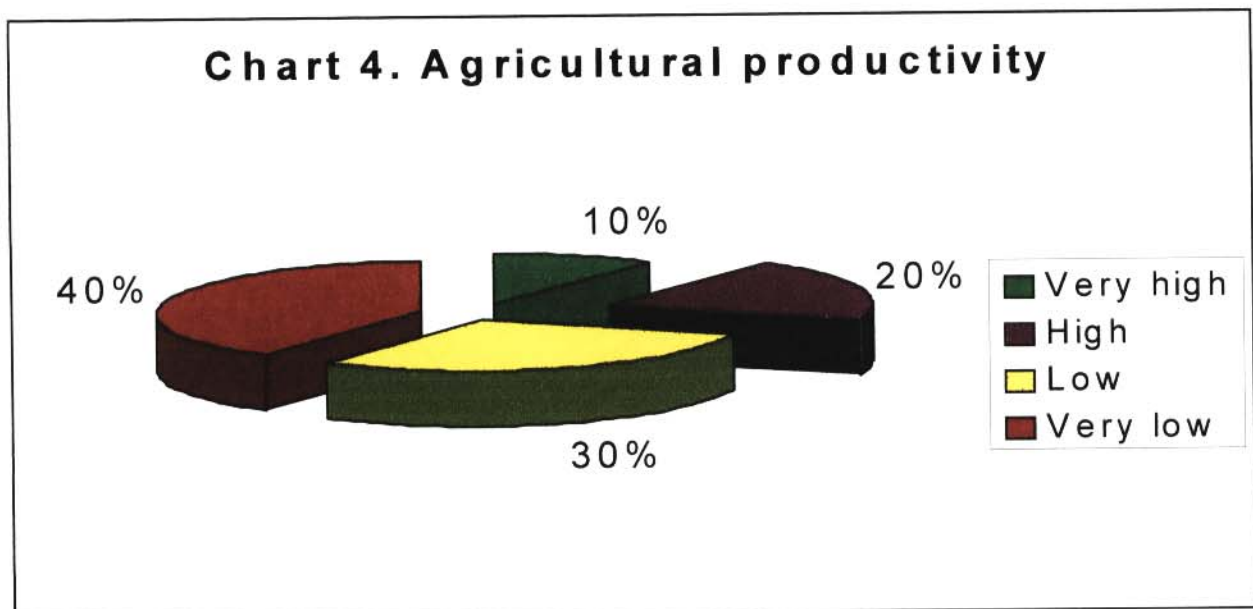
Q: Are you involved in the planning of your area?

R: 40% yes; 59% no and 1% no response.

### 3.3. Agriculture and Conservation aspects

Q: How productive is your agricultural land?

R: See Chart 4 below.



Q: If production is low, what do you think is the cause? (tick more than 1 if applicable).

R: 12% of the sample indicated that drought as the cause of low agricultural land production, 8% soil loss, 9% poor ploughing, another 9% drought and soil loss, 12% drought, soil loss and poor ploughing and 31% no response.

Q: To what extent does drought affect your crops?

R: 12% of the sample indicated that it affects its crops to less extent, 32% to some extent, 53% to great extent and 3% do not know.

Q: Is the government involved in drought relief programmes in your area?

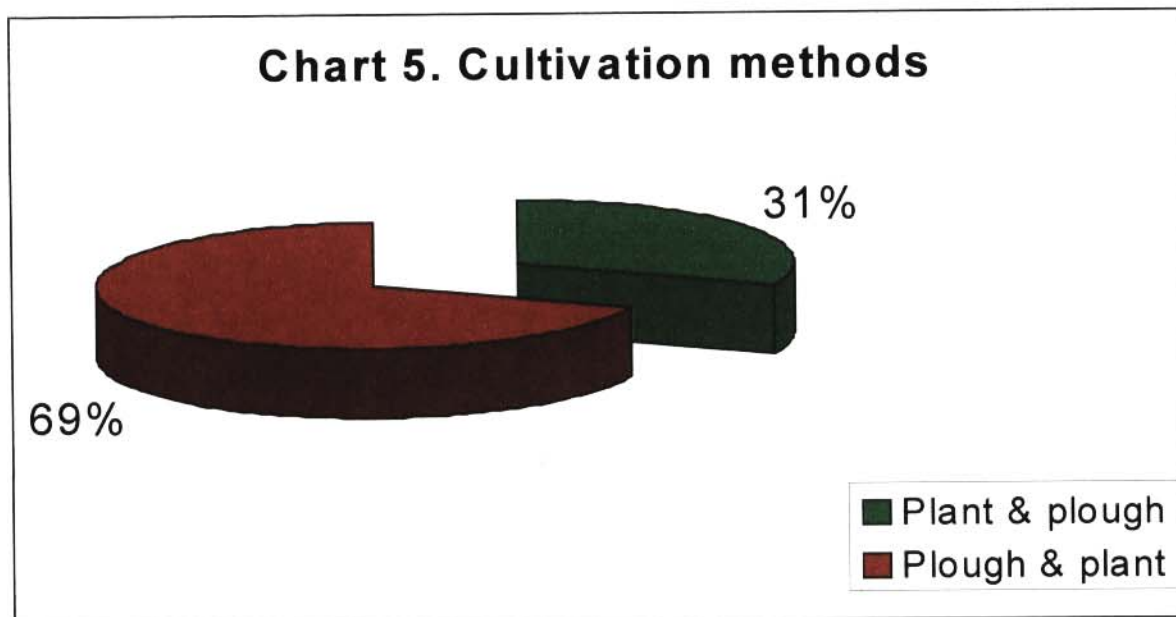
R: 83% indicated government's non-involvement and 17% government's involvement in drought relief programmes.

Q: Are you ploughing throughout the year?

R: 22% yes and 78% no.

Q: How do you cultivate your fields?

R: See Chart 5 below.



The researcher also observed that the traditional plant and plough method (distribution of seeds first and then cover it with the soil) is mostly practiced by subsistence farmers of Dilokong area.

Q: What type of seeds do you plant?

R: 20% use drought resistant seeds, 22% wet season seeds, and 58% any available seeds.



Q: Do you fertilize your soil?

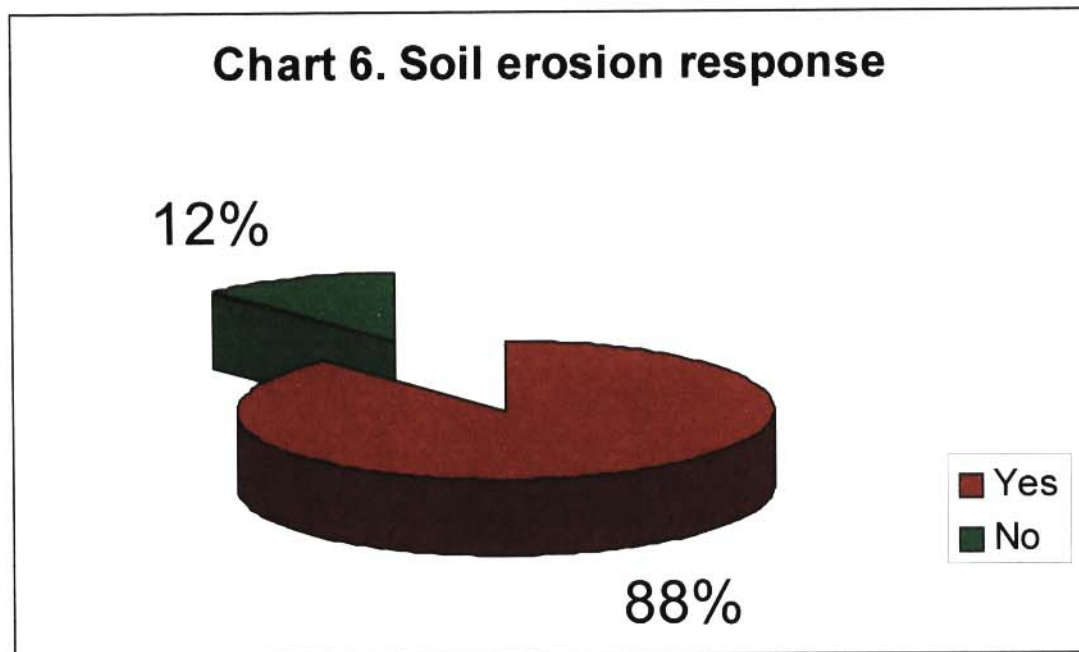
R: 12% yes, 86% no and 2% no response.

Q: If yes, specify.

R: 10% use manure to fertilize their soil, 1% 3:2:3 fertilizers, 1% responded inappropriately by saying "often" and 88% no response. The researcher observed that the majority of the people of Dilokong do not fertilize their soil.

Q: Is soil erosion a problem in your area?

R: See Chart 6 below.



Q: If yes, are you involved in fighting it?

R: 3% is involved all the time, 50% sometimes, 36% not at all and 11% no response.

Q: Is there any soil conservation programme in your area?

R: 4% yes and 96% no.

The researcher has seen a soil conservation project at Maandagshoek village which was initiated by Lebowa Nature Conservation Division in 1997.

Q: If yes, specify.

R: Drought relief projects from the Department of Agricultural Resource Conservation, Community Gardening Schemes and Farmers' organizations.

Q: If no, is it because of:

R: 34% stated lack of funds, 19% government apathy; 40% inefficiency of relevant authority; 2% the three above-mentioned reasons; and 5% no response.

Q: Do you take your agricultural products to the market?

R: 2% yes, 97% no and 1% no response.

Q: Are there livestock farmers in your area?

R: 33% of the sample indicated that there are less than 10 livestock farmers per household in the area, 32 % between 10 and 39, 14% between 40 and 69, 8% between 70 and 99, 12% 100 and above and 1 % no response.

Q: Are there grazing camps in your area?

R: 4% yes, 95% no and 1% no response.

Q: If yes,

(a): Do you have enough grazing land for your livestock?

R: 1% yes, 11% no and 88% no response.

(b): What is the carrying capacity of your grazing land?

R: 1% indicated less than 10m<sup>2</sup> per cattle, 2% indicated 10m<sup>2</sup>-40m<sup>2</sup> per cattle, 1% indicated 20m<sup>2</sup>-30m<sup>2</sup> per cattle, 0% indicated 30m<sup>2</sup>-40m<sup>2</sup> per cattle, 0% indicated 40m<sup>2</sup>-50m<sup>2</sup> per cattle; 5% indicated 50m<sup>2</sup> and above per cattle and 1% do not know. The researcher assumed that the 92% non-response was caused by the respondents' failure to understand the measurement for grazing land per cattle.

Q: If no, how much grazing land do you need?

R: 7% need smaller than 5 hectares; 15% need 5-10 hectares; 22% need 10-20 hectares; 20% need 20-50 hectares; 28% need 50-70 hectares and 8% no response.

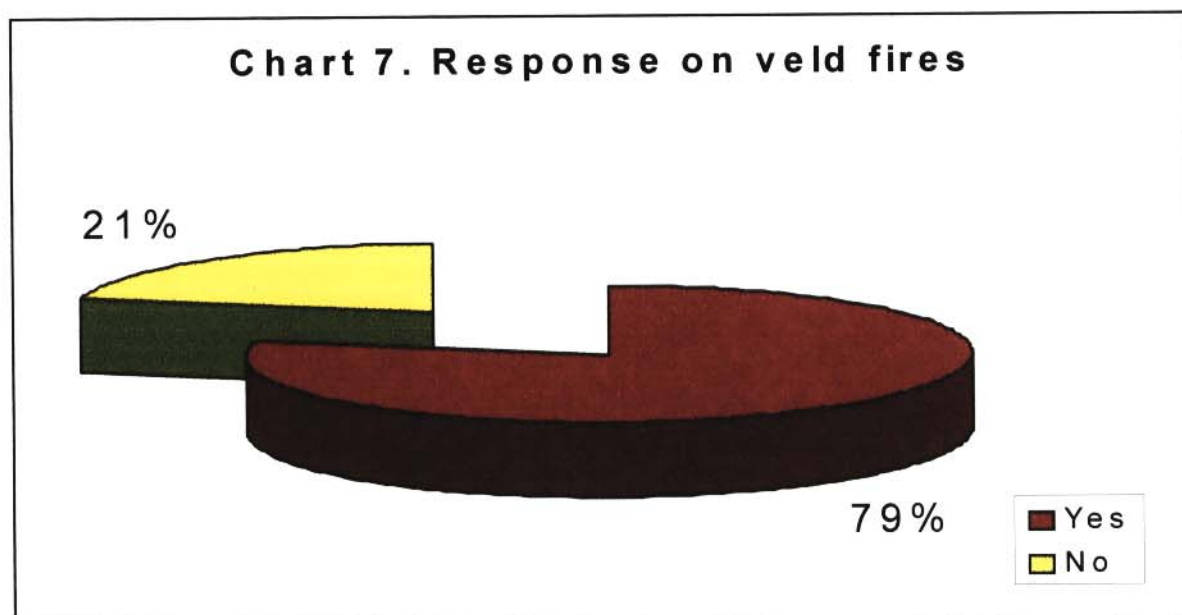
R: 40% of respondents sometimes take their livestock to the market whilst 60% do not at all market their livestock.

Q: What do you use for cooking? (tick more than 1 if applicable).

R: 85% of the sample use firewood for cooking, 8% use paraffin, 3% use coal, 5% gas, 15% electricity, 8% firewood and paraffin, 3% firewood and electricity, 3% paraffin and gas, 5% firewood, paraffin and electricity, 4% firewood, paraffin, coal and electricity, 3% firewood, paraffin, gas and electricity and 45% firewood, paraffin, coal, gas and electricity.

Q: Do you experience veld fires in your area?

R: See Chart 7 below.



Q: If yes, what do you think are the causes of veld fires? (tick more than 1 if applicable).

R: 2% indicated natural veld fires, 61% manmade, 10% unknown, 3% both nature and manmade, 2% nature and unknown, 4% manmade and unknown and 18% no response.

Q: To what extent do veld fires affect your grazing land?

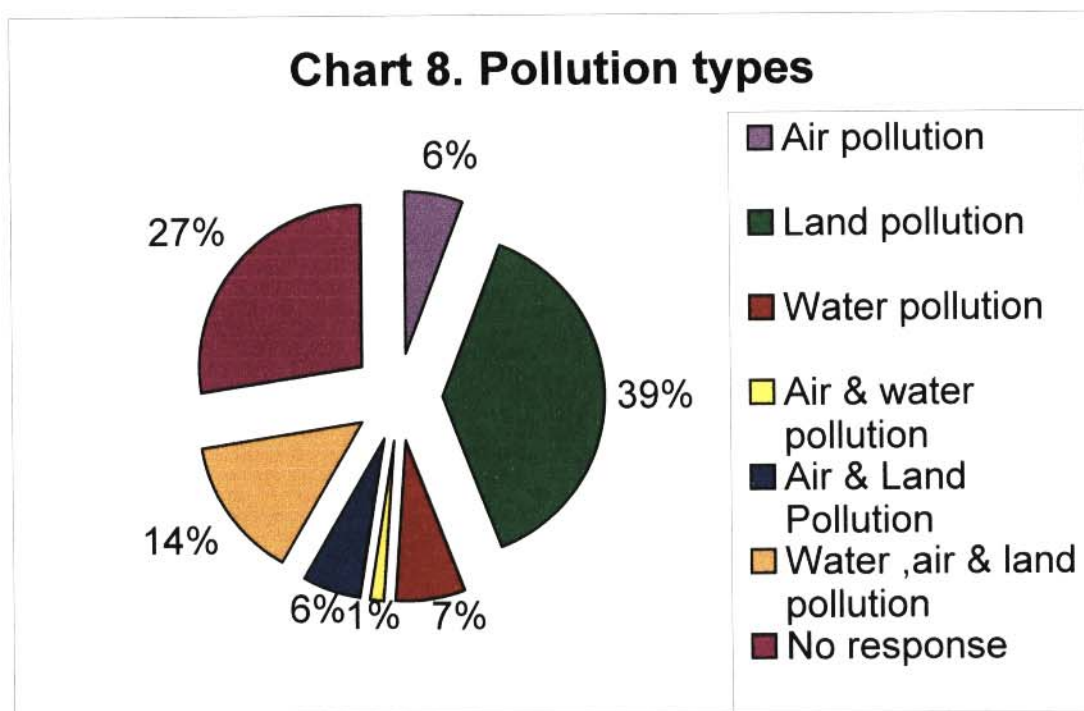
R: 5% indicated that veld fires affect their grazing land to less extent, 29% to some extent, 48% to great extent and 18% no response.

Q: Is there any pollution in your area?

R: 74% indicated yes while 26% indicated no.

Q: If yes, what kind of pollution do you experience in your area? (tick more than 1 if applicable).

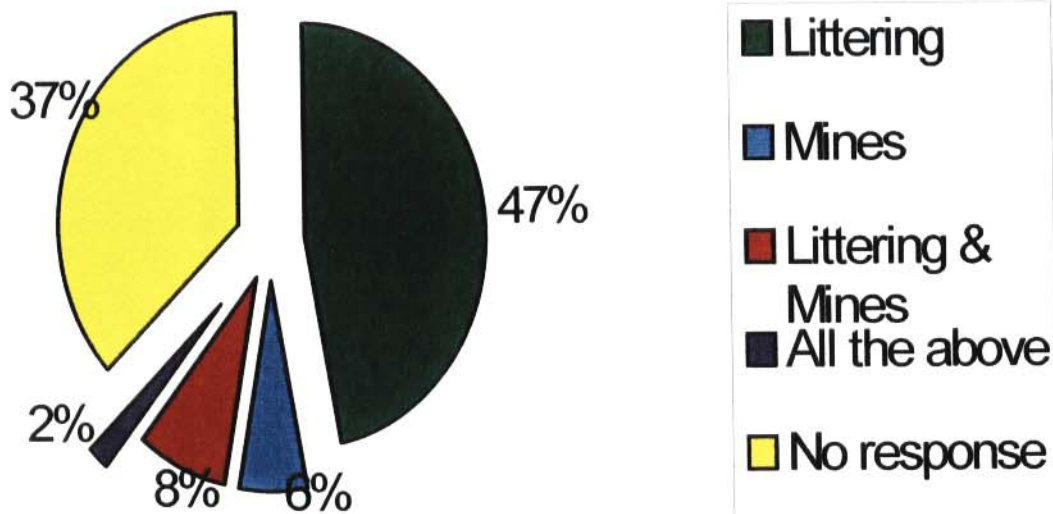
R: See Chart 8 below



Q: What is the cause of air pollution if you ticked it above? (tick more than 1 if applicable).

R: 17% indicated mines as the causes of air pollution, 1% factories, 2% both mines and factories and 80% no response. The researcher observed emissions from Dilokong ferrochrome smelter, smoke from fuelwood and dust from gravel roads as the causes of air pollution.

**Chart 9. Causes of land pollution**



Q: What is the cause of land pollution if you ticked it above? (tick more than 1 if applicable).

R: See Chart 9 above.

Q: What is the cause of water pollution if you ticked it above? (tick more than 1 if applicable).

R: 15% indicated littering as the cause of water pollution, 4% effluent from mines, 4% effluent from sewerage, 2% dumping sites, 2% littering and effluent from mines, 3% littering and dumping sites, 2% effluent from mines and dumping sites, 4% both littering, effluent from mines and dumping sites, 2% littering, sewerage and dumping sites and 60% no response. The researcher observed that villagers residing along Motse river do their laundry inside the river which also contributes to pollution.

Q: Are there any mine dumps in your area?

R: 67% no and 33% yes.



Q: If yes, to what extent do they impact on the health conditions of your community?

R: 4% showed that mine dumps impacts on the health conditions of their communities to a lesser extent, 8% to some extent, 9% do not know and 68% no response. The researcher assumed that the no response might have been caused by lack of knowledge of how the mine dumps are impacting on their health.

Q: Is there any rehabilitation of those mine dumps?

R: 3% yes, 30% no and 67% no response.

Those who failed to respond might have encountered problems in understanding the word “rehabilitation” and associating it with behavioural change.

Q: Is solid waste a problem in your area?

R: 2% yes, 67% no and 31% no response.

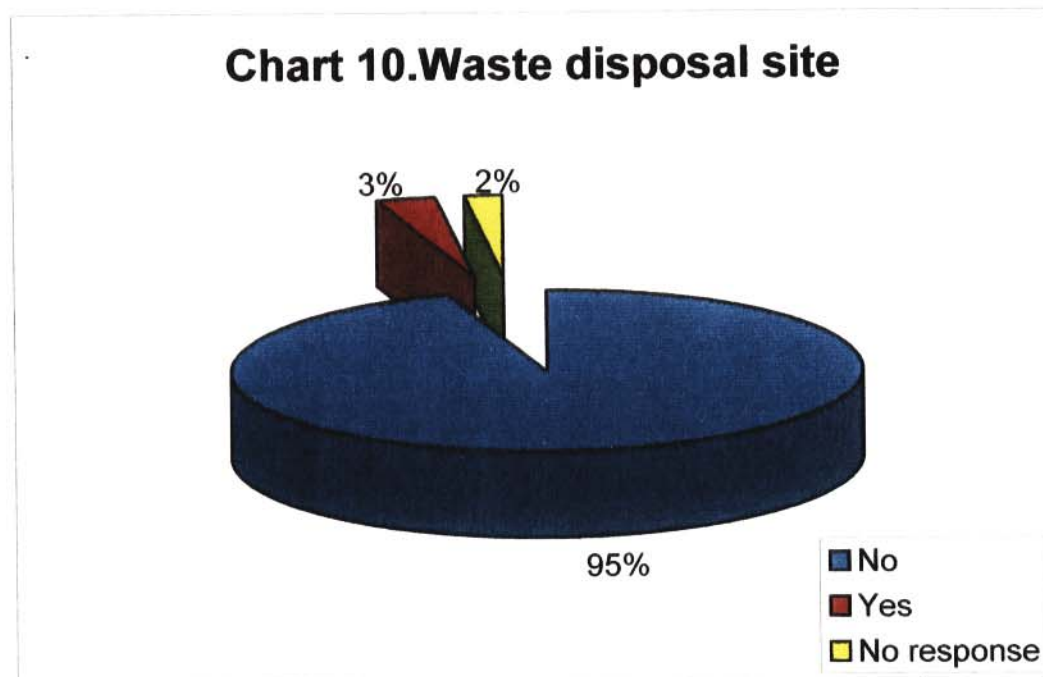
Q: If yes, do you have a waste removal system in your area?

R: 2% yes, 67% no and 31% no response.

The researcher assumed that the 31% non-responses might have been caused by lack of understanding of the removal systems as some respondents are unaware of the existence of such systems, while others do not imagine the possibility of having such services.

Q: Do you have a waste disposal site in your area?

R: See Chart 10 below.



Q: If yes, is the site located in a suitable area?

R: 8% indicated that the waste disposal site is not located in a suitable area, 1% indicated a suitable area, and 91% no response. The researcher assumed that those who did not respond had no knowledge of waste disposal sites as there is no legalized sites in the whole of Dilokong.

Q: If no, how do you treat your waste?

R: 69% burn their waste, 5% bury it, 14% litter it, 2% burn and bury, 5% burn, bury and litter and 2% no response.

### 3.4. Policy

Q: Do you know of any environmental policies which regulate land developments?

R: 6% yes, 93% no and 1% no response.

Q: If yes, specify.

R: Environmental Club, Nature Conservation Act and Community Policing Forum.

Q: Were you involved in the formulation of the Land Development Objectives (LDOs) of your area?

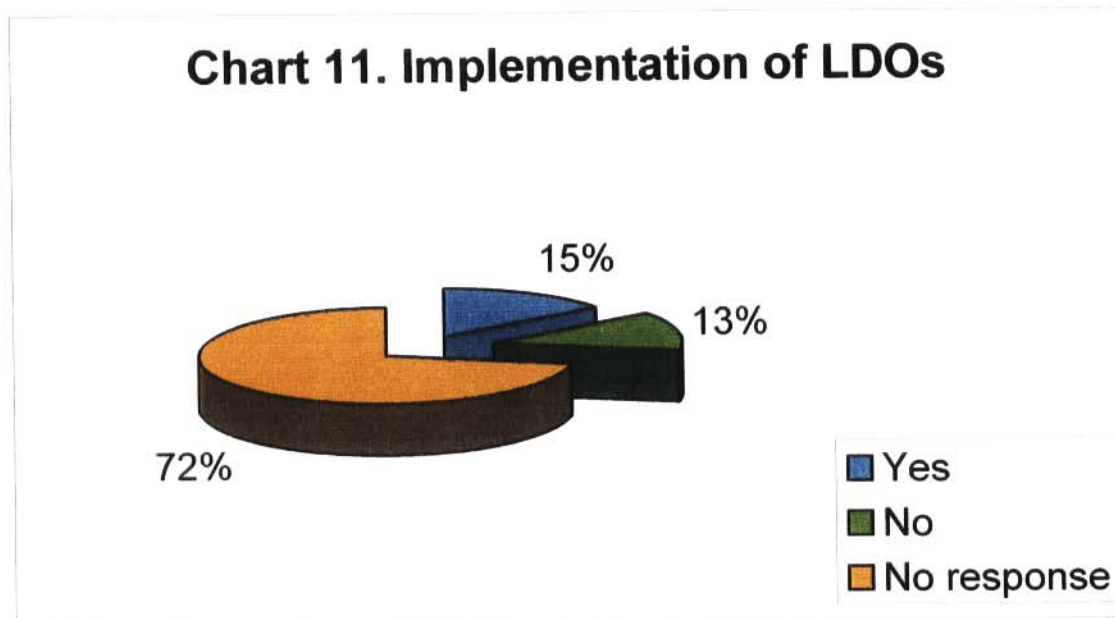
R: 27% yes, 70% no and 3% no response.

Q: If yes, on which level?

R: 19% were involved in the formulation of LDOs at information sharing level, 3% consultation level, 5% decision-making level and 71% no response. The researcher was of the opinion that majority of the people of Dilokong area know nothing about LDOs of their area and the 71% no response clearly confirms her personal opinion.

Q: If yes, are the LDOs put into practice in your area?

R: See Chart 11 below.



The 72% non-response is a clear indication that LDOs are not known to the sample hence their failure in responding to the question.

### 3.5. Conclusion

The researcher analyzed 130 completed questionnaires on the impacts of the rural land-use on the natural environment in Dilokong area. In addition to the questionnaire schedule, the researcher also made field visits to observe different land uses in order to assess the reliability of the responses on the completed questionnaires.

The purpose of the analytical stage was to answer the research questions examining patterns within the data, primarily through the use of statistical techniques. Raw data in a form of tables (see Appendix 4 for raw data) which was then turned into percentages in a form of pie-charts was used to analyze data. The charts were used in some instances to display a visual image of the dispensation of data. Data has also been analyzed so that the research hypotheses can be tested. Statistically, significant patterns and correlations have been found, and those will be interpreted in the next chapter.

## CHAPTER 4

### INTERPRETATION AND DISCUSSION OF THE FINDINGS

#### 4.1. Introduction

This chapter confines itself to the interpretation of analyzed and observed data, and the discussion of the relevant legislative policy frameworks. Since the questionnaire was long, the analyzed data was a bit noisy. To reduce the noise and aid comprehension, data was grouped into various land-uses and natural resource aspects.

The above mentioned aspects will not be discussed deeply to avoid tedious data which may impact negatively on the intended holistic approach to the study. Hypothesis testing will unfold concurrently with the interpretation and discussions of the findings. In this way, the research questions formulated in Chapter 1 will also be answered.

#### 4.2. Settlement and land tenure aspects

Findings from the questionnaires revealed that the majority (70%) of the people residing in Dilokong is staying in unplanned villages with some patches of communities staying in planned (13%) and partly planned (16%) villages. The latter are recent developments, which were initiated by the Department of Agriculture under the defunct Lebowa homeland.

Chiefs have more powers in the allocation of land for residential and agricultural purposes. This is confirmed by the (87%) response of the analyzed data in Chart 1 of chapter 3. Land management in rural areas, especially the demarcation of sites, in Dilokong has been done in terms of the *Black Areas Land Regulations, Proclamation R188 of 1969*, which did not provide clear guidelines or procedures regarding physical planning and demarcation of sites within a locality. This has therefore permitted different procedures adopted in the province throughout the former homelands.



Legally, the state has the power to allocate land to individuals and communities through the issuing of permissions to occupy (PTOs) and the responsibility to control the use of the land and to register tenure rights. However, this procedure was not applied in Dilokong. The communities' experience is that the tribal authority through the Chief or headman, allocates land rights in the area. In most cases the allocation is not reflected in the formal PTOs.

As a consequence, the following problems have been identified:

- There is no uniform procedure and process on subdivision and demarcation of sites.
- Land development in rural areas, especially demarcation of residential sites, is not fully coordinated with all relevant departments. Settlements are thus being located without due consideration of the capacity of available resources, for example water, carrying capacity of the land, potential for mineral deposits, safety, etc.
- Insecure tenure rights ruled out the possibility of using the fixed property as collateral to raise loans for housing and or business purposes.
- Surveying methods used for demarcations of sites do not allow for upgrading of tenure rights to freehold.

The above-mentioned issues clearly confirm the hypothesis that stated that land-tenure reform is a prerequisite for addressing the environmental problems. Though the 3% of the respondents have indicated that local governments also allocate land, the local councillors denied this. In all the areas, permission to occupy land is requested from the Chiefs. Land administration issues are not yet clear at the local government level. The question of whether the TLC will be given the powers to administer land issues or whether the Chiefs will continue allocating land remain unanswered.

The population density of the area is relatively high as observed and the 70% response confirms the high density in the area. The 30% response of low density has been mainly from the respondents who live near the mountain areas which are relatively self-supporting scattered settlements.

The increasing population density has led to the scarcity of suitable land for housing settlements. This is supported by the 70% response of the need for more land for housing settlements. As a result of unplanned land for settlement, people already occupied vleis and erosion prone areas. This clearly confirms the hypothesis that high population density is one of the main causes of negative environmental impact in Dilokong area.

The researcher observed that considerable hectares are required to accommodate the expanding villages. Rural areas are normally defined by scattered settlement arrangements they support, but to the contrary, Dilokong supports high-density settlements.

#### 4.3. Infrastructure

Infrastructural development findings covered the following:

##### *4.3.1. Power supply*

The study revealed that the majority (65%) of the people of Dilokong is without electricity. Respondents alleged that electricity is mostly enjoyed by the privileged few who own viable businesses and also residing next to the grid which supply mining houses. The rural electrification programme of Eskom, managed to electrify few villages since its establishment in 1994. The 35% response of people having electricity marks the success of Eskom in rural electrification. The former Lebowa government failed dismally to supply electricity to the people.

The few communities who have power, normally use it for lights only. Those who can afford power, use it for all household purposes. Eskom was concerned about the low rate of power usage. During data collection period, the researcher met two Eskom researchers in July 1999 who were collecting data on the low rate of electricity utilization at Legabeng and Ga-Ragopola villages of Dilokong. The collected data revealed low income or no income at all as the cause of low rate power usage. People could not afford to buy electricity cards and further maintain their electrical appliances. An attempt to have access to the research report was not successful due to the confidentiality of the household information.

There is also a correlation between the low rate of power usage and firewood utilization. The analyzed data shows that 85% of the sample use firewood for cooking. Other sources of energy in use include paraffin (8%); coal (3%), gas (5%), electricity (15%) and others interchange all the sources of energy.

#### *4.3.2. Water supply*

The majority of the people (78%) in the area received their water from boreholes and the remaining few (10%) from rivers. The problem of water provision is twofold namely:

- The absence of potable water (at minimum RDP standards) in 65% of the villages in the Dilokong area, and
- Inadequate management and maintenance of existing water supply systems to most villages in the area.

The communities inter alia articulated these problems:

“Insufficient water supply”

“Unpurified water”

“Sources of water too far (rivers)”

“Pumping equipment not secure”.

The rural water supply programme of the Department of Water Affairs and Forestry (DWAF) has managed to provide water a reticulation system to most of the villages. It was observed that most households do not have water taps within their yards. Taps are placed centrally within walking distances. Due to lack of power grid in most communities, water pumps are propelled by diesel.

Shortage of water is still experienced despite the existing reticulation system. The communities are supposed to pay for the services rendered which they are unfortunately not yet used to. Masakhane campaigns are in process to sensitize them about the importance of paying for the services.

Communities without a water reticulation system collect their water from running streams and fountains. This water is unpurified and unhygienic to utilize. People also still prefer to do their laundry inside the streams which end up polluting the water and endangering the lives of downstream users.

#### *4.3.3. Sanitation*

The study revealed that 63% of the respondents have toilets in their households, whereas 37% are without them. Bushes, dongas and mountains are used as toilet substitutes. During wet seasons, the toilet substitutes have the potential to pollute water courses and spread diseases. Cases of typhoid are confirmed by the two hospitals in Dilokong. The victims are mostly people who drink untreated water from rivers. Fifty five percent of those with toilets use pitlatrine, 6% water flushed and 2% both pitlatrine and flushing toilets. Water flushed toilets are mainly used by the haves.

The Environmental Health Officer (EHO) of Mecklenburg Hospital have indicated that underground water studies have proven that pit toilets do contaminate underground water. This mostly happen in low-lying areas where the underground water is shallow.

The Northern region of DWAF has initiated programmes of community sanitation in conjunction with the Health Department. Interested households are then subsidized on the erection of environment-friendly toilets. The project is not progressing well firstly, because most people cannot afford the required amount of money to pay for the erection of the toilet and secondly, due to lack of comprehension about maintenance of health standards. The provision of sanitation facilities in Dilokong is appalling and is critical that pilot projects initiated be fully supported by the TLC.

Communities in Dilokong believe that infrastructural development is the responsibility of local government (50%) while others (34%) believe it to be the responsibility of the Chiefs. Nine percent of the respondents believe that it is a shared responsibility between the Chiefs and the local government.

Given the understandings that it is the responsibility of government to develop infrastructure in communities, the provision of basic infrastructure in Dilokong is inadequate. This poses a serious challenge to the upcoming cross border district council. Chiefs are expected to work closely with the local councils to project infrastructural needs of their communities.

The study revealed that 59% of the sample was not involved in the planning of their area whilst 40% claim to be involved. The involvement of local community leaders by the TLC in planning efforts is critical. One principle of RDP is that development should be demand driven (RDP: 1994). “Demand” in this context should be clearly understood as the motivation for development originating from within the community, not from outside agency (including the state) on behalf of the community. This ultimately leads to the community having no control over its own future and becoming disempowered. “Demand driven development” also does not mean that the community simply “demands” services from the government. It rather means meaningfully responding to the needs of the community as they themselves has expressed and prioritized it.

#### 4.4. Agriculture and Conservation aspects

The above-mentioned aspects are discussed below with agricultural aspect preceding conservation aspects:

##### *4.4.1. Crop farming*

The agricultural land productivity is rated low (30%) and very low (40%) by the respondents. According to the analyzed data, drought and poor ploughing methods are considered to be the major causes of low agricultural land production. As observed, loss of the fertile topsoil due to erosion impacts much on the productivity of the agricultural land. This is confirmed by the 23% response of soil loss as the cause of low yield. Figure 2 in Appendix 2 shows loss of fertile topsoil caused by erosion.



Drought is seen as a factor which affects productivity adversely. Fifty five percent have indicated that drought affect yield to a greater extent. This is true because the communities of Dilokong practice subsistence farming. The majority of the sample (83%) has indicated that the government is not involved in drought relief programmes in Dilokong.

As observed in the Northern Province, commercial farmers are given priority compared to subsistence farmers. Dilokong area is situated in the humid area of the province, which is normally not worsely affected by drought compared to the far North, Bushveld and Lowveld regions.

About 78% of the sample are not ploughing throughout the year. It was observed that cultivation takes place only during the wet season that starts from October to February. The priviledged few who cultivate throughout the year plant fruit, trees and vegetables within their yards at a very small scale. The researcher observed that some small-scale farmers occupy riverbanks of the few perennial streams at Dilokong and manage to plough throughout the year. The Department of Water Affairs and Forestry forbid cultivation of riverbanks as it destabilizes the slopes of the river course and enhancing soil erosion.

The method of cultivation also impacts negatively on the land production. The majority of the sample 69% use the traditional “plant and plough” method, that is, they first distribute seeds all over the ploughing field by hand (plant) and then cover the seeds with the top soil (plough).

This method of cultivation inhibits seed growth and in most cases seeds grow by chance. Haphazard planting leads to a usage of too much seeds. Seedlings normally need breathing space to grow faster and this method compacts seedlings which die easily during hot days. Figure 3 in Appendix 2 shows compacted seedlings due to the plant and plough cultivation method.

The discussions above have clearly shown the impact of agricultural practice on crop yield and on the natural environment. This confirms the hypothesis which claim that the present land-use practices have a negative impact on the natural environment.

The minority of the sample (31%) affords to till the land during winter and plough during summer. Very few can afford to use a seed planter. This method enhances production yield compared to the plant and plough method.

The types of seeds cultivated have a direct bearing on productivity. Quality and climate orientated cultivars increase productivity. The majority of the sample (58%) uses any available seeds. As observed, they do so firstly, because they have no information about different types of cultivars and secondly, because they could not afford to buy treated seeds from Agricultural Corporations. Claims of using wet season and drought resistant seeds by some of the respondents were disputed by agricultural extension officers.

Fertilizers improve the soil structure and eventually increase productivity. Eighty six percent of the sample does not fertilize according to the analyzed data. The researcher observed that people are still able to reap some bags of sorghum and maize without using fertilizers. This indicates that the soils are relatively good.

Only 12% of the respondents claimed to fertilize their fields. It was observed that those who fertilize their fields normally use kraal manure and the few privileged afford phosphate fertilizers.

Subsistence farming is prevalent in Dilokong. The 97% respondents who indicated that their agricultural products are not taken to the market confirm this. Two percent claimed to be taking them to the market, which is a neglectable percentage to impact on the local economy. Maize, sorghum and beans are the main products of the communities of Dilokong. After reaping, the maize and sorghum are treated with the ash of Aloe Marlothi and Aloe Doyviales. They are then stored in their traditional storage houses for domestic use.

#### *4.4.2. Livestock farming*

Livestock farming is one of the pillars of subsistence farming in rural set-ups. Livestock observed in the area include donkeys, goats, cattle and sheep. Sheep are found in very few households and does not thrive well in the high lying areas because of their sensitivity to high temperature. Cattle are the most preferred among all livestock. In most African communities the number of cattle one has, depicts his or her wealth status.

Goats are normally used in traditional ritual ceremonies hence they are afforded some respect. Donkeys are heavily employed in ploughing fields and in transporting wood and water. Donkeys are relatively strong animals because they survive hard work and very dry seasons, but they are also good in uprooting the grass that protect the soil from erosion.

Ninety percent (90%) of the sample has shown that there are livestock farmers in Dilokong. Among the 90% above, 33% keep between 10 and 39 head of cattle; 14% between 40 and 69; 8% between 70 and 99; 12% 100 and above and 1% no response. Livestock keeping by most respondents clearly shows that the people of Dilokong are still dependent on livestock farming for their livelihood.

As observed by the researcher, there are no demarcated grazing camps in Dilokong. This is confirmed by the 95% response of no grazing camps. Only 4% claimed the existence of grazing camps and this response came from the people residing near the Stellenbosch Breeding Station.

The improvement of livestock is mostly dependent on controlled grazing. Grazing camps are therefore important to ensure that livestock is moved from one camp to the other seasonally before they overgraze the land. Overgrazing expose virgin soils to erosion.

The question of carrying capacity has been too scientific to ordinary community people. It is more relevant to agricultural specialists. The (97%) ninety seven percent no response indicates that the question was above many respondents' comprehension. However, some people have speculated and fell far below the calculated (square meter) carrying capacity. Basically there is a need for grazing camps to improve livestock production and also to enhance sustainable use of land.

Generally, there is no marketing of agricultural products in the area and this has a direct negative impact on the local economy. The area has the potential to produce more agricultural products to the market. There is a need for intensive capacity building programmes on production and marketing of products. Government support is necessary to such programmes to help with the take-off. A process of capacity-building and skills transfer should unfold to ensure community independence and self-reliance.

#### 4.5. Conservation aspects

It is unfortunate that the term "conservation" has been misinterpreted for a long time. Accordingly, the term created an impression that nature should be fenced off, be inviolate and untouchable. The terms conservation and preservation were often used as synonymous in contrast to utilization, while the term conservation includes restoration, preservation and sustainable utilization. According to the *World Conservation Strategy* (IUCN: 1980) conservation is the management of human use of the biosphere so that it may yield the greatest sustainable benefits to present generations while maintaining its potential to meet the needs and aspirations of future generations.

It is once more unfortunate that conservation is still viewed as an imposition of unnecessary constraints upon the use of natural resources. South African Blacks and Whites had their notions of environmental concerns shaped by the forces of the past. The polarized nature of perceptions today is characterized by widespread black indifference to larger environmental issues.

The injustices perpetrated to the South African Blacks during the apartheid era, particularly those related to dispossession of land have had significant impact on the perception that they hold towards their environment.

Nevertheless, conservation of the natural resources remains central to the sustainable development of our country. Dilokong area is characterized by large scale deterioration of the natural landscape. Prevalent causes of deterioration are discussed below.

Incorrect ploughing methods and the occupation of steep and sensitive slopes exacerbate the problem. Soil erosion has already claimed some ploughing fields and grazing areas and is currently invading settlements (See Map 1 in Appendix 1). Figure 5 in Appendix 2 depicts settlements in a badland area. Some of the causes of soil erosion in Dilokong include poor land use practices like deforestation, overgrazing, etc. This definitely confirms the hypothesis that present land use practices in Dilokong have negative impacts on the natural environment.

The study showed that there is less involvement of the people of Dilokong in fighting soil erosion. Only 3% of the sample is involved in fighting it all the time, 50% sometimes and 36% not at all. The researcher observed that those who fight it plant sisal and use rubbish to cover the dongas caused by soil erosion. However, rubbish in the dongas end up in the river courses which become an obvious pollution source.

Nearly the total sample, which is 96%, indicated that there are no government soil conservation programmes in the area, while (4%) four percent indicated the availability of such programmes. As observed there are no programmes running at present except the soil reclamation project of Maandagshoek village. The project was initiated in 1987 by the Nature Conservation division of the former Lebowa homeland. Its success is a clear indication that it is possible to combat soil erosion and restore land to be useful again. Figure 6 Appendix 2 depicts the Soil Conservation Project of Maandagshoek.



The discussion above also shows that the government has failed to implement the *Environmental Conservation Act No.73 of 1989* and the *World Conservation Strategy of 1980*. This confirms the hypothesis that the present implementation of the government policies related to the natural environment and land use is ineffective.

The majority of the sample (40%) indicated that the relevant authorities are inefficient. The researcher assumed that the Department of Local Government and Traditional Affairs and all state departments charged with the responsibility of administering environmental functions fail to ensure the implementation of the environment and land use policies. Some (34%) think that lack of funds is the cause of government's non-involvement in conserving the soil while others (19%) indicated government apathy.

Discussions with local councillors have shown that their priority is provision of basic services. It is unfortunate that both processes are not seen as equally compelling. The provision of basic services will not be sustainable for as long as erosion is allowed to degrade the life sustaining land. In fact, the notion of sustainable development clearly requires that a balance be created between conservation and development – health, well-being and improvement in quality of life need both.

The effect of fire and the role it plays in forest ecology can be considered to vary along climatic gradients. The highly humid forests such as tropical and the temperate rainforests are virtually fire proof in their natural state. The extremely dry forest at the arid end of climatic gradients is dry enough to carry fire at any time.

The greater part of the Northern Province which includes Dilokong forms part of the Savanna grasslands. Savanna grassland are mostly maintained by natural veld fires or livestock farmers who maintain their grazing patches through controlled burning. This is an indication that veld fires are not always destructive, especially when controlled. Dilokong area experiences uncontrolled veld fires on yearly basis, especially during winter. This is confirmed by the 79% response to the question as to the kind of fire prevalent in Dilokong.

## 4.6. Pollution and Waste issues

### 4.6.1. Air pollution

Pollution is the introduction into the environment of any substance property that has or results in direct harmful effects to humanity or the environment, or that makes the environment less fit for its intended use (*White Paper on Integrated Pollution and Waste Management for South Africa: 1998*). According to the research findings, the study revealed that the majority (74%) of the respondents experience various kinds of pollution. Five percent experience air pollution, 32% land pollution, 6% water pollution, 16% both water and land, 1% air and water, 5% air and land, and 12% air pollution. In other words the most experienced pollution is that of land. There are various causes of air pollution mentioned by the respondents. The majority of the sample indicated mines as the cause of air pollution in Dilokong. The researcher observed the following causes of air pollution in Dilokong:

- (a) Dust problems from untarred roads in all of the entire villages is a significant air pollution problem.
- (b) Domestic fuel combustion from firewood and coal stoves which are used for cooking. The pollution from these sources is well above safety levels.
- (c) Vehicles which use leaded petrol.
- (d) Dilokong ferrochrome smelter mine.
- (e) Unrehabilitated asbestos mine dumps.

The following are significant deficiencies perceived in current air pollution control:

- Air pollution is not considered adequately in planning the placement of industrial and residential areas,
- Lack of prosecution of offenders, and
- Lack of transparency, especially from mines in air pollution control, ranging from the extent of emissions, through the width of implications of best practicable means, to the control strategies, planning input and monitoring of implementation.

Air pollution control should take account of the growing international concerns with the issue of climate change.

#### 4.6.2. Land pollution

- Littering

There are also various causes of land pollution. Littering is rated as the main cause of land pollution in Dilokong. Litter does not only make land ugly, but is unpleasant to look at. Lack of waste disposal sites as confirmed by the 95% response contributes a lot to the littering problem. Only 3% of the sample claimed to have a waste disposal site. Respondents mostly refer to borrow pits, which are used as dumping sites. There is no legalized waste disposal site in the TLC area. Figure 7 in Appendix 2 depicts a borrow pit that is used as a dumping site.

- Mine dumps

Sixty seven percent of the sample indicated that there are mine dumps in the area. Figure 8 Appendix 2 confirms the presence of unrehabilitated mine dumps in certain villages like Maroga, Penge and Maandagshoek. It was difficult for the respondents to determine the extent to which those mine dumps are impacting on their health conditions, as this needed a health expert. This is confirmed by the 77% of the non-respondents. Four percent indicated that these mine dumps are impacting to a lesser extent, 8% to some extent and 11% to a great extent.

Although there is legislation to control and manage the environment, it was only after the proclamation of the *Constitution of RSA Act, 1996 (Act 108, 1996)* that environmental rights were entrenched. Everyone has rights and obligations with regards to the environment and legal requirements to comply with Section 24 of the Bill of Rights. However so far, the department of Minerals and Energy has not done anything to ensure that all the existing mine dumps in Dilokong are rehabilitated.

#### 4.6.3. Water pollution

The majority of the sample indicated that littering causes water pollution. The researcher observed diffuse water pollution including pitlatrines, substitute toilets such as dongas and mountains, contamination from animal wastes and run-off from farmlands as the cause of water pollution in Dilokong.

Wash-off from inadequate sanitation with diseases-causing micro-organisms and parasites also causes water pollution. One should not forget that water is not treated in Dilokong. One would imagine the number of diseases related to water-problems like diarrhoea, typhoid, etc. treated at the local health institutions.

With this high percentage (67%) of the sample indicating the problem of waste in Dilokong with inadequate waste disposal sites and lack of waste removal systems, the need for integrated pollution and waste management in a holistic and integrated system is crucial. The process of management aimed at further pollution prevention and minimization at source is also crucial.

The need to manage the impact of pollution and waste on the receiving environment and to remedy the damaged environments is important. It is clear from the above interpretation that the past and the present government policies on land use and environment were and are not effectively implemented.

#### 4.7. Policy

“Environmental concerns can unite South Africa, going beyond racial, political and economic barriers. In addition to the crisis in education, housing, employment and a host of other problems, the new democracy will be left with apartheid’s environmental legacy. It is often poor communities that are the victims of the government’s weak environmental policies” (Mandela: 1993).

When the new democratic South African government was elected in April 1994, it had not only the enormous environmental toll of apartheid but also the challenge to mount a national programme of reconstruction and development, without doing further damage to the environment and natural resource base of the economy. The key challenge was to convince the economic and social planners of the new South Africa that the environment, as provider of natural resources and ultimate absorber of all waste, underwrites the viability of economic growth and social redistribution.

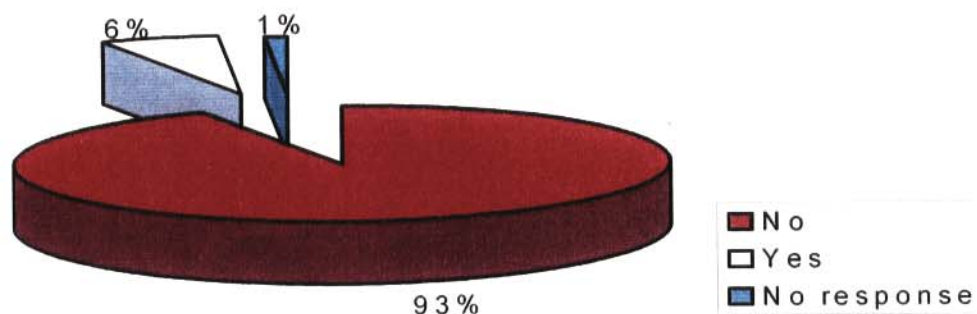
The environmental debt owed by society as a whole is always paid most by those least able to do so, the poor.

In this, environmental degradation is a visible expression on the land of the oppression of the minority by the majority. Apartheid policies robbed the South African people the integrity to exercise effective control in the use of natural resources. The policies of successive previous governments ensured that there was a skewed distribution of access to natural resources that favoured the minority. Under apartheid, economic development was not guided by concern for the sustainability of our natural resource base, but went full ahead without regard for the consequences for either human health or environmental health. That inheritance can be seen in the degraded homelands, the toxic waste and mine tailings, dumping sites, and the pollution hanging in the air above industrial communities.

The policies of segregation and control of people's movement ensured that black people were crowded into the former homelands with no alternative but to degrade their environment in their fight for survival. Deforestation, soil erosion and overpopulation all became the products of the homeland policies. The new provincial and local governments inherited much of the mammoth task of restoring the viability of the natural resource base to support the economic and social development of these devastated areas like Dilokong.

Nearly the total sample (93%) does not know any environmental policies, which regulate land development. Only 6% claim to know such policies which is relatively an insignificant percentage. Among the respondents who claimed to know some environmental policies, most of them mentioned irrelevant policies and organizations. Chart 12 below depicts that clearly.

**Chart 12. Knowledge of environmental policies regulating land development**





One of the gravest legacies of apartheid has been lack of public participation on environmental issues. Environmental legislation and enforcement has largely been put in place during a period when there was little involvement or interest in the process. With the recent growth of environmental awareness and consumer concern, inadequacies in the system are being brought to the fore.

South Africa is witnessing a growing number of environmental issues, such as asbestos mining in Mathabatha, Mafefe and Penge (some of Dilokong areas) which left residents with health problems. Key issues for public participation are now part of the public debate. In the old political order people were left outside.

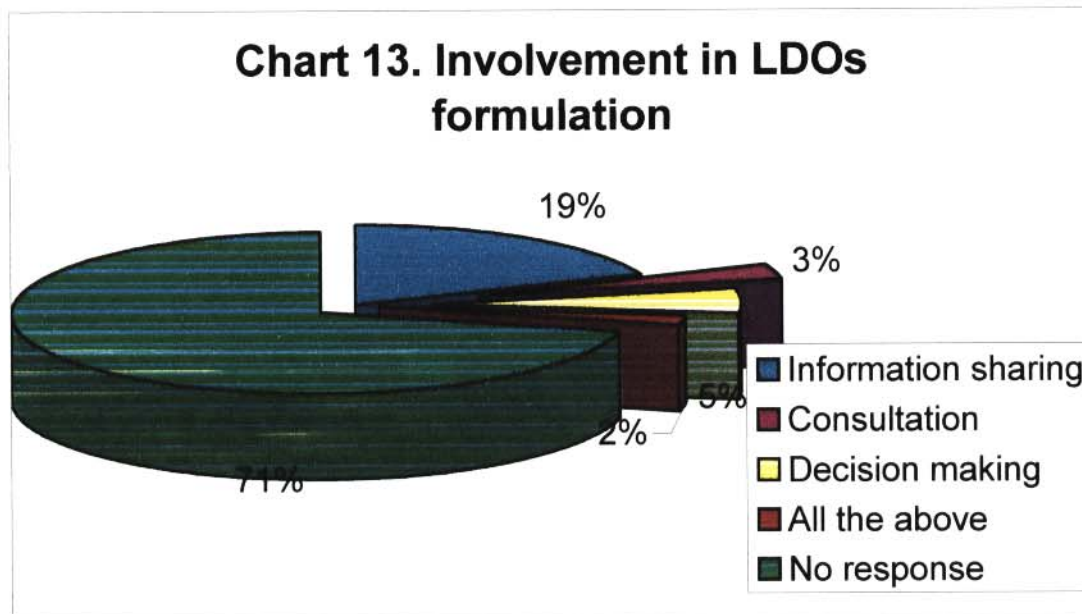
South African people in general and black people in particular were not part of decision-making and policy formulation processes. This was underpinned by laws of apartheid aimed at denying communities their rights to health, housing, water, sanitation and environment. The absence of a people-centered approach, paralleled by the lack of democratic and accountable institutions made it possible for local authorities, other governing agencies, homeland administrators, operating within the framework of "Grand Apartheid" to conduct their activities within impunity.

When key stakeholders were confronted with the question of community involvement they have argued in the past that such a process is slow moving, cumbersome and very expensive. This attitude underscores that there has been very little or no regard for the community.

Communities have been denied access to information. Civil society has played no role in primary health and environmental monitoring because of the high technology applied and the lack of information. These problems are exacerbated in the case of remote rural communities like Dilokong, which account for a large proportion of South Africa's poor. In the nature of things, they are scattered and isolated, poorly serviced and lacking information or political access.

*The Development Facilitation Act* No. 67 of 1995 (DFA) was the first national planning legislation promulgated after the first democratic elections in 1994. It was passed to begin the process of transforming planning to meet the needs of the new democracy. The Land Development Objectives concept was introduced in addition to DFA principles. LDO plans are approved by political decision-makers that set their objectives and targets for development in consultation with the public. These inform the spatial and development imperatives of an area.

Twenty seven percent of the sample got involved in the formulation of the LDOs for Dilokong, whilst 70% of the respondents did not respond. The latter response clearly indicates a serious lack of participation as well as information about the LDOs of Dilokong. Those who claim to have been involved, 19% of them were involved at information sharing level, 2% at the consultation level whereas only 3% claimed involvement at all the levels. Seventy one percent did not indicate their level of involvement as shown in Chart 13 below.

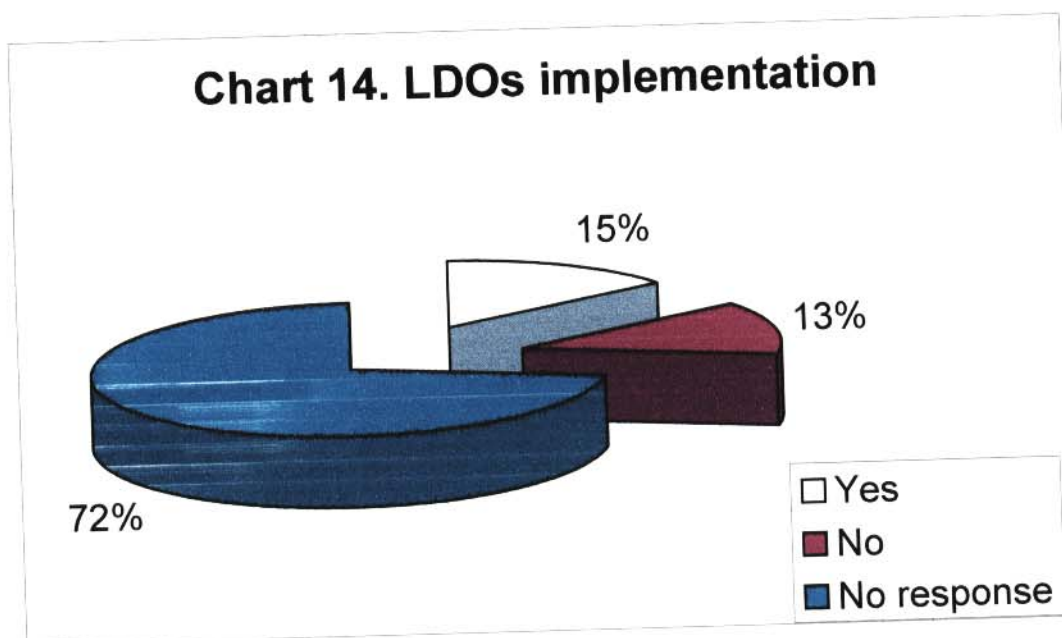


The high percentage of non-response to the question on the level of involvement cast serious doubts about the understanding of LDOs by the respondents. This indicates that respondents who did not participate in the LDOs are more than the predicted 70%. This also indicates that the people of Dilokong are still denied access to information and participation in policy issues even in this democratic government.

From the discussion above, the researcher also concluded that no attention is paid to the role of women in Dilokong society. Women should be involved in decision-making about services and the environment. However, there are still barriers of a traditionally patriarchal society and strong cultural barriers that have to be overcome. Much of the burden placed on the woman should be relieved such that they can find time for personal development of the family unit.

Dilokong women spend long hours searching for wood and water carrying, to the detriment of their personal health. In addition women, shoulder the responsibility for family health care, household hygiene and food preparation. They are therefore key to reconstruction and development of Dilokong.

Out of those who were involved in the formulation of LDOs, 13% of them do not know about its implementation in their area, whilst 15% claim that they are implemented in place as shown in Chart 14 below. The 72% no response is an indication of lack of information about LDOs and its implementation.



The DFA divides the subject matter of LDO into four main areas, namely:

- The objectives relating to development strategies.
- Objectives relating to targets.
- Objectives relating to rural and urban growth.

- Objectives relating to services.

It is highly important to note, however, that the LDO reports compiled in nearly all TLCs in the Northern Province were not approved.

*The researcher's opinion on studied policies*

South Africa's economy, society and environment have been shaped by centuries of colonial rule, which culminated in the apartheid system. This had enormous negative impacts on the interaction between people and the new environment, particularly for those denied citizenship rights and in many cases was forced to live in degraded environments.

Apartheid laws and policies pertaining to environmental issues were stereotyped and only confined to "nature conservation". This nature conservation gave an impression that nature should be fenced off, be inviolable and untouchable. These unjust and partisan laws and policies were enforced by trained rangers and game guards who were indiscriminately shooting without warning or explanation.

The fragmentation of the country into homelands and independent states that had their parliaments further exacerbated the situation because their approach was that of denying people access to natural resources. International conventions and treaties were ignored and discarded because of the apparent kingdom of apartheid they created. Some legislated environmental laws, which were never enforced, include the following:

- (a) *Atmospheric Pollution Prevention Act No. 45 of 1965.*
- (b) *Conservation of Agricultural Resource Act No 63 of 1983.*
- (c) *Physical Planning Act No.125 of 1991.*
- (d) *Forest Act No. 122 of 1984.*
- (e) *Water Act No. 544 of 1956.*
- (f) *Hazardous Substance Act No. 15 of 1973.*
- (g) *Environmental Conservation Act No. 73 of 1989.*



The majority of the population was excluded from decision-making on the use and allocation of resources and services. Nature conservation areas were developed at the expense of local communities. The system led to the forced removals and exclusion of communities from the management and benefits of conservation. Secrecy, lack of access to education, lack of participation in decision-making and lack of access to information by citizen characterized the apartheid years. These impacted particularly harshly on poor communities with few social rights and little access to legal procedures to protect their environment.

The new democratic government realized that the process of democratization and establishment of good governance can only be guaranteed if it is based on a sound socio-economic framework that is environmentally sustainable. It is also realized that a resolution of the “land problem” is a prerequisite for sustainable development in South Africa. Now some policies and laws have been legislated since 1994, which can be seen as a base for environmentally sustainable development. The researcher read land-use and environment-related policies that are discussed below. In the next section I would like to give an overview and assessment of this legislation with a view to determine whether they provide a viable framework to overcome the problems sketched above. This, however, should be read against the background of the environmental problems created by the former Homelands Acts.

**(i) Former Homelands Acts (The Black Land Act No. 27 of 1913 and the Land Act No. 18 of 1936)**

Land, and the manipulation of access to land resources, has been the key area of political conflicts in South African Governments. The 1997 land reform policy that is currently underway to resolve political disputes around land, is the key issue for future sustainability of the land resource base of Dilokong, that is the prevention of the further degradation on land and soil quality. There is no doubt that the future wealth and health of the country is dependent on how its most important natural base is cared for by the present generation.

However, the history of land management has been characterized both during the colonial period and the more recent apartheid period, by the alienation of land from the majority of the people. The management of land is also characterized by private ownership of mineral rights. The previous tenure systems have favored the white minority. Women, although the major agricultural-producers, have had little access to land.

Shortage of land as a result of apartheid legislation such as the 1913 *Land Act*, exacerbated lack of access to extension services, credit and markets and has caused low agricultural outputs by many black farmers. It has also resulted in overgrazing, erosion, and topsoil loss, leading to impoverishment, health and nutrition problems and furthermore, the problem of landlessness has forced rural people onto marginal land in an attempt to survive. This has caused severe degradation of Dilokong land.

Landlessness, and the resulting overcrowding and overgrazing, as well as inappropriate farming methods on subsistence farms have given rise to severe land degradation and soil erosion in Dilokong. In particular Dilokong's clay soil is poor and easily erodable, so that it is very sensitive to mismanagement.

There is strong evidence that soils are deteriorating rapidly due to poor management practice and lack of adequate monitoring and enforcement. The most serious threat to land resources is soil erosion. Dilokong soils are by nature fragile, and human activity has had a great impact on this fragility, and can cause irreparable damage to limited and valuable soils, especially agricultural soils.

#### **(ii) Development Facilitation Act (DFA) No. 67 of 1995**

The **DFA** introduces measures to facilitate and expedite land development projects. It aims to overcome bottlenecks in existing regulations to accelerate land development. The Act has the potential to usher in a new era of principle-led planning.

The following general principles relating to land development have been formulated to promote efficient and integrated land development:



- Policy, administrative practice and laws should provide for urban- and rural land development and facilitate the development of formal and informal, old and new settlements.
- Policy, administrative practice and laws should discourage the illegal occupation of land, with due recognition of informal land processes.
- Policy, administrative practice and laws should promote efficient and integrated land development.
- Communities affected by land development should actively participate in the planning process.
- The skills and capacities of disadvantaged persons involved in land development should be developed.
- Policy, administrative practice and laws should encourage and optimize the contributions of all sectors of the economy as to maximize the capacity to undertake land development.
- Laws, procedures and administrative practice should be clear, generally available, provide guidance and information to those affected, promote trust and acceptance and give further content to the fundamental rights set out in the Constitution.
- Policy administrative practice and laws should promote speedy land development.
- Each proposed land development should be judged on its merits and no particular land-use should in advance or in general be regarded as being less important or desirable than any other are.
- Land development should result in security of tenure, provide for the widest possible range of tenure, and provide for the widest possible range of tenure alternatives, including individual and communal tenure.
- A competent authority at national, provincial and local government level should coordinate the interests of the various sectors involved.
- Policy, administrative practices and laws should stimulate the functioning of a land development market.

A key innovation in this Act is a provision for “staged” tenure. This allows tenure security to be provided at an early stage in the land development process. The **DLA** makes provision for the formulation of LDOs, at local government level. LDOs are important tools to guide land development decisions with reference to goals to development in a particular area as well as with regard to the availability of resources in the area. The process of setting LDOs, should be harmonized with the Integrated Development Plan (IDP), required in local government legislation.

The implementation of this Act in Dilokong could be a solution to raised issues raised concerning the administration of appropriate land-use planning and controls systems for its rural village, though the process might be achieved only in the longer term.

### **(iii) White Paper on South Africa’s Land Policy of 1997**

This policy read be read in conjunction with the *Constitution of RSA* of 1996, because there are other constitutional issues affecting land policy, including the allocation of powers and responsibilities to administer land and promote land reform. The purpose of this policy is to build reconciliation and stability and to contribute to economic growth and to bolster household welfare.

The White Paper on Land Policy also intends to deal with the following issues:

- ◆ The injustices of racially-based land dispossession
- ◆ The inequitable distribution of land ownership
- ◆ The need for security of tenure for all
- ◆ The need for sustainable use of land
- ◆ The use for rapid release of land for development
- ◆ The need to record and register all rights in property; and
- ◆ The need to administer public land in an effective manner.

The White Paper on Land Policy provides three land reform programmes and are discussed as follows:

(a) Land redistribution programme

The purpose of this programme is to provide the poor with land for residential and productive purposes in order to secure their livelihood.

(b) Land restitution programme

Its purpose is to restore land, and provide other remedies to people dispossessed by racially discriminatory legislation and practice.

(c) Land tenure reform programme

The purpose of this programme is to address difficult problems created in the past. The solutions to these problems entail new systems of land holding, land rights and forms of ownership.

The above mentioned land reform programmes are not yet implemented in Dilokong. The researcher believes that land restitution and land tenure reform programmes are relevant to Dilokong's present situation because there are people who claim to have been dispossessed of their land. Most of the residents do not possess any land rights or any form of land ownership. It is, therefore, highly important to investigate tenure reform in Dilokong.

Even the Constitution of South Africa guarantees that a person whose tenure of land is legally insecure as a result of past racially discriminatory laws or practices is entitled to the extent provided by an Act of Parliament, either to tenure which is legally secure, or to comparable redress.

#### **(iv) Integrated Environmental Management**

Landlessness and overcrowding in the former homeland areas including Dilokong and inappropriate farming methods have given rise to severe land degradation and soil erosion. Although there is a lack of data on the extent and rate of land degradation, there is sufficient evidence that South African soils including the clay soils, of Dilokong, have been deteriorating rapidly due to poor management practice and inadequate monitoring and enforcement. There is severe risk of increased environmental degradation if preventative and improved resource management measures do not accompany the land reform program and land development in general.

Responsibility for natural resource management is spread over different national and provincial ministries; each carrying out their jurisdictions as specified by the specific Acts. This means that the institutional framework, as well as the legal system generally failed to facilitate integrated approaches to land use, including the protection of the natural environment.

*The Physical Planning Act No. 125 of 1991, the Environmental Conservation Act No. 73 of 1987 and the Conservation of Agricultural Resources Act No. 43 of 1983* assume integration of Environmental Management in land use planning. However, at the administrative level, environmental management practices remain sectoral and fragmented.

#### **(v) Environmental Conservation Act No. 73 of 1989**

The main purpose of this Act is to conserve the environment. This Act consists of many sections which deal with different issues and for more relevance of this study, the researcher concentrated more on the amendments which were effected from 05 September 1997 which include the following:

- (a) Section 21: the identification of the activities that may have a substantial detrimental effect on the environment.
- (b) Section 22: designation of a competent authority who may issue authorization for the undertaking of identified activities.
- (c) Section 26: Environmental Impact Assessment Reports.

The above-mentioned sections are very good to conserve the environment but little has been implemented since their proclamation. This could be as a result of lack of capacity of the relevant authority and lack of muscles to enforce them. It is also shameful to realize that there are some government departments which do not undertake Environmental Impact Assessments (EIA) before development projects.

#### **(vi) The Constitution of the Republic of South Africa Act No. 108 of 1996**

Section 24 of the Bill of Rights outlines the following issues that are related to the environment:

Every one has the right to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that-

- Prevent pollution and ecological degradation
- Promote conservation, and
- Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

There is no way in which the risk of land degradation can be minimized if there are no programs to alleviate poverty in Dilokong area. The worst environmental health conditions and natural resource degradation occurs around informal settlements, where people have few assets and minimal control over the surroundings.

#### **(vii) The National Environmental Management Act No. 107 of 1998**

This Act provides for co-operative environmental governance by establishing the principal for decision making on matters affecting the environment, institutions that will promote co-operative procedures for co-ordinating environmental functions exercised by organs of the state, and to provide for matters connected therewith.

Section 32 of the Act which is about the legal standing to enforce environmental laws states that:

*Any person or group of persons may seek appropriate relief in respect of any breach or threatened breach of any provision of this Act, including sections contained in chapter 1, or any other statutory provision concerned with the protection of the environment or use of natural resources.*

One way of implementing section 32 of the Act in Dilokong is to establish or join environmental organizations and forums to enable them to participate in raising environmental problems and contribute to the dissemination of information.

#### **(viii) White Paper on Minerals and Mining Policy for South Africa 1998**

Chapter 4 of the White Paper is about environmental management. The intent of this policy is that government, as the custodian of the nation's natural resources should ensure that the essential development of the country's mineral resources will take place within a framework of sustainable development and in accordance with national environmental policy, norms and standards. Some of the issues raised in the policy which are more relevant to the study area include the following:

- (a) Government has to ensure that the costs of environmental impacts of the mining industry are not passed over to the community and this calls for:
  - A co-ordinated and integrated environmental management approach to the planning, management and use of all natural resources.
  - An increased public involvement to ensure proactive and informed decision-making.
  - The implementation of effective and affordable measures and standards for environmental impact management, the prevention or efficient management of water, soil and atmospheric pollution, and the rehabilitation of areas affected by past mining operations.
- (b) The rehabilitation of defunct and derelict mines which are a risk to the environment; public safety and human health should be provided for by appropriate regulation.



- (c) Equitable and effective consultation with interested and affected parties will be undertaken proactively to ensure public participation in the decision-making process and the Audi alteram partem (hear the other side) rule shall apply to all decision making.
- (d) Mining companies will be required to comply with the Local Development Objectives, Spatial Development Framework and Integrated Development Planning of the municipalities within which they operate.
- (e) The ‘polluter-pays’ principle will be applied in the regulation and enforcement of environmental management. Where for reasons such as the demise or incapacity of a mining entrepreneur, no responsible person exists or can be identified to address pollution emanating from past mining operations; the state may accept responsibility or co-responsibility for the rehabilitation required.

The ‘polluter-pays’ principle gives a solution to the problem of the unrehabilitated mines of Dilokong. The South African government is having the best environmental laws, which are clear and appropriate on many aspects of the environment. Furthermore, South Africa has already ratified a considerable number of international treaties and conventions. Environmental laws are not only considered good when embalmed in statutory books, but when they are implemented.

The Northern Province, especially Dilokong TLC is facing a problem of not implementing the environmental laws of South Africa and this situation might deprive the future generations of resources. Since the TLC of Dilokong lacks capacity on identifying and addressing environmental issues, capacity building in this regard should receive serious attention.

#### 4. 8. Conclusion

In this chapter, the interpretation of the findings was done against the background of the original research problem. The researcher interpreted the recorded and observed data. Existing relevant legislative frameworks were also discussed. Hypothesis testing and conclusions were done on the basis of data or evidence that provided sufficient and relevant grounds for those conclusions.

All the formulated hypotheses were found to be true. The research questions raised in chapter 1 were also answered when interpreting and discussing the research findings. My conclusion and recommendations based on both the empirical and theoretical data will be discussed in the next chapter.

# CHAPTER 5

## CONCLUSION AND RECOMMENDATIONS

### 5.1. Introduction

This last chapter attempts to consolidate and collate the information gathered throughout the research process to inform a sustainable land use and natural resource management strategy for Dilokong. The research has managed to project the land-use practices and natural resources utilization in this area together with their related impacts on the natural environment.

Land use practices are considered as primary impactors as proven by the research, whilst natural resources utilization is considered to have some secondary impacts. The main land-use practices identified include settlement, agriculture and mining. Tourism has been observed as a possible land-use.

### 5.2. Land use aspects and their impacts

A summary of land-use aspects and their related impacts is given below.

#### *5.2.1. Housing settlements*

There is a shortage of planned and serviced sites for housing and inadequate support for housing construction in the area. Housing settlements in the area take place in a haphazard way. Village expansion is no longer possible in most villages. Housing settlements are already encroaching on the ploughing fields. The research has identified the following environmental impacts related to housing settlements:

- There is no harvesting of water from rooftops. This leads to an increased run-off which culminates in unacceptable soil loss rates.
- Lack of housing infrastructure shows that there is no channelling of water, which results in rivulets within the village during rainy seasons. Roads are eroded away each time it rains.

- Housing units which have encroached on the agricultural land, caused more damage because such soils are exposed and fragile.
- The land which surround the villages is deteriorating at a faster pace. Badland and dongas characterize most of the villages. Figure 14 in Appendix 2 shows the proximity of dongas to houses, which poses serious safety risks.

### 5.2.2. *Crop farming*

Crop farming is mostly dependent on the fertility of the soil and the availability of water. Dilokong area is still practicing subsistence crop farming. Soils are not fertilized. Crops are only cultivated during the wet seasons which is relatively a short period. The land is left to wallowing throughout the year. Exposure of soil leads to destruction of soil structures and composition that leads to exacerbated soil loss trends.

Poor ploughing methods as confirmed in the previous discussions worsen the soil erosion rate. Though soils may appear sterile and boring, they form the fundamental base of life-sustaining systems. The process of soil formation is very slow. More usually, when new soils are formed from parent rocks, one centimeter might need from 100 years to form (Gaie: 1985). Unfortunately, it is not quick enough to reverse the process caused by human or natural disturbance. Soils can be degraded in a fraction of the time they take to form.

The soil loss trend in Dilokong has already deprived some families ploughing fields as it is turned into bad land. If the present trend of soil loss in the ploughing fields is not capped, subsistence crop farming will be declared history.

### 5.2.3. *Livestock farming*

The research results have shown that livestock farming is deteriorating. The total number of people against those who own livestock is very low. Subsistence livestock farming is currently the backbone of agriculture. Animals are only fit for the market during wet seasons. Mortality rate is very high during winter because the owners could not afford animal feeds for drought relief.

Subsistence stock farm does not improve the local economies because livestock is not taken to the market. Overgrazing is observed throughout the flat plateaus. Due to this, soil erosion and bush encroachment have taken over the place of the palatable sweet grasses, which supported stock farming before. Figure 10 in Appendix 2 depicts overgrazing which is succeeded by bush encroachment.

#### *5.2.4. Mining*

Mining is an important economic activity in Dilokong area. Apart from labour wages, little of the income generated from mineral extraction and processing flows into the local economy. Dilokong has two mineral belts running through it, that is the UG2 and the Marensky Reef. There are several mines exploiting Chromatite and Platinum. As observed, there is no infrastructure for the employees of the mines.

Mining activities impact on the environment to varying degrees. Three important aspects identified by the researcher include the following:

- (a) The environmental impacts of exploration
- (b) Environmental impacts during the life span of the mine, and
- (c) Rehabilitation after decommission and monitoring.

Most of the scaded mining operations are still not rehabilitated. Erosion from slime dams already affected most ploughing fields. Visual impact is prevalent throughout Dilokong. Mines use a lot of water in their daily activities. In Dilokong, boreholes are sources of water supply. Several communities have already complained of their diminishing water tables, especially in winter. However, as we have seen, water pollution has not been raised much as a problem amongst the respondents to this research.

### 5.2.5. *Tourism*

Tourism in many developing countries has heightened local awareness about the importance of their natural resources and cultural heritage. Presently there are no private provincial nature reserves in the area of Dilokong, or even commercially operated resorts within the area. An overview of the sector, however, indicates that the tourism potential of Dilokong is high and should be seriously considered. Employment, while not the main goal of all tourism development is one of its main achievements.

Tourism can help the mining ventures in absorbing the unemployed cadres. The following are identified as tourism attraction sites:

- The Sekhukhune Battle site and Djate caves have serious potential because of the national significance of their historical and cultural profiles. They should be declared as national monuments. The battle between the British soldiers under Shepstone and the Bapedi Tribe under Sekhukhune I in 1879 took place in this area. The Leolo mountains also provide a scenic view and hiking trails could be established.
- The proposed damming of the Olifants River to provide water to the Dilokong Corridor could attract water-loving tourists.
- Cultural tourism could be encouraged through the erection of a cultural center for the Bapedi people.

Tourism has a potential of changing the attitudes of people towards the environment. A sustainable tourism industry thrives well in sustainable natural environment. Employed people do not impact much on the environment as they have options. Tourism development could enhance the current deteriorating state of the environment in the Dilokong area.



### 5.3. Natural resource utilization

It has already been discussed in the introductory part of the conclusion that natural resource utilization is a critical area that is inseparable from land-use. Natural resources have been there ever since to quash man's needs. However, the rate at which they are currently exploited is alarming. The resources that sustain life are already reaching breaking points. Dilokong area is no exceptional to this crisis. The natural resources identified are water, indigenous forests and wild animals.

#### 5.3.1. *Water*

South Africa is a water-scarce country and the management of water resources in the national interest is a key policy for underwriting future economic and social development. South Africa is prone to droughts that can last for several years in a row. This situation is also prevailing in Dilokong. In Dilokong, ground-water supplies are very limited so that rivers are the most important sources of water. Rivers that used to flow perennial are now seasonal due to the destroyed catchment areas and soiled rivers by erosion.

Over-utilization of groundwater has a direct impact on the hydrology of the area. Most communities already travel a kilometer to fetch water, while others buy it. Catchment management and water conservation are critical issues that warrant immediate attention. The challenge facing Dilokong is the provision of water to the envisaged development together with its increasing population.

#### 5.3.2 *Indigenous forest*

Indigenous forests have been destroyed to give way to settlement and agricultural developments during the past 100 years. The need of wood for cooking purposes has increased with the increasing population. Figure 11 in Appendix 2 depicts the need for wood.

While the use of wood is justifiable especially when used by the poverty-stricken communities, the current trend is unacceptable as more trees are depleted. Veld fires are indiscriminately used to get access into deep forests. Virgin forests are also destroyed, resulting in unacceptable loss of fertile soils by erosion. There are already small-scale entrepreneurs who solely depend on wood selling for their human survival. To protect the large-scale exploitation of the virgin forests, job creation becomes a priority.

### 5.3.3. *Wild animals*

Throughout history, wild creatures have been hunted for food, hides and other products. This was not done in a proper manner such that there is a regrettably long list of species that have been over-hunted. The Kudus, Impalas, Leopards, Steenbucks and reptiles of Dilokong are now history. Hunting by burning the veld has exacerbated the situation by destroying habitats. Today existing wild animals in Dilokong are baboons, monkeys, and a few jackals and rabbits. Over-hunting of the last few species left is a cause of concern because the present and the future generations will have to pay a lot of money to see them in zoos and national parks.

## 5.4 Land use practice versus Environmental Management

This research project has clearly indicated that the past and current land-use practices have serious negative impacts on the natural environment and the first hypothesis formulated in Chapter 1 is proven to be true. Blame has been apportioned to past white regime with its deliberate secretive and segregative laws that were based on self-interest. As a result the black people of this country with their environment have suffered dismally.

Major conflicts surround the unequal distribution of land that informed the undesirable land-use patterns today. Much have been done by the forced removals of blacks from lands to which they had cultural and social ties. They also had their own way of protecting their natural resources and the environment.

Lack of land-use planning has been identified by the research as the primary cause of all the social and environmental problems in Dilokong. Policies associated with land-use planning did exist in the past and lack of their implementation has contributed to the current problems that have the potential to impact on the future generation. The dawn of a democratic government has brought some hope to the economic, social and environmental ills of the country.

*The Constitution of the Republic of South Africa Act, 1996* (Act No. 108 of 1996) supports cooperative governance and integration between and within the three spheres of government, namely: national, provincial, and local governments. This means that spatial planning needs to occur at all spheres of government.

The spatial plans at local government's level should be located within the Integrated Development Planning (IDP) model. Local government of Dilokong is expected to produce an IDP, as required by the *Local Government Transitional Act, 1996* (Act No. 97 of 1996).

The Land Development Objectives as required by the *Development Facilitation Act, 1995* (Act No. 67 of 1995) should form part of the IDP. Under the new constitution of South Africa, local government has a new expanded role to play. In addition to providing many of the traditional municipality's services such as ensuring water provision and refuse collection, the Transitional Local Council (TLC) now leads and manages development.

Their task together with the national and provincial governments is to eradicate poverty, boost local economic development and create jobs, and carry forward the process of reconstruction and development.

Planning and management of development should combine all the important aspects of development namely: social, economic, environmental, ethical, infrastructural and spatial. These should be done on a short, medium and long terms. To achieve all these, the TLC should mobilize the participation, commitment, and energies of residents and stakeholders by establishing participatory processes, which are constructive and effective. These are the people who hold indigenous information and hard tactics about social, economic and environmental issues.

It is however, unfortunate that the IDP does not consider strategic environmental management as a requirement of IDP process. The TLC with no environmental capacity will always ignore environmental issues as they are traditionally not being seen as central to development.

The above is disputed by the Integrated Environmental Management (IEM) as required by the *National Environmental Management Act (NEMA)* No. 107 of 1998. IEM promotes the application of appropriate environmental tools in order to ensure the integrated management of activities.

The general objective of Integrated Environmental Management is as follows:

- (a) promote the integration of the principles of environmental management set out in section 2 of *NEMA* into the making of all decisions which may have a significant effect on the environment;
- (b) identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimizing negative impacts, maximizing benefits, and promoting compliance with the principles of environmental management set out in section 2 of *NEMA*;
- (c) ensure that the effects of activities on the environment receive adequate consideration before actions are taken in connection with them;
- (d) ensure adequate and appropriate opportunity for public participation in decisions that may affect the environment;
- (e) ensure the consideration of environmental attributes in management and decision-making which may have a significant effect on the environment; and



(f) identify and employ the modes of environmental management best suited to ensuring that a particular activity is pursued in accordance with the principles of environmental management set out in section 2 of *NEMA*.

*The Constitution of the Republic of South Africa Act No. 108 of 1996*, section 24 of the Bill of Rights outlines the following issues related to the environment:

- (a) Everyone has the right to an environment that is not harmful to their health or well-being; and
- (b) Everyone has the right to have environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:
  - (i) prevent pollution ecological degradation;
  - (ii) promote conservation; and
  - (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

This means that the environment and people are protected by laws hence every planning or decision-making process should incorporate environmental issues. There is consensus between policies of development planning and environmental governance. All the above-mentioned laws and other related ones are good enough to conserve the environment, but little has been implemented since their proclamation, especially in Dilokong area.

This has been the result of lack of capacity of the relevant authorities and lack of muscles to enforce the laws. It should be noted that laws are only good when they are enforced; otherwise they will fail like the previous ones.

#### 5.5. Recommendations

The completion of the demarcations of the Local Authorities boundaries is critical to ensure that there is efficiency and effectiveness in managing and implementing development plans. In light of the above research findings and discussions, it is hoped that the following recommendations could help ramify the disparate situation and contribute towards the improvement of the development process of Dilokong:

5.5.1. A Tenure Reform Investigation be implemented with the following as brief:

- to identify the land administration tenure needs, issues and concerns of Dilokong people.
- to assist role players in evaluating and selecting options.
- to assist role players in compiling a work program and securing funding for the implementation of an appropriate land administration and tenure system.

5.5.2. Macro-Spatial Framework be planned in a greater detail to serve as a plan for the designation of land-uses in the area (infrastructure, residential, social, businesses, etc.).

5.5.3. The principles of the *Development Facilitation Act* No. 67 of 1995, chapter 1, Section 2 (a) should be applied to any form of planning affecting land development initiatives.

5.5.4. Government should use both economic and legal instruments to ensure that land as a resource is protected from further degradation in Dilokong.

5.5.5. Integrated Environmental Management-type procedures should be incorporated into all land-use planning and interdepartmental structures should be established to enable integrated land-use planning with national, provincial, and local governments.

5.5. 6. The LDO report should be reviewed to ensure that they really inform sustainable development of the area.

5.5.7. Establishment of participatory processes in all environmental and developmental issues are critical.

5.5.8. An Integrated Development Plan that centralizes environmental management of development activities should be developed.

5.5.9. Proper cultivation methods should be taught to Dilokong farmers.

5.5.10. A special forestry body in government should look after indigenous forests.

5.5.11. Government soil conservation programme(s) should be established as a matter of urgency.

5.5.12. The “polluter-pays” principle should be used to ensure that mines do less damage to the environment.



- 5.5.13. The local government together with the Department of Minerals and Energy Affairs should ensure that the existing mine dumps are rehabilitated.
- 5.5.14. The operating mines should contribute to the infrastructural development of Dilokong.
- 5.5.15. Water Services Development Plan for Dilokong be developed, as provided in the *Water Services Act No. 108 of 1997*. The plan should address both the provision of potable water to villages and the proper operation and maintenance of existing water supply systems.
- 5.5.16. The program of erecting environment-friendly toilets by the Department of Water Affairs be speeded up at an affordable cost.
- 5.5.17 The local government should ensure that poor families and rural businesses get electricity or other kinds of clean energy.
- 5.5.18. It should also find ways to get the communities to recycle rubbish.
- 5.5.19. Eco-tourism should be explored to develop local economy.
- 5.5.20. Traditional knowledge about the environment and natural resources should be respected and recorded.
- 5.5.21. Local government officials should be capacitated to understand environmental problems.
- 5.5.22. Public awareness of the issues surrounding the need to sustain land resources and land productivity should be part of a major popular environmental education initiative.
- 5.5.23. A further research should be undertaken to establish the extent, duration and magnitude of environmental impacts.
- 5.5.24. Programs aimed at alleviating poverty should be established.

## 5. 6. Concluding remarks

The researcher strongly believes that all the research objectives were achieved and all the research questions were thoroughly answered. The study will be helpful to Dilokong TLC, other relevant government departments and other interested parties by providing them information about the status of land-uses and its impacts on the natural environment. It will also help Dilokong TLC to understand the challenges facing them on the implementation of their environmental functions.

The study is not an end in itself, but it is intended to provoke the thought and stimulate dialogue on land-use challenges facing Dilokong community. This status quo report, though comprehensive, is not a complete collection of all information. It focuses on key issues that affect the development of the area.

The challenge facing the near future demarcated Dilokong TLC boundaries is to locate environmental issues central to all their planning. The review of the LDOs report should accommodate environmental issues that were left out.

Though it is acknowledged that environmental management capacity is still lacking in the provincial and national departments, it is imperative to build this capacity also at local level as they directly impact on the rural areas. Mass environmental literacy programmes are critical to implement, to ensure that the ordinary citizens' environmental rights are protected.

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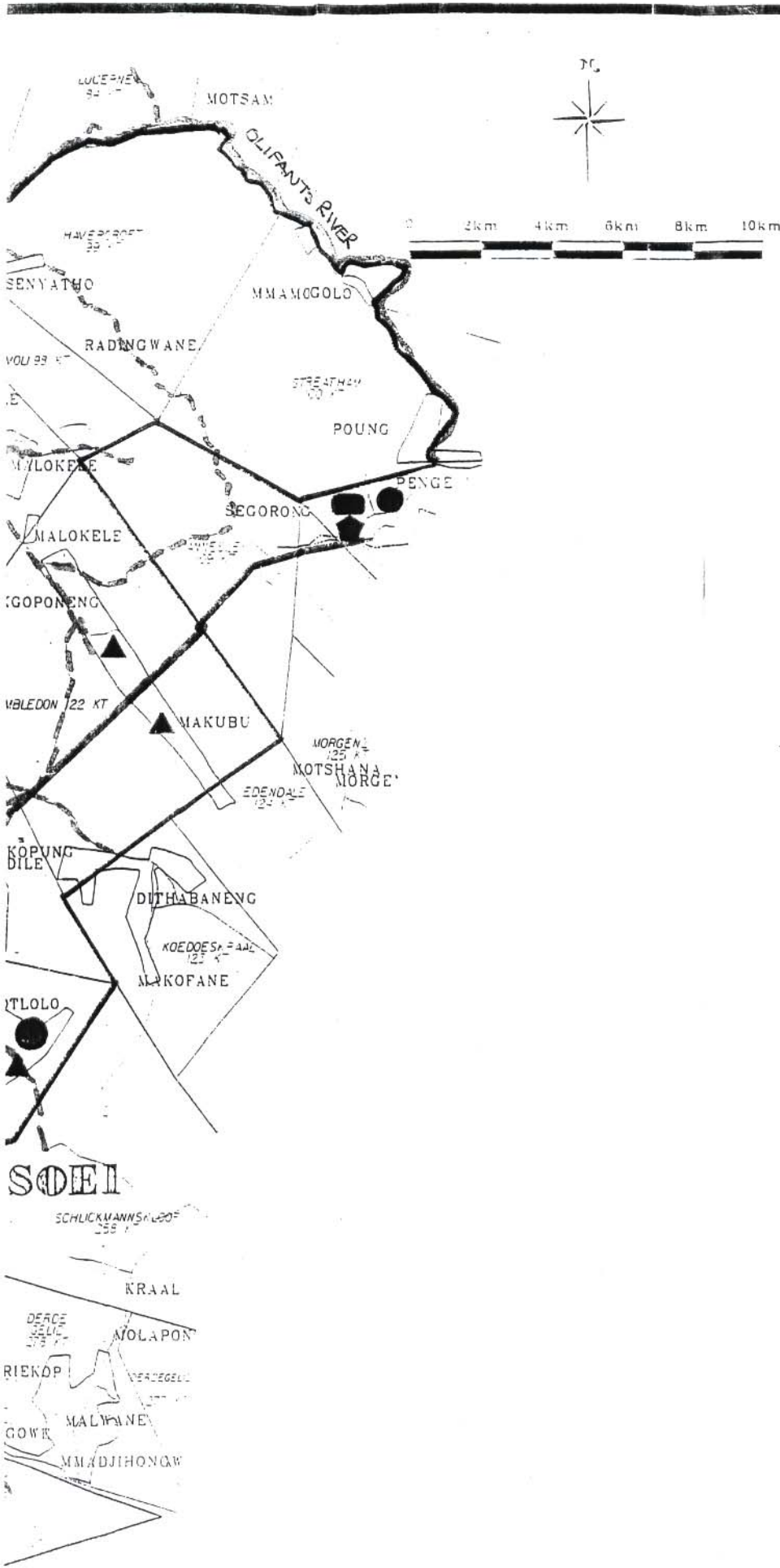
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## DECLARATION

I hereby declare that the research on the Impacts of rural land use on the natural environment in Dilokong district was solely conducted by me and all references mentioned were perused.

## APPENDIX 1: MAPS OF THE AREA





# SOUTHERN DISTRICT NORTHERN PROVINCE

## RURAL COUNCIL DILOKONG

INFRASTRUCTURE	MAP
	2

VILLAGES	
MAIN ROAD: P33-2 (R37)	—————
EARTH ROADS	□ □ □ □
POWER LINES	—————
RAILWAY	—————
CLINICS	●
POLICE STATION	△
SCHOOLS	▲
POST OFFICE	■





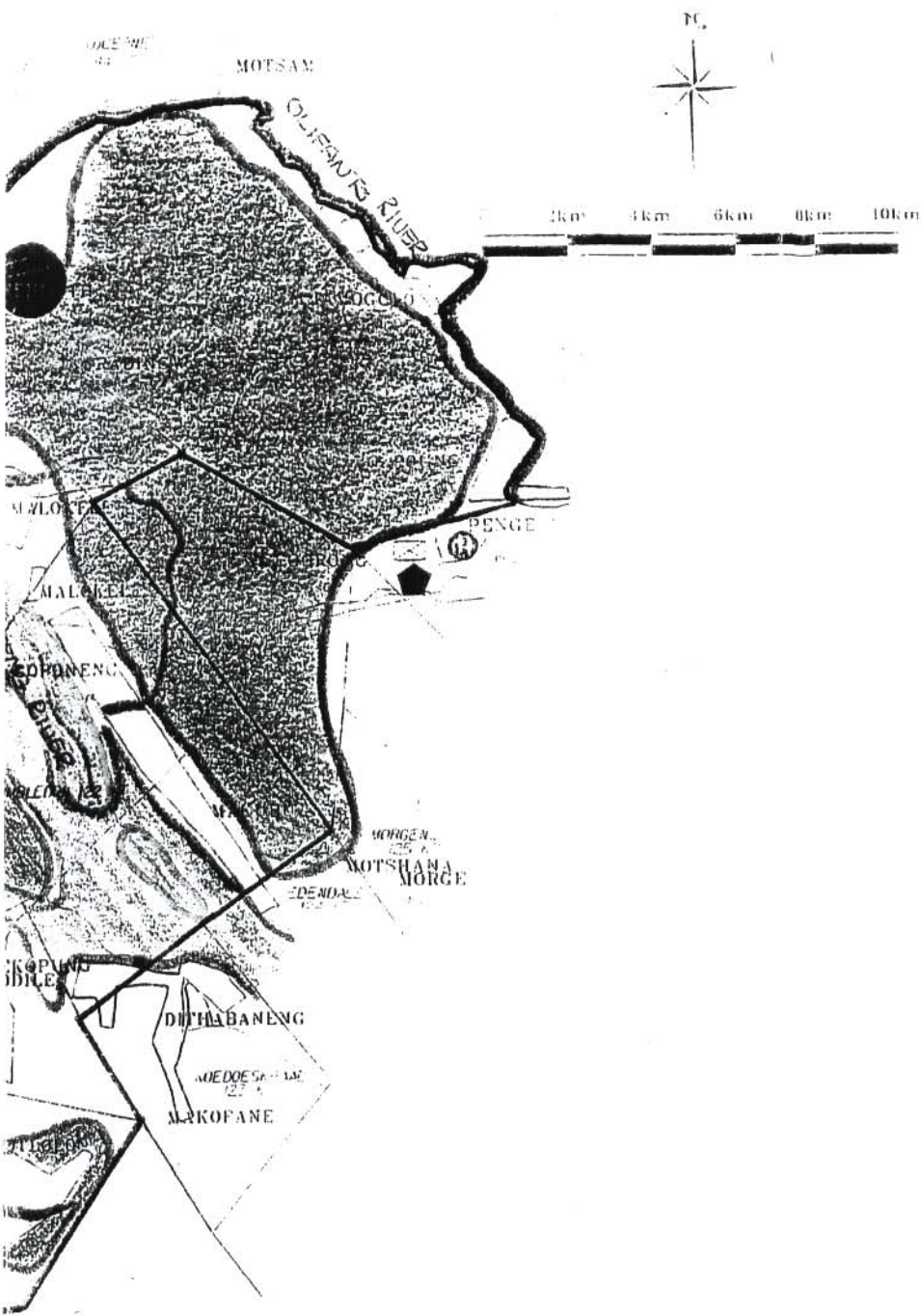


# SOUTHERN DISTRICT

## NORTHERN PROVINCE

### RURAL COUNCIL

#### DILOKONG

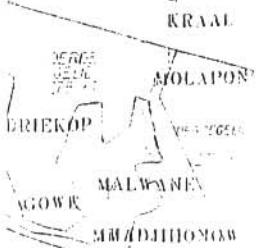


NATURAL ENVIRONMENT AND LAND USE	MAP
	1

VILLAGES	
EROSION	
MINES	
MOUNTAINS	
PERENNIAL RIVERS	
CULTIVATED LANDS	

SOEL

SCHULKMAN



## APPENDIX 2: SITE SPECIFIC PHOTOS

Fig 1: (below) Depicts the mountain ranges



Fig 2: (below) Shows loss of fertile topsoil caused by erosion





Fig 3: (below) Shows compacted seedlings due to the traditional plant and plough cultivation method



Fig 4: (below) Depicts the severity of soil erosion at Ga-Ratau village

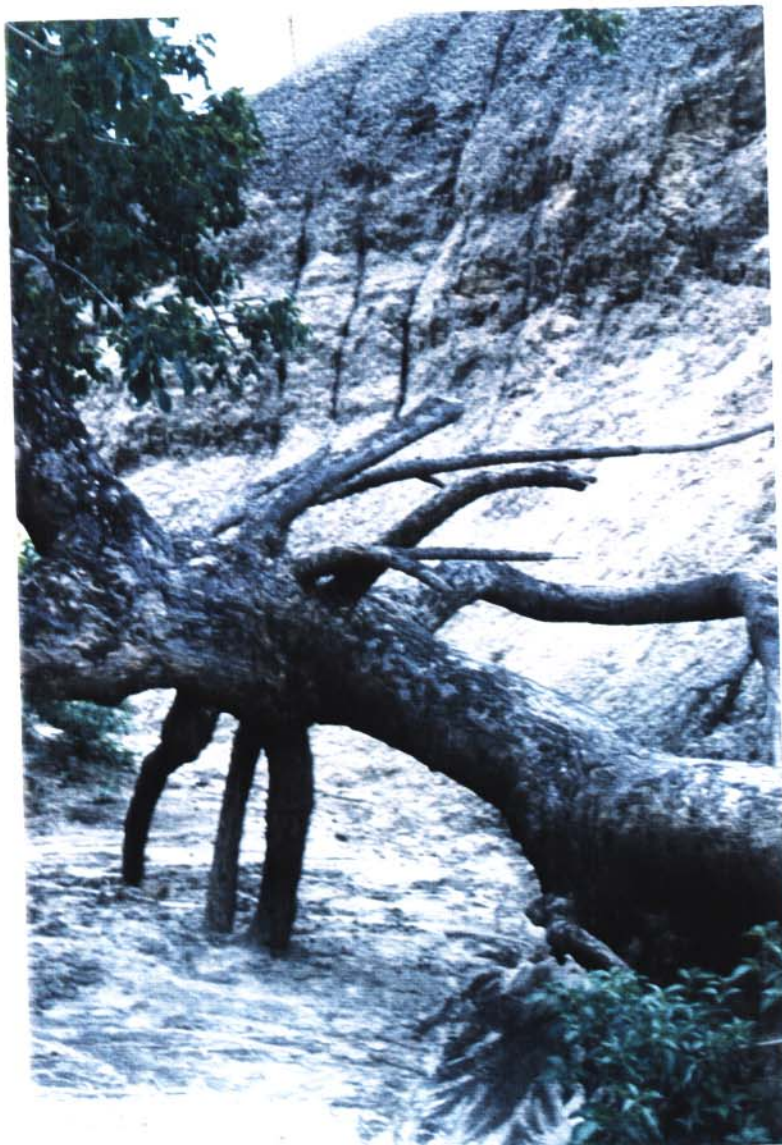




Fig 5: (below) Shows settlements in a badland

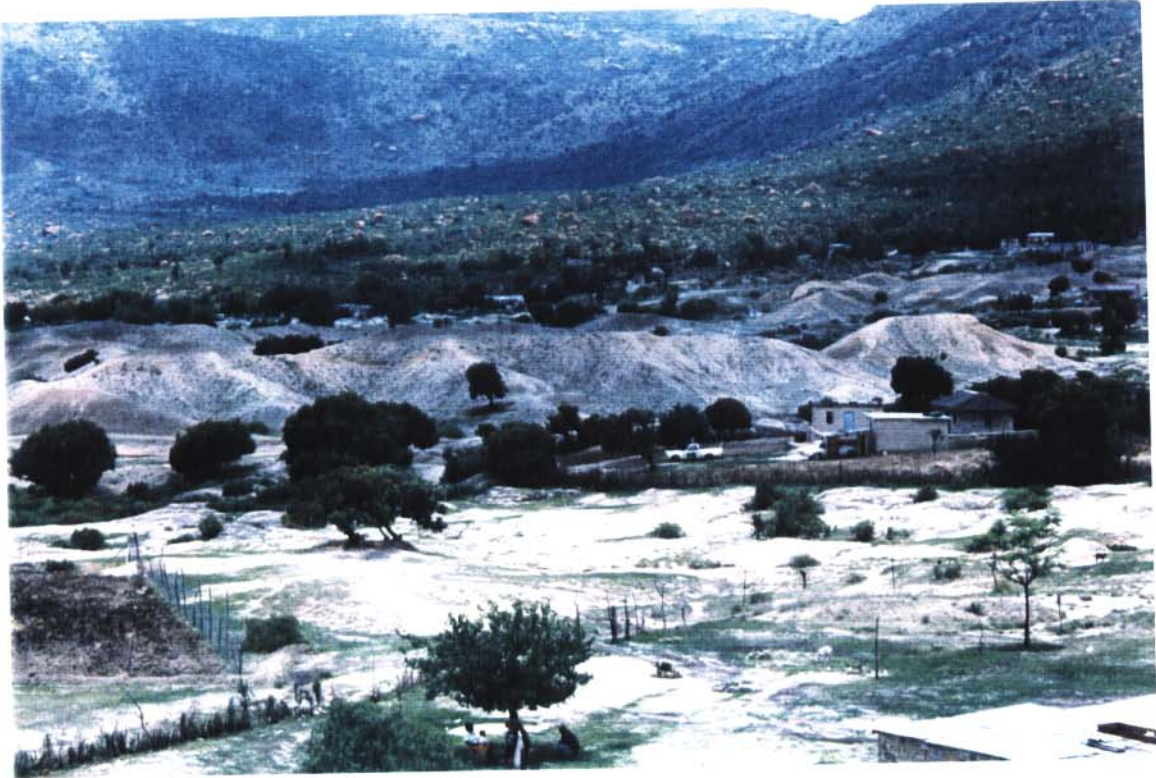


Fig 6: (below) Depicts Soil Conservation Project of Maandagshoek village



Fig 7: (below) Depicts a borrow pit that is used as a dumping site





Fig 8: (below) Shows unrehabilitated mine dumps



Fig 9: (below) Shows the proximity of dongas to houses which poses safety risks

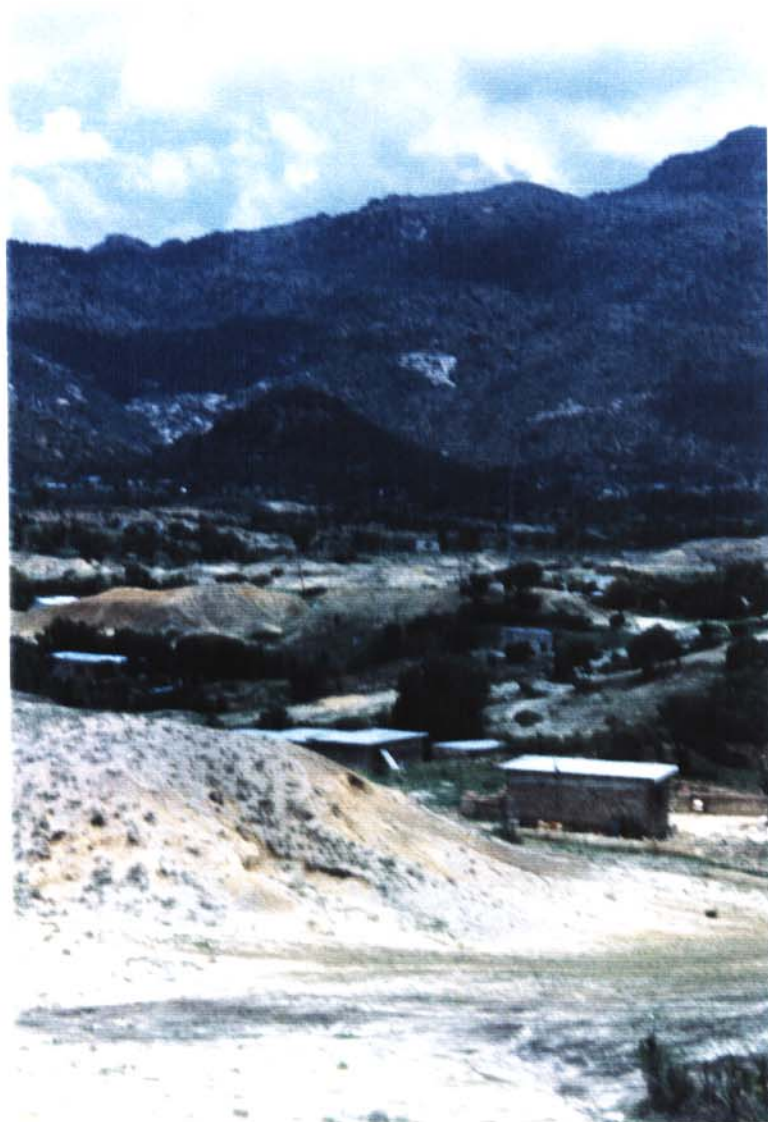




Fig 10: (below) Depicts overgrazing which is succeeded by bush encroachment.



Fig 11: (below) Depicts the need for wood



## APPENDIX 3: QUESTIONNAIRE SCHEDULE

## QUESTIONNAIRE COVERING LETTER

Date: 26 July 1999

To : Participants in the study of the impacts of rural land-use on the natural environment in Dilokong District.

You are cordially requested to participate in a research project which intends to gather information about the present land-use practice in your area and its impact on the natural environment. The research is conducted by a Masters student in Development Studies from the University of the North. A few minutes of your time will be greatly appreciated to respond to the questionnaire.

Results of this research will benefit Dilokong Transitional Local Council by providing current land-use patterns and further give bearing to development trends.

Participants' names will not be revealed. All individual information will remain confidential.

The questionnaire should take about twenty minutes to complete. Please return it to the office of the Social Worker at Mecklenburg Hospital before or on the 15/07/1999. This study is envisaged to be completed by end of November 1999 and workshops will be conducted to give the participants feedback on the results and findings.

Your participation in this research will be a meaningful contribution towards the reconstruction and development of your area.

Thank you.

Regards

Yours truly,

MAHLAKE P. A.

(Researcher)

## EXPLANATIONS OF SOME QUESTIONNAIRE CONCEPTS

1. Population density - the total number of people in the area.
2. Housing settlement - refers to the households in the area.
3. Hectare (ha) - is equivalent to 10 000 square meters.
4. Settlement arrangement - refers to the configuration of houses in the area.
5. Power - means electricity.
6. Plough and plant - means tilling the soil and then planting the seeds.
7. Plant and plough - means the distribution of the seeds throughout the field and then covering them with hard topsoil.
8. Drought resistant seed - are seeds which survive very dry conditions.
9. Effluent - is waste water.
10. Rehabilitation - is the restoration of the mine dumps to an environmentally sustainable land-use.
11. Land Development Objectives is the land-use planning strategy as required by the Development Facilitation Act No. 67 of 1995.
12. Conservation - is the sustainable management of the natural resources.
13. Relevant authority - is the government department responsible for the protection of the environment.
14. Carrying capacity - is the ability of the land to accommodate grazing animals.



# QUESTIONNAIRE

CONFIDENTIAL

Mark the relevant column with an X

26 July 1999

## 1. PERSONAL DATA

1.1. What is your sex?

Male	
Female	

1.2. How old are you?

20-29 years	
30-39 years	
40-49 years	
50-59 years	
60 - above	

1.3. Are you employed?

Yes	
No	

1.4. If yes, is it full-time, part-time or voluntary work?

.....

1.5. Which institution are you working for?

.....

1.6. Which position are you holding in your organization?

.....

1.7. How long have you been residing in Dilokong?

.....

## 2. SETTLEMENT, INFRASTRUCTURE, AND LAND TENURE ASPECTS

2.1. What type of settlement are you residing at?

Planned	
Partly planned	
Unplanned	
Do not know	

2.2. Who allocates land in your area?

Chief	
Local government	
Dept. of Agriculture	
Other (specify)	

2.3. How is population density in your area?

Very high	
High	
Low	
Very low	

2.4. Is there any need for housing development space?

Yes	
No	

2.5. If yes, how much space do you need?

Less than 1 hectare	
1-2 hectares	
2-3 hectares	
3-5 hectares	
5-10 hectares	
10-20hectares	
20-50 hectares	

2.6. How is the settlement arrangement in your area?

Very dense	
Dense	
Scattered	
Very scattered	

2.7. Do you have electricity in your household?

Yes	
No	

2.8. If yes, what do you use it for?

Lights	
Cooking	
Other (specify)	

2.9. Where do you get water for household use?

Borehole	
River	
Other (specify)	

2.10. Is there a water piped system in your area?

Yes	
No	

2.11. Do you have a toilet in your household?

Yes	
No	

2.12. If yes, what type of toilet?

Pitlatrine	
Water flushed	
Other (specify)	

2.13. If no, what do you use as toilet substitute?

.....

2.14. Who is responsible for the infrastructural development of your area?

Chief	
Local government	
Other (specify)	

2.15. Who is responsible for the planning of your area?

Dept of Agriculture	
Local government	
Chief	
Other (specify)	

2.16. Are you involved in the planning of your area?

Yes	
No	

### 3. AGRICULTURE AND CONSERVATION ASPECTS

3.1. How productive is your agricultural land?

Very high	
High	
Low	
Very low	

3.2. If production is low, what is the cause?

Drought	
Soil loss	
Poor ploughing	
Other (specify)	

3.3. To what an extent do drought affect your crops?

To a lesser extent	
To some extent	
To a greater extent	
Do not know	

3.4. Is the government involved in drought relief programmes in your area?

Yes	
No	

3.5. Are you ploughing throughout the year?

Yes	
No	

3.6. How do you cultivate your fields?

Plough and plant	
Plant and plough	
Other (specify)	

3.7. What type of seeds do you plant?

Drought resistant	
Wet season	
Available seeds	
Other (specify)	

3.8 Do you fertilize your soils?

Yes	
No	

3.9. If yes, specify .....

3.10. Is soil erosion a problem in your area?

Yes	
No	



3.11. If yes, are you involved fighting it?

All the times	
Sometimes	
Not at all	

3.12. Is there any soil conservation effort undertaken by government?

Yes	
No	

3.13. If yes, specify .....

3.14. If no, is it because of :

Lack of funds	
Government apathy	
Inefficiency of authorities	
Other (specify)	

3.15. Do you take your crops to the market?

Yes	
No	

3.16. How many livestock do you have per household?

Less than 10	
Between 10 and 39	
Between 40 and 69	
Between 70 and 99	
100 and above	

3.17. Are there any grazing camps in your area?

Yes	
No	

3.18. If yes,

(a) do you have enough grazing land for your livestock?

Yes	
No	

(b) what is the carrying capacity of your grazing area?

Less than 10 square meters per cattle	
10 – 20 square meters per cattle	
20 – 30 square meters per cattle	
30 – 40 square meters per cattle	
40 – 50 square meters per cattle	
50 square meters and above per cattle	
Do not know	

3.19. If no, how much grazing land do you need?

Less than 5 hectares	
5 – 10 hectares	
10 – 20 hectares	
20 – 50 hectares	
50 – 70 hectares	
70 – 90 hectares	

3.20. Do you take your livestock to the market?

Always	
Sometimes	
Not at all	

3.21. What do you use for cooking?

Firewood	
Paraffin	
Coal	
Gas	
Electricity	
Other (specify)	

3.22. Do you experience veld fires?

Yes	
No	

3.23. If yes, what are the causes of the veld fires? (Tick more than 1 if applicable)

Natural	
Manmade	
Unknown	

3.24. To what extent do veld fires affect your grazing land?

To a less extent	
To some extent	
To a great extent	

3.25. Is there any pollution in your area?

Yes	
No	

3.26. If yes, what kind of pollution do you experience?

Air	
Land	
Water	

3.27. What is the cause of air pollution if you ticked it in 3.26? (Tick more than 1 if applicable)

Mines	
Factories	
Other (specify)	

3.28. What is the cause of land pollution if you have ticked it in 3.26? (Tick more than 1 if applicable)

Litter	
Mines	
Factories	
Other (specify)	

3.29. What is the cause of water pollution if you ticked it in 3.26? (Tick more than 1 if applicable)

Litter	
Effluent from mines	
Effluent from factories	
Broken sewers	
Dumping sites	
Other (specify)	

3.30. Are there any mine dumps in your area?

Yes	
No	

3.31. If yes, to what an extent do they affect your health?

To a less extent	
To some extent	
To a great extent	
Do not know	

3.32. If yes, are the mine dumps rehabilitated?

Yes	
No	

3.33. Is solid waste a problem in your area?

Yes	
No	

3.34. If yes, do you have a waste removal system?

Yes	
No	

3.35. Is there any waste disposal site?

Yes	
No	

3.36. If yes, is the site located in a suitable area ?

Yes	
No	

3.37. If no, how do you treat your waste?

Burn	
Bury	
Litter	
Other (specify)	

#### 4. POLICY

4.1 Do you know any environmental policies which regulate land development?

Yes	
No	

4.2. If yes, specify .....

4.3. Were you involved in the formulation of the Land Development Objectives of your Transitional Local Council?

Yes	
No	

4.4. If yes, on which level?

Information sharing	
Consultation	
Decision making	
Other (specify)	

4.5. If yes, are the LDOs implemented in your area?

Yes	
No	



5. Please give any other comment(s) which may assist in this research:

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

## APPENDIX 4: STATISTICAL RAW DATA

Count of Sex	Total
1	81
2	49
(blank)	
Grand Total	130

Count of Age	Total
1	31
2	55
3	33
4	7
5	3
6	1
(blank)	
Grand Total	130

Count of Employed	Total
no	72
yes	58
(blank)	
Grand Total	130

Count of Residing	Total
0	3
2	2
4	1
6	1
8	1
9	1
10	3
13	1
14	1
15	1
16	2
17	1
18	1
20	5
21	1
23	1
24	3
25	4
26	3
27	1
28	1
29	11
30	7
31	2
32	2
33	4
34	7
35	7
36	1
37	2
38	3
39	11
40	1
41	2
42	1
43	1
44	1
45	3
46	4
47	1
48	1
49	12
53	1
59	4
60	1
65	1
78	1
(blank)	
Grand Total	130

Count of Type	Total
0	59
Full time	41
Part time	14
Voluntary	16
(blank)	
Grand Total	130

Count of Position	Total
0	58
Accountant Asst.	1
Acting Chief	1
Additional member / Secretary of youth league	1
Administrator	1
Agric Technician	1
Agriculture officer	1
Aids councillor	1
Anc Dept Chair	1
Asst. Marketing Manager	1
Carer	1
Cashier	1
CEO	1
Chairman	1
Chairperson	7
Chief councilor	1
Chiefs Secretary	1
Church	1
clerk	2
Community development officer	1
community member	1
Community organiser	1
Co-ordinator	2
Dep Principal	1
Deputy chairman	1
Deputy chairman ANC league	1
Deputy Secretary	1
Deputy secretary of Woes league	1
Educator	3
General assistant	1
Kgoshi	1
Labour desk	2
labourer	2
member	2
Officer	1
Owner of cafee	1
Plimber	1
Principal	1
Secretary	11
Secretary for elder and youth	1
Sen Agric Technician	1
supervisor	1
Teacher	4
Treasurer	2
Vice chairman	1
Youth Leader ANC	1
(blank)	
Grand Total	130

Count of 2-1	
2-1	Total
1	17
2	21
3	91
4	1
(blank)	
Grand Total	130

Count of 2-2	
2-2	Total
1	113
2	4
3	8
13	3
123	2
(blank)	
Grand Total	130

Count of 2-4	
2-4	Total
no	39
yes	91
(blank)	
Grand Total	130

Count of 2-5	
2-5	Total
0	38
1	2
2	8
3	6
4	7
5	8
6	19
7	42
(blank)	
Grand Total	130

Count of 2-6	
2-6	Total
0	1
1	7
2	59
3	61
4	2
(blank)	
Grand Total	130

Count of 2-7	
2-7	Total
no	85
yes	45
(blank)	
Grand Total	130

Count of 2-9	
2-9	Total
0	8
1	101
2	13
12	8
(blank)	
Grand Total	130

Count of 2-10	
2-10	Total
no	37
yes	93
(blank)	
Grand Total	130

Count of 2-8	
2-8	Total
0	85
1	12
2	4
12	29
(blank)	
Grand Total	130

Count of 2-12	
2-12	Total
0	48
1	72
2	8
12	2
(blank)	
Grand Total	130

Count of 2-13 Specify	
2-13 Specify	Total
0	82
Bushes	16
Bushes and Dongas	7
Donga	23
Mountain	1
Neighbours toilet	1
(blank)	
Grand Total	130

Count of 2-11	
2-11	Total
no	48
yes	82
(blank)	
Grand Total	130

Count of 2-15	
2-15	Total
1	51
2	20
3	45
13	2
23	3
123	9
(blank)	
Grand Total	130

Count of 2-16	
2-16	Total
0	1
no	77
yes	52
(blank)	
Grand Total	130

Count of 2-14	
2-14	Total
0	12
1	44
2	65
12	9
(blank)	
Grand Total	130



Count of 3-1	
3-1	Total
1	8
2	32
3	63
4	27
(blank)	
Grand Total	130

Count of 3-2	
3-2	Total
0	40
1	16
2	10
3	12
12	12
13	25
123	15
(blank)	
Grand Total	130

Count of 3-3	
3-3	Total
1	16
2	41
3	69
4	4
(blank)	
Grand Total	130

Count of 3-5	
3-5	Total
no	102
yes	28
(blank)	
Grand Total	130

Count of 3-6	
3-6	Total
1	40
2	90
(blank)	
Grand Total	130

Count of 3-4	
3-4	Total
no	108
yes	22
(blank)	
Grand Total	130

Count of 3-7	
3-7	Total
1	26
2	29
3	74
30	1
(blank)	
Grand Total	130

Count of 3-8	
3-8	Total
0	2
no	113
yes	15
(blank)	
Grand Total	130

Count of 3-9	
3-9	Total
0	115
3:2:3	1
manure	13
often	1
(blank)	
Grand Total	130

Count of 3-10	
3-10	Total
no	15
yes	115
(blank)	
Grand Total	130

Count of 3-11	
3-11	Total
0	14
1	4
2	65
3	47
(blank)	
Grand Total	130

Count of 3-12	
3-12	Total
no	125
yes	5
(blank)	
Grand Total	130

Count of 3-13	
3-13	Total
	126
agricultural conse	1
community Garde	1
contractors	1
farmers organisat	1
(blank)	
Grand Total	130

Count of 3-14	
3-14	Total
0	7
1	44
2	25
3	52
123	2
(blank)	
Grand Total	130

Count of 3-15	
3-15	Total
0	1
no	126
yes	3
(blank)	
Grand Total	130

Count of 3-16	
3-16	Total
0	1
1	44
2	42
3	18
4	10
5	15
(blank)	
Grand Total	130

Count of 3-17	
3-17	Total
2	1
no	124
yes	5
(blank)	
Grand Total	130

Count of 3-18b	
3-18b	Total
0	120
1	1
2	3
3	1
6	4
7	1
(blank)	
Grand Total	130

Count of 3-19	
3-19	Total
0	7
1	6
2	13
3	20
4	18
5	27
6	39
(blank)	
Grand Total	130

Count of 3-18 (a)	
3-18	Total
0	115
no	14
yes	1
(blank)	
Grand Total	130

Count of 3-20	
3-20	Total
2	51
3	79
(blank)	
Grand Total	130

Count of 3-21	
3-21	Total
1	83
2	6
3	1
4	3
5	12
12	6
14	1
15	2
24	1
45	1
124	3
125	2
1235	5
1245	1
12345	3
(blank)	
Grand Total	130

Count of 3-22	
3-22	Total
2	1
no	27
yes	102
(blank)	
Grand Total	130

Count of 3-24	
3-24	Total
0	23
1	7
2	38
3	62
(blank)	
Grand Total	130

Count of 3-23	
3-23	Total
0	24
1	3
2	78
3	13
12	4
13	3
23	5
(blank)	
Grand Total	130

Count of 3-25	
3-25	Total
no	34
yes	96
(blank)	
Grand Total	130

Count of 3-27	
3-27	Total
0	105
1	22
2	1
12	2
(blank)	
Grand Total	130

Count of 3-28	
3-28	Total
0	48
1	62
2	8
12	10
123	2
(blank)	
Grand Total	130

Count of 3-26	
3-26	Total
0	30
1	7
2	42
3	8
12	6
13	1
23	21
123	15
(blank)	
Grand Total	130

Count of 3-29	
3-29	Total
0	90
1	23
2	3
4	3
5	1
12	1
15	2
24	1
124	3
125	2
145	1
(blank)	
Grand Total	130

Count of 3-30	
3-30	Total
0	3
2	1
no	85
yes	41
(blank)	
Grand Total	130

Count of 3-31	
3-31	Total
0	89
1	5
2	10
3	14
4	12
(blank)	
Grand Total	130

Count of 3-32	
3-32	Total
	87
	39
s	4
(blank)	
Grand Total	130

Count of 3-33	
3-33	Total
0	1
no	42
yes	87
(blank)	
Grand Total	130

Count of 3-34	
3-34	Total
0	40
no	88
yes	2
(blank)	
Grand Total	130

Count of 4-1	
4-1	Total
0	1
no	121
yes	8
(blank)	
Grand Total	130

Count of 4-2	
4-2	Total
0	121
Burgersfort Environmental Programme	1
CPF	1
Environmental conservation act	1
Environmental Management Act / Land use act	1
Land development objectives	1
no	2
people must get involved	1
Tribal authority policy	1
(blank)	
Grand Total	130

Count of 4-3	
4-3	Total
0	4
no	91
yes	35
(blank)	
Grand Total	130

Count of 4-4	
4-4	Total
0	94
1	25
2	4
3	6
123	1
(blank)	
Grand Total	130

Count of 4-5	
4-5	Total
0	93
no	17
yes	20
(blank)	
Grand Total	130