VULNERABILITY TO BROWN ENVIRONMENTAL PROBLEMS WITHIN INFORMAL SETTLEMENTS IN SESHEGO, LIMPOPO PROVINCE

by

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Declaration

I declare that the dissertation hereby submitted to the University of Limpopo, for the degree of Master of Administration in Development Management has not previously been submitted by me for a degree at this or any other University; that is my work in design and in execution, and that all materials contained herein has been duly acknowledged.

Initials & Surname (Title)

Date

[redacted]

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Abstract

Living in informal settlements is associated, theoretically, with the exposure and vulnerability to Brown Environmental Problems. Literature further stresses the association of informal settlements and poor living conditions by demonstrating that the establishment of informal settlements around the cities is intricately associated with poor living conditions that enforce circumstances of perpetual risk and high levels of vulnerability to Brown Environmental Problems.

Overcrowding, poor service provision and heavy reliance on dirty fuels characterizes informal settlements and therefore link these settlements and environmental risks and hazards. The link between informal settlements and environmental risks and hazards is in return making people who live in these settlements vulnerable to, among other things, the Brown Environmental Problems, such as indoor pollution, dirty water, poor sanitation and poor waste management.

It therefore became increasingly necessary to investigate the vulnerability to Brown Environmental Problems associated within these settlements. The investigation was done in Seshego, Zone 6, mostly known as Shushumela (Rainbow-Park). The study adopted a combination of the qualitative and quantitative approaches. The qualitative approach was used to describe the characteristics of the informal settlement, the types and origins of the Brown Environmental Problems, the living conditions within the settlement, and to detail the individual accounts of the informal settlements population's opinions and experiences on their vulnerability.

Additionally, quantitative approach was used to measure the demographic profile of the households within the settlements, to determine the population density in the settlements, the frequency of the households' exposure to a variety of Brown Environmental Problems and the amount of time of exposure to dirty fuels, dirty water, and poor sanitation. The prevalence rate of the different types of the Brown Environmental Problems was also quantitatively constructed. The study compiled its conceptual framework by digesting and synthesising contributions from the system of ideas that involves the general assumption about the relationship between informal settlements living conditions and vulnerability of the populations therein to Brown Environmental Problems.

Zone 6 is an informal settlement in Seshego, this settlement is also known as Rainbow Park-Shushumela. Like other informal settlements, Shushumela comprises of people who need a place to stay but unable to find one due to various reasons one of them being affordability issue. Shushumela informal settlement does not have basic services. Its residents stay in shacks and use their own ways to survive the situation of living without electricity, adequate sanitation and waste removal services. The residents are exposed to various Brown Environmental Problems such as indoor air pollution due the use of paraffin wood and coal, waterborne diseases and sanitation-borne diseases due to the limited access of water and use of pit latrines. The residents' overall living conditions expose them to Brown Environmental Problems.

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1.1 Introduction and Background

Living in informal settlements is associated, theoretically, with the exposure and vulnerability to Brown Environmental Problems (Hamza & Zetter, 1998; Forsyth, 2002; Dasgupta, Deichmann, Meisner & Wheeler, 2005). Most of these settlements develop around urban centres as poor people migrate from rural areas in search of a better life (Hamza & Zetter, 1998; Mugisha, 2006). That is, the perception that cities offer better opportunities for a better life has in reality enforced a strong rural-to-urban migration among poor people (Gilbert, 2002; Mugisha, 2006). Consequently, the poor migrants establish informal settlements at their destination. In this way, the formation of informal settlements around urban centres involves, at heart, the transference of poverty from rural to urban areas (Hamza, & Zetter, 1998; Anan, 2003).

The informal settlements emerge spontaneously without any form of planning and remain illegal, outside formal town planning processes (Anan, 2003; Department of Economic Development, Environment and Tourism, 2007). Inevitably, these settlements are characterised by squalid conditions of poor housing, lack of basic services and environmental degradation (Anan, 2003; Mugisha, 2006; DEDET, 2007). These conditions, together with the dwellers' means of survival create circumstances under which the inhabitants are exposed to a variety of environmental risk and hazards (Satterthwaite, 2002; Dasgupta et al., 2005). Among these environmental considerations

are the problems of filthy water, indoor pollution, inadequate sanitation and poor waste management (Forsyth, 2002; Anan, 2003; Mugisha, 2006). These problems are collectively denoted Brown Environmental Problems (Forsyth, 2002). Contrary to the Green Environmental concerns, the Brown Environmental Problems largely affect poor people who settle within informal settlements (Forsyth, 2002).

However, these problems operate in ways that have become difficult to legislate against. For instance, the poor migrants in shanty towns burn dirty fuel for cooking and heating because the clean sources of energy are beyond their means (Satterthwaite, 2002; Dasgupta et al., 2005). Research has demonstrated that despite the seriousness of these Brown Environmental Problems, international debates on environmental management have largely circumvented them (Forsyth, 2002; Anan, 2003). As a result, the poor people's nature and level of vulnerability to these Brown Environmental Problems within the informal settlements in developing countries remains largely unattended. The developing countries' approaches to risk and vulnerability management have continued to be technocratic, ignoring the political-economy considerations involved in the realization of disasters (Hamza & Zetter, 1998; Forsyth, 2002).

This study adopted the view that the nature and level of vulnerability to Brown Environmental Problems within the informal settlements is also a function of the political-economy structure of the society (Hamza & Zetter, 1998). From this theoretical stance, the study wanted to investigate the living conditions within the informal settlements, the types and origin of the Brown Environmental Problems that informal settlements population are exposed to and their levels of vulnerability to those Brown

Environmental Problems in Limpopo Province. Polokwane is the only city in Limpopo Province; and, for this reason, Seshego within Polokwane Municipality was selected as the case study for this research. Being the only city in the Province, Polokwane offers attractions to the poor rural communities who migrate to settle in informal settlements around the abutting townships such as Seshego. This study investigated the interface between living conditions, the Brown Environmental Problems and the level of vulnerability of the informal settlements population in Seshego.

1.2 Problem Statement

The environmental risks and hazards are inevitably within informal settlements due to their characteristics of overcrowding, poor service provision, and heavy reliance on dirty fuels (Forsyth, 2002). For these reasons, poor people who live in these settlements are vulnerable to, among other things, the Brown Environmental Problems, such as indoor pollution, dirty water, poor sanitation and poor waste management (Daniere & Takahashi, 1999; Forsyth, 2002).

In 2001, 924 million people, or 31.6% of the world's urban population lived in informal settlements; the majority of them were in the developing regions, accounting for 43% of the urban populations in contrast to 6% in more developed regions (Anan, 2003). It is almost certain that the informal settlements population increased substantially during the 1990s and it is further projected that, in the next 30 years, the global number of informal settlements population will increase to about 2 billion if no firm and concrete action is

taken (Mukhija, 2001). The urban population in less developed regions increased by 36% in the last decade (Anan, 2003).

The same concerns have to be raised about Limpopo where in 2004, Limpopo Province was characterised by 15.4% of its households having pit latrines with ventilation, 50.7% of households with pit latrines without ventilation, and 15.8% of households with no toilets. Whereas 76.7% of the households had access to piped-water facility, a large majority of households continued to use sources of filthy water, because of their inability to afford piped-water supplies (RSA, 2007).

Electricity is the main source of energy in the province, only for lighting purposes; and 63.8% of all households had access to electricity in 2001 largely used for lighting (RSA, 2007). Most of the households in the province continue to use dirty fuels, such as wood and cow-dung, for cooking and heating purposes because the cost of electricity is beyond their means. About 82.4% of households in Limpopo Province lived in tribal settlements in 2001 because the province has incorporated several densely populated former Bantustans (RSA, 2007). Over 77% of households, particularly those in the tribal settlements, continue to live in deep poverty and the likelihood of migration from these tribal settlements into urban centres is high because of the condition of pull and push factors (Mugisha, 2006).

Whereas only 1.3% of households in Limpopo Province lived in informal settlements in 2001, this was an increase from 0.3% in 1996. This increase was due to the intensification of urbanization, and this trend remains unaltered in the 21st century. This 1.3% of households living in informal settlements has to be understood in the context that

the province was only 10.93% urban in 2001 (RSA, 2007). As the population drifts away from tribal settlements, informal settlements have tended to mushroom in the province.

It has become increasingly necessary and relevant to investigate the corresponding vulnerability to the Brown Environmental Problems associated with these informal settlements. This study wanted to uncover the prevalence of the various types of the Brown Environmental Problems, and the level of exposure and vulnerability of increasing informal settlements population. These concerns were investigated using the informal settlements in Seshego, Zone 6, Polokwane Municipality in Limpopo Province.

1.3 Delimitation of the study

Limpopo Province is one of South Africa's nine provinces located in the northern part of the country. In terms of dermacation, the province is divided into five districts and each district municipality has a number of local municipalities depending on how big the district is. The province has housed a lot of people including in the informal settlements. Capricon District Municipality (CDM) is one of the five district municipalities in Limpopo Province. The municipality is located at the centre of Limpopo Province and it is situated at the core of the province's economic development.

The province's capital city, Polokwane City, is located within this district municipality. CDM has approximately 547 settlements and within the 113 wards, are 285 565 households with an estimated population of 1 243 167. One of CDM's fast growing local municipalities is Polokwane local municipality. Polokwane Local Municipality houses

over 10% of the province's population and it is home to approximately 561 770 people from around 5.2 million (5 238 300) people in the province (Polokwane Community Survey, 2007).

The municipality has a tremendous number of people who have no income, a total of about 250 000. Since the re-demarcation of wards, Polokwane Local Municipality comprises 37 wards. Polokwane city in Polokwane Local Municipality is one of the cities that have satisfying economic activities and therefore experience a flow of people from other areas in the province. The 1996 to 2001 growth figures showed that the municipal population increased by 16.39%, which means an annual average population growth rate of 3.27%.

The increase in population is ascribed to the influx of people from other rural areas that are in search of economic activities as the perception of employment and economic stability exists in Polokwane. There are four clusters in Polokwane local municipality. One of the clusters is City Seshego which is located at the west of Central Business District (central part) and railway line. Being closest to Polokwane's economy core, Seshego experiences an enormous influx from rural-urban migration.

The study used a Case Study of the informal settlement in Polokwane Municipality because Polokwane city is the only city in Limpopo Province. Within this municipality, the Seshego Township is conspicuous by the spatial spread and mushrooming of informal settlements. Zone 6 in Ward 37 is an informal settlement; therefore, this informal settlement constituted the Case Study for the compilation of evidence about the vulnerability of the informal settlements populations to Brown Environmental Problems.

1.4 Research Questions

The primary focus was on the exposure and vulnerability of the increasing informal settlements population to Brown Environmental Problems. Accordingly, the research question was formulated as follows: How vulnerable is the informal settlements population to Brown Environmental Problems?

To operationalise this primary research question, a set of five related questions were asked as follows:

- What are the types and conditions of dwellings, water, energy, sanitation and waste management within Seshego's informal settlements?
- What are the types and origins of the Brown Environmental Problems within the informal settlements in Seshego?
- What is the prevalence rate of the Brown Environmental Problems (especially indoor pollution, filthy water, poor sanitation) within the informal settlements in Seshego?
- What is the level of vulnerability of the Seshego's informal settlements population to Brown Environmental Problems?
- What are the measures that could be used to reduce the vulnerability of the informal settlements population to Brown Environmental Problems in Seshego?

1.5 Aim and Objectives

In accordance with the research question above, the aim of the study was to investigate the types and levels of vulnerability of the informal settlements population to various Brown Environmental problems in Seshego, Polokwane Municipality. Consistent with this aim, the study wanted to achieve the following objectives:

- To determine the types and conditions of dwellings, water, energy, sanitation and waste management within Seshego's informal settlements
- To study the types and origins of the Brown Environmental Problems within the informal settlements in Seshego
- To investigate the prevalence rate of the Brown Environmental Problems (especially indoor pollution, filthy water, poor sanitation) within the informal settlements in Seshego
- To determine the level of vulnerability of Seshego's informal settlements population to Brown Environmental Problems

1.6 Definition of Terms

1.6.1 Informal Settlements

In the 2001 census, an informal settlement was defined as "an unplanned settlement on land which has not been surveyed or proclaimed as residential, consisting of mainly, informal dwellings (shacks)" (RSA, 2007:106). Informal settlements population are expected to be poor due to the housing and living conditions within these settlements

(Anan, 2003; RSA, 2007). This study adopts both the RSA and Anan definitions and therefore defines informal settlements as the settlements where the residents normally do not have legal rights to land or property and in most cases do not have formal housing or access to services.

1.6.2 Brown Environmental Problems

Brown Environmental Problems are problems associated with urbanization and industrialization (Forsyth, 2002; Mugisha, 2006). These are the problems of pollution, and poor sanitation. Almost all the Brown Environmental Problems relate to environmental health. In most cases, poor people are the ones who are affected by Brown Environmental Problems (Forsyth, 2002). These definitions will apply to this envisaged study.

1.6.3 Vulnerability

A body of literature demonstrates that there is no universal definition of vulnerability; "the mainstream definition holds that vulnerability involves a combination of factors which determine the degree to which someone's life and livelihood is put at risk by a discrete and identifiable event in nature or society" (Forsyth, 2002:299). In short, vulnerability denotes a statistical condition that applies to people during normal (pre-disaster) life that is not realized and tested until it is triggered by a natural event (Hamza & Zetter, 1998). These definitions give meaning to this study and therefore, vulnerability will be used as defined by Forsyth and Hamza & Zetter.

1.7 Research Design and Methodology

1.7.1 Research Approach

This study adopted a combination of the qualitative and quantitative approaches because vulnerability to the Brown Environmental Problems involves more than just the measurable and observable factors. It also involves how people feel about their levels of exposure to types of Brown Environmental Problems. The qualitative approach was used to describe the characteristics of the informal settlement, the types and origins of the Brown Environmental Problems, the living conditions within the settlement, and to detail the individual accounts of the informal settlements population's opinions and experiences on their vulnerability.

The description involved the conditions of dwellings, water, sanitation, waste management and energy within the informal settlement. Whereas the conditions of dwellings, water, sanitation, waste management and energy were observed and measured, how people feel about these conditions was also a deserving research concern. Whereas the study could not afford the necessary technology to detect levels of exposure to the Brown Environmental problems, the study used the respondents' opinions to determine the frequency and levels on the basis of three broad categories of high, moderate and low.

Additionally, quantitative approach was used to measure the demographic profile of the households within the settlements, to determine the population density in the settlements, the frequency of the households' exposure to a variety of Brown Environmental Problems and the amount of time of exposure to dirty fuels, dirty water, and poor sanitation. The

prevalence rate of the different types of the Brown Environmental Problems was also quantitatively constructed in terms of the proportions of the households exposed in the informal settlements. In short, this study relied on the various indicators of quality and quantity in order to investigate the vulnerability of the informal settlements population to the Brown Environmental Problems.

The study also wanted to compile evidence that could be tested through inductive procedures. The hope was that using an inductive approach will allow for use of further evidence to create, if possible, new ideas and to strengthen the conclusions drawn. The study used a Case Study of the informal settlement in Polokwane Municipality, as already indicated. This municipality was selected for this study because Polokwane city is the only city in Limpopo Province. Within this municipality, the Seshego Township is conspicuous by the spatial spread and mushrooming of informal settlements. Zone 6 in Ward 37 is an informal settlement. This informal settlement (Zone 6) is divided into 11 sections (Sections A to K). All these 11 sections within Zone 6 constituted the Case Study for the compilation of evidence about the vulnerability of the informal settlements population to Brown Environmental Problems.

1.7.2 Kinds of Data Required

The study acquired data on the living conditions within the informal settlements, especially the types and nature of dwellings, quality of water; energy used for cooking and heating; the manner in which waste is disposed and managed; and the nature and quality of sanitation facilities. Also, data on the types and origins of the Brown Environmental Problems was collected, with specific emphasis on the indoor pollution,

filthy water, waste management and poor sanitation. Furthermore, the respondents' assessment of the living conditions and levels of vulnerability was compiled. In addition to the empirical data described above, the study hoped to collect information on the debates about the general assumptions of the relationship between the informal settlements living conditions and vulnerability to Brown Environmental Problems. Also information on the government's response measures was collected.

1.7.3 Target Population and Sampling Design

This study defined its target population as all the informal settlements in Seshego, Zone 6 as well as the households therein. The primary units of analysis were the households, but there were incidences where analysis focused on individual sections as a whole, for the purpose of a section-to-section comparative analysis. The Medical Centres and the units of the Department of Health and Social Development in the township were included as part of the target population. As a result, the target population also included health workers, development and environmental officers within the township. Key informants in the informal settlements, particularly the local leaders and those who have knowledge of the Brown Environmental Problems, were included for survey.

As already explained, all 11 sections in zone 6 of Seshego's informal settlements were included in the study. Purposive sampling was used to select households whose dwellings are shacks. The plan was to select 30 such households per informal settlement section in Seshego's Zone 6. This choice was forced by the limitation of resources for this study. Overall, 330 (30 households multiplied by 11 sections) households whose dwellings are shacks in the 11 sections were selected for detailed survey. In each of the

households selected purposively, one respondent was identified and requested to assist with furnishing information relating to the household living conditions and exposure to the Brown Environmental Problems.

Within each of these sections, snowballing procedure was used to identify and trace those key members of the community who have been involved with the environmental concerns within the settlements. With regard to the units and centres involved in the informal settlements, self-selection procedure was adopted so that officials who have an interest in the specific issues of the study can provide information. All in all, the study used a combination of three sampling procedures, which are purposive, snowballing and self-selection, in order to select samples of households with shack dwellings, key informants in the community and officials from both government and non-government centres and units within the community.

1.7.4 Data Collection

The study compiled its conceptual framework by digesting and synthesising contributions from the system of ideas that involves the general assumption about the relationship between informal settlements living conditions and vulnerability of the populations therein to Brown Environmental Problems. Data is documented in books, journal articles, internet and other related sources. As a result, these sources were reviewed with the purpose of identifying and analysing the system of knowledge pertinent to this study. The analysis involved disciplined reading, remembering, understanding, digesting and synthesising ideas in ways that provide a theoretical response to the primary research question formulated in this study.

The study also involved field observations and compilation of fieldwork reports. Those observations attempted to assess the conditions of the dwellings, water, sanitation, energy, as well as all other observable aspects of the Brown Environmental Problems in Zone 6's 11 sections in Seshego. In addition, fieldwork involved taking photographs of specific structures for presentation in the dissertation. A questionnaire survey was conducted among the 11 sections that were selected into the sample. This survey basically involved assisted questionnaire completion by the fieldworker because most of the respondents could have been unable to complete the questionnaire by themselves due to language limitations.

The questionnaire tried to solicit information on the types and origins of the Brown Environmental Problems that the informal settlements population may be experiencing. At the same time, the questionnaire attempted to compile information on the frequency of exposure to particular types of Brown Environmental Problems and the levels of vulnerability, using the three general categories of high, moderate and low. Finally, the questionnaire attempted to assess the opinions of the respondents on the relationship between the living conditions in the informal settlements and the vulnerability to the Brown Environmental Problems. Finally, interviews were conducted with key informants as described earlier, in section A to K, Zone 6, with the purpose of assessing the general conditions about the relationship between the informal settlements living conditions and the levels of vulnerability.

General information on the symptoms, such as respiratory diseases and cholera, of the Brown Environmental Problems, was planned to be solicited from the local Medical

Centres and such other environmentally-based centres but unfortunately the medical centres did not co-operate. It must be emphasised that the plan was that this data should only involve average statistics, and not individual patients' records.

The key informants also were probed on their opinions with regard to the types and origins of the Brown Environmental Problems, as well as the overall levels of vulnerability of the informal settlements populations in Seshego. During data collection, it was discovered that the settlement is not only called Zone 6 but mostly, Shushumela or Rainbow-Park. Therefore, to identify this informal settlement, Shushumela is used throughout this report.

1.7.5 Data Analysis

The household data was captured using the Statistical Package for the Social Science (SPSS) in order to manipulate it and to create the summary statistics and to identify the underlying patterns. Capturing data into SPSS involved conceptualisation of specific issues of the relationship between informal settlements living conditions and vulnerability, as guided by the relevant system of knowledge. From the SPSS, frequency tables, graphs and other descriptive summary statistics were generated and interpreted in accordance with the research focus of this study.

The data collected from key informants was assessed and used to complement that collected from households. This data was also compared with the general patterns established through SPSS analysis of the household data. Survey results were interpreted in order to address the questions formulated for this study.

1.8 Significance of the Study

This study aimed to add to knowledge on the relationship between informal settlements population's living conditions and vulnerability to Brown Environmental Problems. From a pragmatic point of view, the study is aiming to contribute information relevant to the mitigation of informal settlements population's vulnerability to Brown Environmental Problems, especially those in the informal settlements in all the 11 sections in Seshego. Also, the people in the informal settlement in Seshego will receive feedback from the proposed study that could contribute towards their understanding of the circumstances involving their vulnerability to the Brown Environmental Problems.

1.9 Ethical Considerations

This study did not have a potential to cause harm or injuries to the people or other animals. The purpose of the study was fully explained to the participants so that their participation is based on free will; and participants' expectations of the results of the study were not raised to levels that are unrealistic. Given the fact that this study involved the living conditions of the respondents, the questions were phrased in ways that do not offend or belittle people due to their poverty conditions. All the participants were respected, treated with dignity, and their participation was appreciated. In cases of individual quotations, participants were asked if they would allow their names to be used. But the study guaranteed anonymity for all participants.

1.10 Conclusion

With the help of all other researchers' demonstrations that were referred to during literature review, this study was founded on the general assumption that the informal settlements living conditions are positively correlated with the level of their vulnerability to Brown Environmental Problems. For South Africa, the National Environmental Management Act 107 of 1998 amended 2002 and 2004 states that:

> "whereas many inhabitants of South Africa live in an environment that is harmful to their health and well-being: everyone has the right to an environment that is not harmful to his or her health or well-being; the State must respect, protect, promote and fulfill the social, economic and environmental rights of everyone and strive to meet the basic needs of previously disadvantaged communities" (RSA, 1998:4).

Therefore, the South Africa's NEMA guarantees a healthy environment for all people, especially those who were previously disadvantaged and vulnerable to the government policies. Hence, this study hoped to assess whether or not these informal settlements population in Seshego is benefiting from the policies in the new democratic dispensation.

Chapter 2: Conceptual Framework on the Vulnerability to Brown Environmental Problems within the Informal Settlements

2.1 Introduction

A general assumption holds that poor people, due to their living conditions are vulnerable to various environmental problems, particularly, the Brown Environmental Problems (Forsyth, 2002; Satterthwaite, 2002; Madulu, 2006). In the above argument, informal settlements population are no exception. Most informal settlements are found in the cities due to the search of better life by the poor, this means, the development of informal settlements in most cities is linked, either directly or indirectly, to employment opportunities (Mugisha, 2006; K'Akumu & Olima, 2007). Furthermore, the rural population of the developing countries is projected to increase from 2.92 billion to 3.09 billion over the next 25 years, whilst the urban population is expected to double to 3.73 billion. This will result in corresponding shifts in poverty and undernutrition from the rural to urban areas (Goebel, 2007)

Despite the increases in urban influxes, it seemed unlikely that informal settlements improvement or formal construction has kept pace to any degree with the population increases (Rakodi, 2002; Anan, 2003). As a result of these urban population increases, people who do not have financial resources establish their own settlements just to have

shelter (Satterthwaite, 2002). Rather than being assisted with their efforts, they have been overlooked and excluded when basic services are provided and when formal opportunities are offered to other urban citizens (Anan, 2003). As a result, these informal settlements population establish their own ways of survival. The ways of survival that they establish constitute their living conditions and these informal settlements living conditions, together with the vulnerability of the informal settlements population to the Brown Environmental Problems, are discussed below.

2.2 Living Conditions within the Informal Settlements

The establishment of informal settlements around cities within developing countries is intricately associated with poor living conditions that enforce circumstances of perpetual risk and high levels of vulnerability to Brown Environmental Problems (Hamza & Zetter, 1998; Satterthwaite, 2002; Anan, 2003; Dasgupta et al., 2005). Relevant literature demonstrates that the number and size of informal settlements has continued to grow, despite the poor living conditions, numerous demolitions, fires and natural disasters (K'Akumu & Olima, 2007). The informal settlements continue to grow as these settlements not only provide a place to live; they also offer an entry point to the urban economy (Huchzermeyer, 2004; K'Akumu & Olima, 2007).

The continued expansion and proliferation of informal settlements around urban cities is attributable to the rapid rate of growth of the cities' population, the poverty of the inhabitants, and the deficient housing policy frameworks (Gilbert, 2002; Anan, 2003; K'Akumu & Olima, 2007). Meaning, informal settlements can be, among other things,

distinguished by the poor quality of housing, the poverty of the inhabitants, the lack of public and private services and the poor integration of the inhabitants into the broader community and its opportunities (Gilbert, 2002; Anan, 2003; K'Akumu & Olima, 2007). Furthermore, most informal settlements have extremely high densities resulting in high congestion levels (Gilbert, 2002; Anan, 2003). This has exposed residents; particularly women and children, to severe environmental health risks which critically affect their health and well-being (K'Akumu & Olima, 2007).

The physical appearance of informal settlements demonstrates that informal settlements and poverty are closely related and mutually reinforcing (Dasgupta et al., 2005). It is further specified that informal settlements population rate far lower on human development indicators than other urban residents, they have more health problems (Anan, 2003).

2.2.1 Housing

Informal settlements are usually characterised by self-made shelters. These poor housing conditions, which normally distinguish informal settlements, usually include, the shacks that are built from cheap material like cardboard, scrap or corrugated material, and plastic (Gilbert, 2002). While many of these shacks do not have windows, they are also not ventilated (Hill, 1997). One of the reasons for poor housing conditions within the informal settlements is the population's financial status: the poor do not have access to the financial resources needed to buy houses because the existing housing finance systems are not accessible to them and subsidies for housing are not properly targeted (Gilbert, 2002).

The incomes, of the informal settlements population are, in most cases, too low for formally regulated markets to provide them with permanent housing (Anan, 2003). They, therefore, acted to solve their problems by building their own dwellings (Satterthwaite, 2002). These informal settlements population is usually being evicted because of their illegal stay in those settlements even though the law on security of tenure makes the provision that everyone has a right to a secure home, meaning, families have to have peace of mind that their homes are secure and can not be taken away from them without a legal process that ensures that their rights are protected.

2.2.2 Water

The provision of potable water is a serious issue within the informal settlements as water is only provided to a few through standpipes if it is provided at all (K'Akumu & Olima, 2007). In these settlements, water is usually collected from unreliable sources and stored in drums and other storage facilities for domestic purposes, particularly, for drinking and cooking (Madulu, 2005; Mugisha, 2006).

2.2.3 Sanitation

Due to the lack of water within the informal settlements, there is no adequate sanitation; therefore, the disposal of human waste in these settlements is mainly through pit latrines and other on-site methods (Anan, 2003; Mugisha, 2006; K'Akumu & Olima, 2007). While other households in informal settlements use pit latrines, others use open defecation as a sanitation facility.

2.2.4 Waste Management

Solid waste management in developing countries is characterised by highly inefficient waste collection practices, variable and inadequate levels of service due to limited resources, lack of environmental control systems, indiscriminate dumping, littering and scavenging and, most of all, poor environmental and waste awareness of the general public. But for informal settlements population, due to the lack of formal service provision within the settlements, there are no waste disposal facilities, nor the waste collection facilities (Daniere & Takahashi, 1999). In this regard, informal settlement populations use their waste management mechanisms to manage the waste generated.

They normally use big tins or buckets to dispose waste and when full, they dispose the waste within the settlement, developing dumping sites. However, this dumping of waste within the informal settlements is not only done by the informal settlements population, but also the nearby formal settlements population (Forsyth, 2002).

2.2.5 Energy

Lack of electricity is one of the characteristics of informal settlements. Informal settlement population usually use paraffin stoves, wood stoves and animal waste like cow dung as fuel for cooking and heating purposes (Anan, 2003; Forsyth, 2002; Dasgupta et al., 2005). These means of fuel are usually combusted or used inside the shacks.

2.3 The Nature and Origin of the Brown Environmental Problems

Brown Environmental Problems are associated with pollution, poor sanitation, etc (Forsyth, 2002). The pollution includes, for example, indoor air pollution, outdoor air pollution, water and land pollution (Forsyth, 2002; Dasgupta et al., 2005). Brown Environmental Problems are increasing and are becoming immeasurable throughout the world, especially with the increasing amount of pollution and the lack of service delivery in the informal settlements (Forsyth, 2002; Anan, 2003). Despite the incidences of Brown Environmental Problems in poor households, little attention has being paid to Brown Environmental issues in environmental debates (Forsyth, 2002).

2.3.1 Water Pollution

Among the major Brown Environmental Problems, there is water pollution. Water is described to be of quality due to its physical, chemical and biological make-up (Dasgupta et al., 2005). Water is regarded as of high quality when it is safe to drink, that is when its dissolved and suspended constituents are below a level at which they are harmful (Pearson, 1999).

2.3.1.1 Origin

In informal settlements, the informal settlements population collect and store water in storage containers like drums and tanks, and for this reason the quality of water is lost because of the formation of some particles during their storage period, furthermore, the water is not discarded, it is always filled up, meaning, the storage facilities are not

cleaned often (Mugisha, 2006; Dummer & Cook, 2007). Since there is lack of water in the informal settlements, pit latrines and open defecation are, in most cases, used (Anan, 2003; Mugisha, 2006). The use of pit latrines and open defecation contribute to water losing its biological make-up quality (Pearson, 1999). In addition, lack of adequate sanitation could result in groundwater and surface water pollution (Hill, 1997; Kay, 1999; Madulu, 2005).

When water comes into contact with human excreta, it becomes faecal contaminated due to the presence of coliform bacteria (Pearson, 1999; Dasgupta et al., 2005). The absence of adequate sanitation services not only results in water pollution but also vectors of diseases and flies (Forsyth, 2002). Among these vectors of diseases are mosquitoes, such as *Culex Quinquefasciatus*, which are found in pit latrines due to their preference of polluted waters (Kay, 1999).

2.3.1.2 Vulnerability

Safe water and sanitation are one of the critical determinants of health status (Madulu, 2005). Almost half of the population in urban areas is suffering from diseases associated with inadequate provision of water and sanitation (Anan, 2003). Inadequate water supply can result in water-borne diseases (Kay, 1999). When one drinks water or ingests food that is contaminated with coliform bacteria she/he is very likely to have diarrhoeal diseases and diarrhoea is the prime cause of infant mortality (Pearson, 1999; Dagupta et al., 2005; Dummer & Cook, 2007).

2.3.2 Land Pollution (Waste)

2.3.2.1 Origin

Informal settlements are in most cases overcrowded. This overcrowding within the informal settlements is one of the problems that lead to the high generation of waste, making these areas highly polluted zone (Forsyth, 2002; Anan, 2003; Mugisha, 2006). Some agents of disease transmission are found on the dumping sites, which are the common feature of informal settlements (Hill, 1997).

2.3.2.2 Vulnerability

Lack of adequate solid waste management systems not only increase the risk of polio, enteric diseases, etc., but also creates a magnitude of small artificial breeding sites such as tins bottles etc. that are suitable for dengue mosquitoes (Kay, 1999). Waste or garbage dumping sites also pose a serious danger to people living within or near to the settlements (Hill, 1997; Daniere & Takahashi, 1999). When waste is accumulated on the streets, it attracts vectors of diseases and pests (Dummer & Cook, 2007). Vectors like mosquitoes are the common cause of malaria (Kay, 1999). Since informal settlements also have dumping sites within them, the informal settlements populations have greater potential of being infected with malaria.

2.3.3 Air Pollution

2.3.3.1 Origin

Due to lack of electricity in the informal settlements, informal settlements population use fossil fuel like charcoal, wood, paraffin, cow dung etc., for cooking and heating purposes (Forsyth, 2002; Anan, 2003; Dasgupta et al., 2005; Franklin, 2007). These means of energy result in indoor air pollution.

2.3.3.2 Vulnerability

Airborne infections are among the world's leading cause of death (Hill, 1997). Their transmission is thought to be aided by overcrowding and inadequate ventilation that is common in small shacks in which most low income populations live (Hill, 1997; Mugisha, 2006). Airborne infections in informal settlements result mainly from, for example, indoor air pollution, which results from the use of dirty fuels (Hill, 1997; Colls, 2002; Forsyth, 2002; Satterthwaite; 2002; Anan, 2003; Franklin, 2007) like those mentioned earlier. More than 1.5 million urban populations are exposed to air pollution and these incidents are among the causes of premature death at household level (Forsyth, 2002). These incidents are worse where there is overcrowded accommodation made from temporary materials and use of open fires like candles paraffin stoves, etc (Satterthwaite, 2002; Franklin, 2007).

Furthermore, indoor air pollution is perceived to be having more risk than outdoor pollution (Forsyth, 2002; Franklin, 2007). Respiratory problems are associated with indoor air pollution, meaning people living in the informal settlements are at high risk

because of their exposure to this condition (Colls, 2002; Forsyth, 2002; Dasgupta et al, 2005; Franklin, 2007). Women who spent long periods in poorly-ventilated cooking areas are at the greatest risk (Hill, 1997; Dasgupta et al., 2005). Infants are also highly exposed as they are carried on their mothers' backs while cooking (Mullera, Diabb, Binedella, & Hounsomea, 2003).

Around 2 billion people rely on these fuels to meet most of their energy needs, amounting to around 25% of the total energy consumption in the cities. It is for sure that informal settlements populations are included in this case because of their lack of electricity (Hill, 1997). There is some evidence of a higher incidence of respiratory illness and reduction of lung function, especially amongst children, in homes with such stoves (Colls, 2002; Franklin, 2007).

Acute exposure to indoor air pollution (e.g. smoke) causes slight drowsiness and headaches at low concentrations, irritation of the nose, throat, respiratory tract, fatigue and dizziness (Forsyth, 2002; Mullera et al., 2003). More exposure to this type of pollution can result in depression of the central nervous system (CNS), with symptoms of numbness and nausea being experienced (Hill, 1997; Forsyth, 2002; Mullera et al., 2003). Mental confusion and lack of co-ordination can also occur and a person could become unconscious and die. Chronic exposure to indoor air pollution is associated with severe CNS damage and impaired liver and kidney function (Forsyth, 2002; Mullera et al., 2003).

2.4 The interface of Informal Settlements Living Conditions, the Brown Environmental Problems and Vulnerability

Living in inadequate housing conditions which is coupled with overcrowding, lack of water and electricity, inadequate sanitation facilities and improper disposal of waste is not good for people's well-being (Rakodi, 2002; Anan, 2003). The latter demonstrates the relationship between health and living conditions (Dasgupta et al., 2005). Overall, if the quality of the local environment is very poor, the population will be susceptible to water-borne diseases, malaria and other contagious diseases (Anan, 2003). Meaning, inadequate housing or poor living conditions can put people's health and well-being at risk, in that they are exposed to many diseases associated with Brown Environmental Problems (World Health Organisation Habitat Agenda, 1999). In low-income settlements, environmental problems are found to be a major cause of disease and death (Goebel, 2007).

Under-nutrition continues to be the major problem facing children (Goebel, 2007). This form of malnutrition is caused by poor food intake and increased infections in young children (Wilna, Oldewage-Therona, Emsie, Dicksb, Carin, Napierb, 2006). The underlying causes of poor food intake and infections in young children are household food insecurity, inadequate care for the vulnerable groups such as maternal and childcare, insufficient essential human services including water, sanitation and housing (Wilna et al., 2006; Goebel, 2007). Therefore, poor living conditions results in food insecurity which makes a contribution to the children being undernourished. Literature demonstrates that poverty, malnutrition and chronic household food insecurity are the

major problems observed in communities and confirm the corresponding shifts in poverty and under-nutrition from the rural to urban areas (Lowry, 1990, Wilna et al., 2006; Goebel, 2007).

Estimates show that as many as 31.6% of the urban population in 2001 were living in inadequate housing conditions (Anan, 2003). Child mortality remains a major problem, since 5.8% of children in the developing world's cities die before reaching the age of five years, more than 20% in less developed countries overall, compared with 0.6% in the higher income countries (Rakodi, 2002). In addition, historical evidence also linked poor housing and high infant and child mortality, and also with infectious diseases epidemics (Gray, 1979; Lowry, 1990; Dummer & Cook, 2007).

2.5 Mitigating Vulnerability to the Brown Environmental Problems

One of the first approaches promoted internationally in the 1960s was to have a perspective that squatter settlements are not a problem but a solution (Turner, 1968; Magnin, 1967). That is, an informal settlement is not simply a collection of individual households that have found a solution to their individual housing need, rather invariably a collective effort to secure access to land and shelter (Huchzermeyer, 2003). Collectively, the residents continue to seek the protection of their rights. However, the perspective recognises that informality in itself is no real solution, unless the effective protection of rights is ensured (Anan, 2003; Huchzermeyer, 2003).

It is generally expected that, in terms of service provision, the service providers need to consult with the beneficiaries to ensure that the service to be provided is in need. This should be the case in urban areas/cities. Urban policies should not underscore the constant vulnerability of the urban poor as well as their ability to challenge unfavourable urban policies (Zerah, 2007). Meaning that policies should let people voice-out their needs and exercise their existence by gaining access to the policy processes in order to ensure that their needs are being met (Forsyth, 2002).

Basic services like adequate water supply, adequate sanitation provision, proper waste management, electricity supply and adequate housing, need to be provided to the informal settlements population in order to reduce their vulnerability to Brown Environmental Problems (Anan, 2003; Dasgupta et al., 2005). It is understood that these services can only be provided when the settlement is formal, therefore, it is in this context that the informal settlements be assessed for their environmental condition and be formalised if in an acceptable condition, and if not in an acceptable condition (environmentally), the informal settlement population be relocated to a formalised settlement so that services can be provided and exposure to Brown Environmental Problems be minimised (Mukhija, 2001; Forsyth, 2002; Mugisha, 2006).

2.6 Conclusion

Informal settlements population is vulnerable to Brown Environmental Problems and the vulnerability is due to the living conditions within these settlements (Hamza & Zetter, 1998; Zerah, 2007). This is the reason why some definitions of informality in human

settlements suggest that the situation be looked from the position of those living in the informal settlements. From the position of the informal settlements population, it emphasises the lack of protection against the infringement of rights, rather than the contravention of laws (Huchzermeyer, 2004).

The Bill of Rights of the South African Constitution enshrines the rights to an environment that is not harmful to people's health and well-being, people to have access to adequate housing, and the right of every child to have access to shelter (Republic of SouthAfrica, 1996). However, the vulnerability within the informal settlements means that those residing in such settlements have no protection against the infringement of these rights (Huchzermeyer, 2004). Accordingly, the informal settlements population is vulnerable to Brown Environmental Problems such as indoor air pollution, water and land pollution etc., (Forsyth, 2002; Dasgupta et al., 2005).

The exposure of the informal settlements population towards these Brown Environmental Problems can result in acute and chronic illnesses and can even cause death of people. As mentioned earlier, informal settlements do not have access to basic services such as water, sanitation, electricity, which is one of the reasons of their vulnerability to Brown Environmental Problems. The indices of diseases caused by polluted water, air or both have been rising rapidly in the informal settlements (Anan, 2003).

Chapter 3: Evolution of Informal Settlements in South Africa

3.1 Introduction

South Africa has a high rate of population growth that is impacting on the cities in the form of burgeoning squatter camps or informal settlements (Saff, 1993). Some of the contributions to the mushrooming of informal settlements around the cities include the migration of poor people from rural areas. South Africa has a history of informal settlements formed around the cities; referring back, in 1994, approximately 1.06 million households comprising 7.7 million people lived in informal settlements (Republic of South Africa, 1994). Coupled to this estimates, 720 000 serviced sites that were provided by provincial legislatures under the previous government required upgrading and 450 000 people lived in various, often inappropriate forms of hostel accommodation (Republic of South Africa, 1994; South African Institute of Race Relations, 1994).

In 1995, South Africa's total population was estimated at approximately 44 million with estimates for annual population growth for urban Africans ranging from 2.4% to 3.5% (Statistics South Africa, 2001). According to the mid-2007 estimates from Statistics South Africa, the country's population stands at 47.9-million with a growth rate of 0.8%, an increase from the 2001 census count of 44.8-million (Statistics SA, 2007). In terms of population, 79.6% of the entire population are Africans, and the majority of South Africa's poor are Africans, which explains the reason the majority of informal settlement dwellers are Africans (Barry and Mason, 1997).

The aim of this chapter is to discuss the background history of informal settlements in South Africa and the legal framework, starting from the national level to the local level.

3.2 South Africa and Informal Settlements

South Africa has a higher proportion of urbanized dwellers than elsewhere in Africa and this is due to its relatively high level of industrialization and role as economic powerhouse of the continent (Goebel, 2007). As a result, South Africa's urban population was estimated at 56.9% for the year 2000, with its projected 2010 figure at 64.2% (World Health Organisation, 2003). Even though they are in urban areas, some people live in inadequate housing conditions. Insufficient and inadequate housing for the urban poor has a long history in South Africa, with apartheid-era policies of urban containment resulting in overcrowded and under-serviced townships and informal settlements on the urban periphery (Lemanski, 2009).

According to the 2001 Census, an estimated 16.4% of households nationally were of the informal settlements in South Africa (Goebel, 2007). In 2005, 66% (28 million people) of the South Africa's population was urbanized, and about 13.5% of South African households were forced into informal settlements due to the low priority attributed to permanent housing for Africans (Oldewage-Theron, Dicks, Napier, & Rutengwe, 2005).

Recent estimates shows that nearly one-fifth of urban households in South Africa reside in informal settlements (Lemanski, 2009). Although legal frameworks demonstrate a constitutional right to basic shelter and basic service-provision for the vulnerable, most

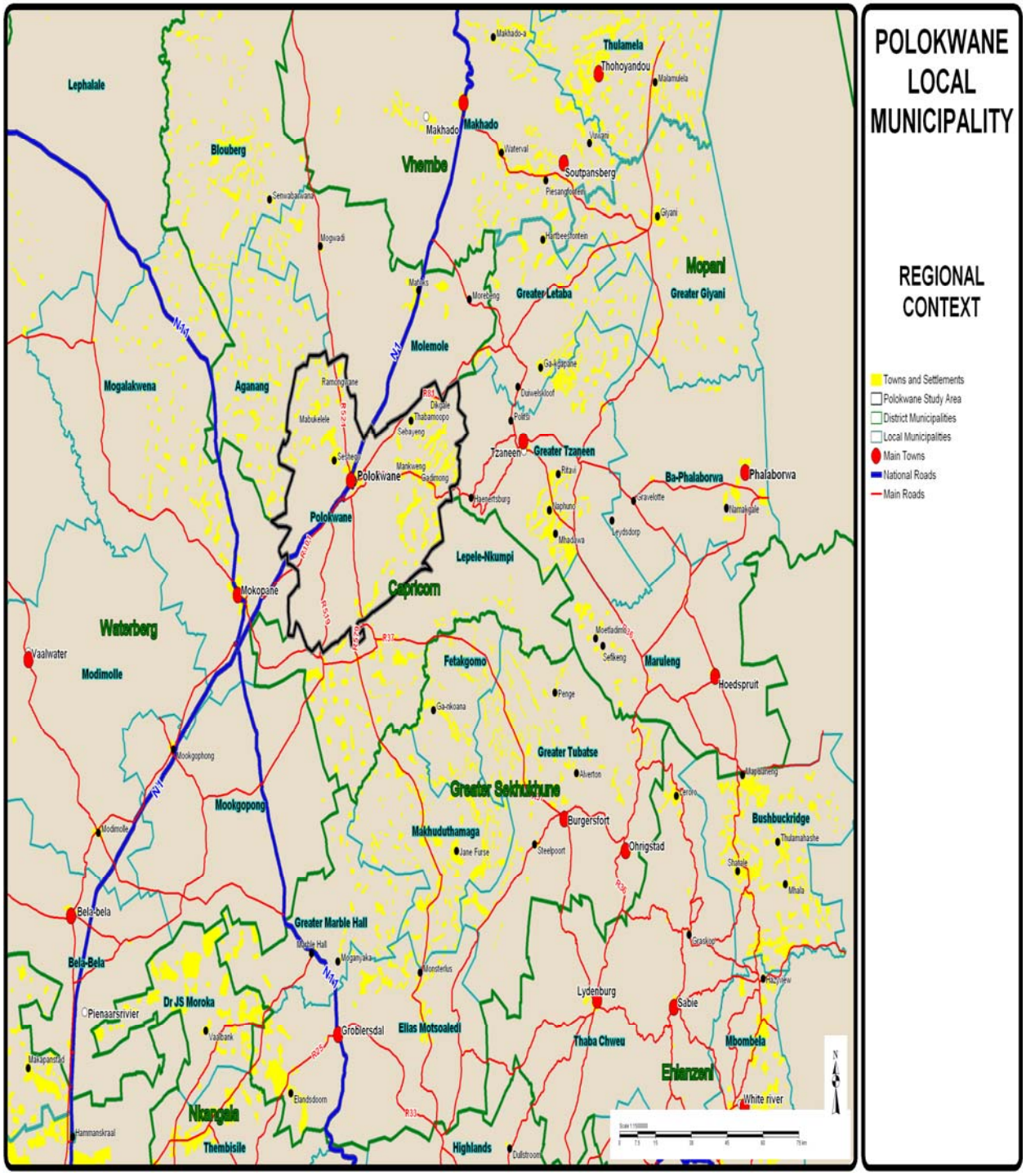
informal settlements remain unserviced and lack tenure security (Huchzermeyer, 2003). The shacks within the settlements are constructed from corrugated iron, metal sheets, boards and wooden planks, ranging in size and quality, with most comprising a single room in which residents cook, eat, sleep, wash and live.

The inhabitants of the informal settlements live in structures that offer only partial shelter against the social elements like crime and environmental elements like rain. The establishment of informal settlements is linked to high levels of unemployment and a growing wage gap between higher and lower sectors of the labour market.

3.3 Limpopo Province and Informal Settlements

Limpopo Province is one of South Africa's nine provinces and is located in the northern part of the country. In terms of demarcation, the province is divided into five districts and each district municipality has a number of local municipalities (Figure 1: Demarcation within Limpopo Province). The districts that are in the province are Mopani (east), Sekhukhune (south), Vhembe (north), Waterberg (west) and Capricorn (centre). Like any other province in the country, Limpopo Province is home to many people and has housed a lot of people including in the informal settlements. The province has a surface area of ±124 000 km^2 and an estimated population of 5 274 800.

Figure 1: Demarcation within Limpopo Province



Like any other province, this province has economic attractions that attract people from the rural areas of the province to the urban areas within the province. This rural-urban

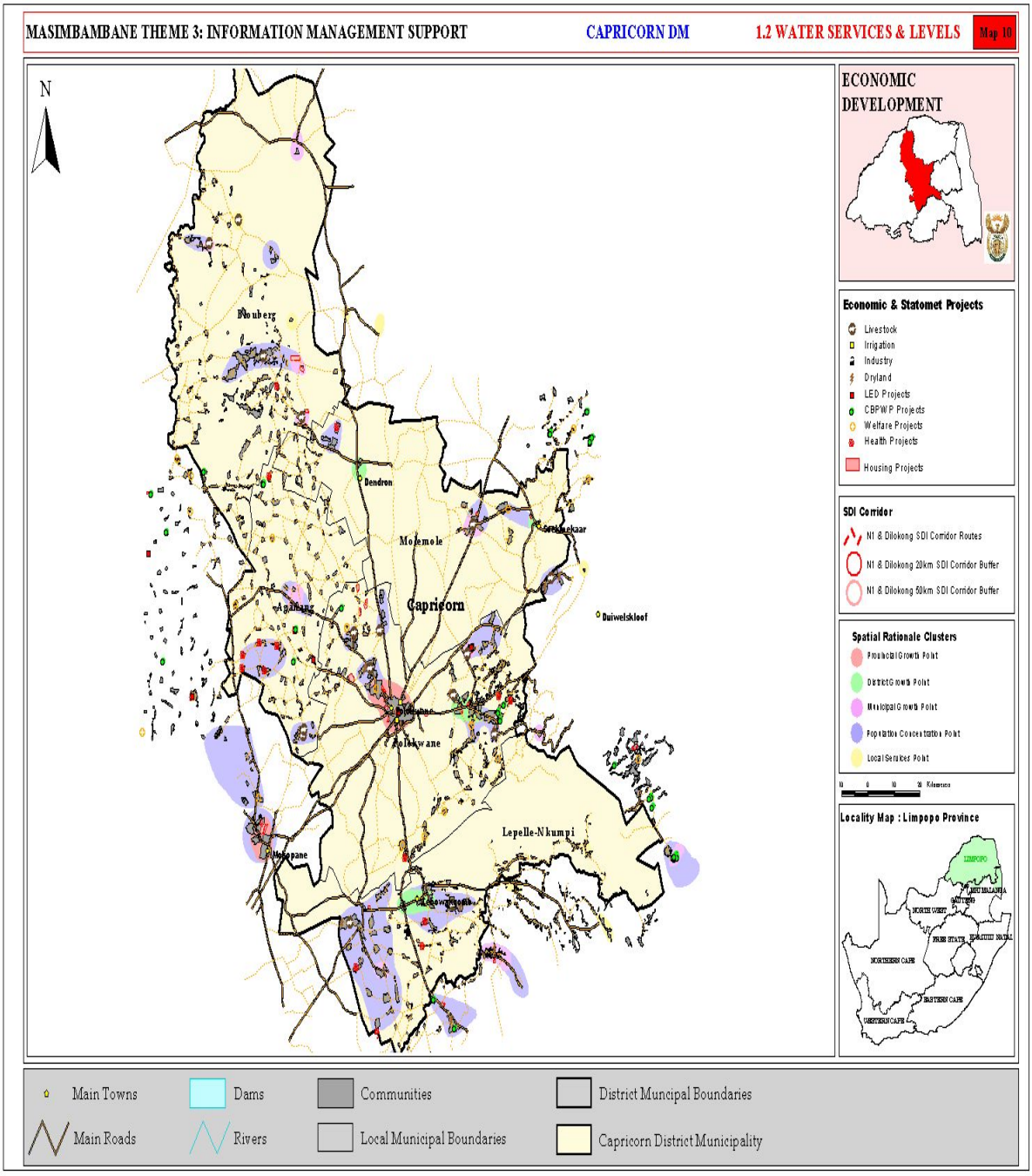
migration results in population increase in the urban areas. Since most people come to the urban areas in search for economic opportunities, some of them tend to squat around the cities in the form of informal settlements. To most poor people, living in the informal settlements is the only way out and the only way to survive in the cities.

3.3 Capricorn District Municipality and Informal Settlements

Capricorn District Municipality (CDM) is one of five district municipalities in Limpopo Province. The municipality is located at the centre of Limpopo Province and it is situated at the core of the province's economic development. The province's capital city, Polokwane City, is located within this district municipality. CDM covers an area of 18 570.30 km^2 and comprises 113 wards within the five local municipalities which it serves under its jurisdiction (Figure 2: Divisions of Capricorn District Municipality).

The local municipalities that are within CDM are Aganang local municipality (1 852.22 km2 and 18 wards), Blouberg local municipality (5 054.84 km2 and 18 wards), Lepelle-Nkumpi local municipality (3 454.78 km2 and 27 wards), Molemole local municipality (3 347.25 km2 and 13 wards), Polokwane local municipality (3 775.21 and 37 wards). CDM has approximately 547 settlements and within the 113 wards, is 285 565 households with an estimated population of 1 243 167 (CDM Integrated Development Plan, 2009).

Figure 2: Divisions of Capricorn District Municipality (CDM)



Even though the district enjoys a comparative advantage in trade, finance, transport and services, it is estimated that over 55% of the economically active population (between the age of 15 and 64) is unemployed (CDM, 2009). In terms of natural resources, the entire

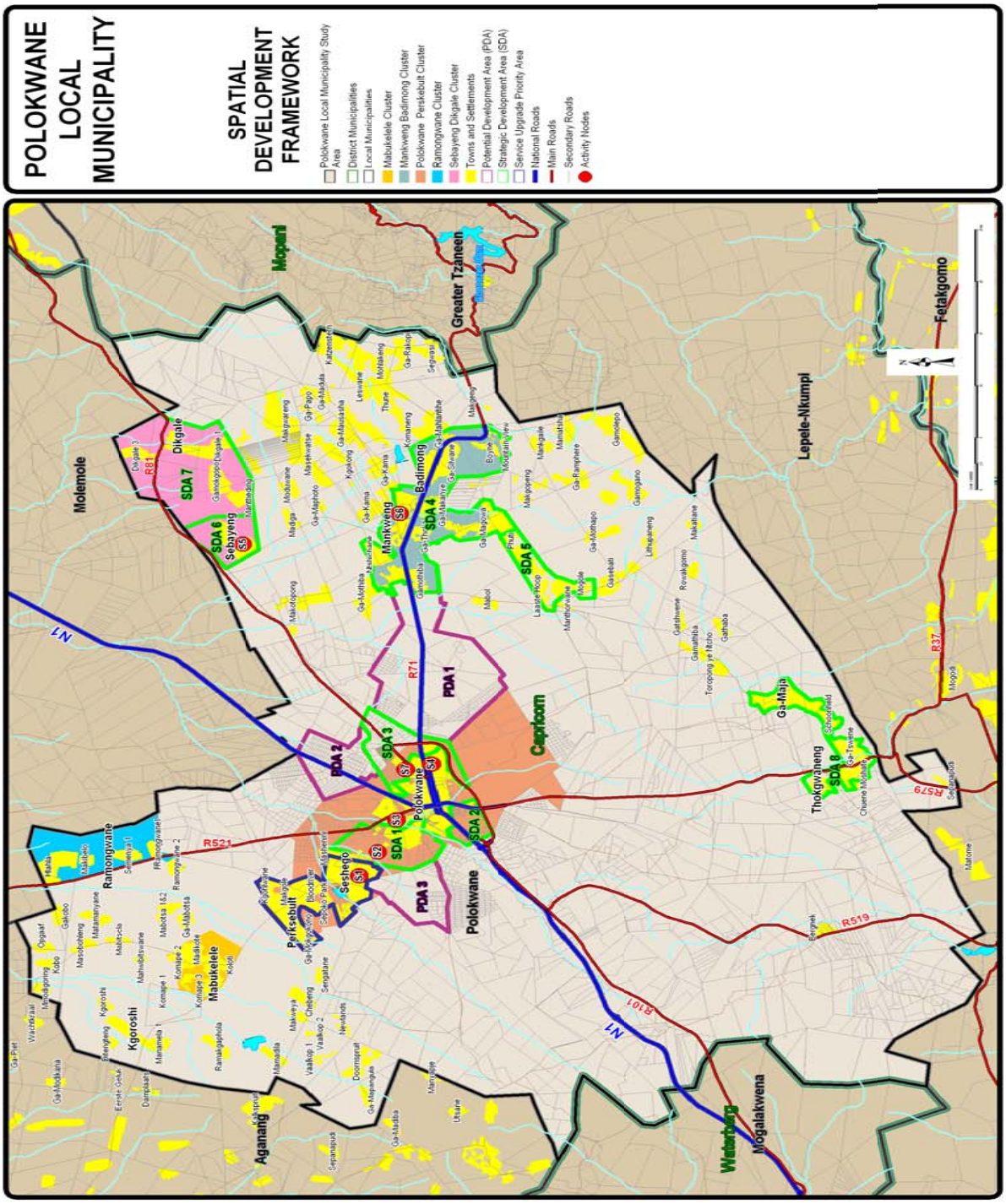
district is water poor and as a result, water that is used in Polokwane City is imported (CDM Service Delivery and Budget implementation Plan, 2009). This scarcity of water in the district makes it difficult to meet the water and sanitation needs of the people. There is a water backlog of 29% in the district and the households that do not have adequate water supply get water from rivers, dams, streams and other natural resources (this 29% does not include households who get water from street standpipes). Due to water shortages in the district, only 35.7% of the population has off-site sanitation (flushing toilets) and 55% of the population with Ventilated Improved Pit (VIP) latrines, leaving 8.8% backlog (CDM IDP, 2009).

The challenge does not end with water and sanitation shortages, but goes further to energy and housing issues. In terms of energy, 18.2 % of the population do not have electricity (CDM IDP, 2009). And housing backlog of 3 25 503 units exists in the district with 112 503 units in urban areas and 213 000 units in rural areas. CDM also have a problem of informal settlements (CDM IDP, 2009). These informal settlements represent approximately 14.32% of housing units and 41.31% of the total area of CDM is subject to land claims.

3.4 Polokwane Municipality and Informal Settlements

Polokwane Local Municipality is located within the Capricorn District Municipality in Limpopo Province. It covers a surface area of 3775 km^2 and accounts for 3% of the province's total surface area of ±124 000 km^2 (Polokwane Local Municipality, 2009a).

Figure 3: Map of Polokwane Local Municipality



With 3% of the surface area, Polokwane Local Municipality houses over 10% of the province's population and it is home to approximately 561 770 people out of

approximately 5.2 million (5 238 300) people in the province (Polokwane Local Municipaly, 2007). The municipality is dominated by African population which accounts for 94.1% of the municipal population, with a large number of people who have no income, a total of about 250 000 (Polokwane Local Municipality, 2007).

In terms of the physical composition, Polokwane Municipality is 23% urban, 71% rural and 6% of the remaining area comprises holdings and institutional, industrial and recreational land (Polokwane Local Municipality, 2009b). Since the re-demarcation of wards, Polokwane Local Municipality comprises 37 wards. Polokwane city in Polokwane Local Municipality is one of the cities that have economic attractions and therefore experiences a flow of people from other areas in the province.

Economically, the municipality is the economic hub of the province (Limpopo), meaning, it is important as far as the economy of the province is concerned. This municipality is divided into layers, the inner layer which is the central part and the outer layer which is the outskirt (Polokwane Local Municipality, 2009a). At the central part is Polokwane economic hub which comprises the Central Business District, industrial area and a range of social services and well established urban areas servicing the more effluent residents of Polokwane (Polokwane Local Municipality, 2009b).

On the outskirt, there are several areas comprising less formal areas which are experiencing a massive influx from the rural-urban migration trends. People move from their original places of residence to reside on the outskirt of Polokwane Municipality because of the attractions of the central part of the municipality which is economically growing since, according to 2004 statistics, Polokwane's economy is dominated by the

tertiary sector of the market, and if it was dominated by the primary sector, there would not be such a large influx (Polokwane Local Municipality, 2009b).

The 1996 to 2001 growth figures showed that the municipal population increased by 16.39%, which means an annual average population growth rate of 3.27% (Polokwane Local Municipality, 2009a). Polokwane Municipality's population size of 561 770 is also an increase from 2001's population size of 508 280 (Polokwane Local Municipality, 2009a). This means that in the period of five and half years (2001-mid 2007) the population increased by 53 490 which is 1.7% growth (Polokwane Local Municipality, 2007). The number of households also increased from 124 980 (2001 Census) to 130 360 in 2007.

Statistics shows that while there is an increase in population in Polokwane Municipality's urban areas, there is a decrease in population size in some rural areas, proving that people are moving from rural areas to urban areas around Polokwane. The increase in population around the urban cities is ascribed to the influx of people from other rural areas, people who are in search of economic activities as the perception of employment and economic stability exists in Polokwane.

In terms of service provision, Polokwane local municipality has the responsibility to serve four clusters within its municipal area. These clusters include Seshego, Mankweng, Molepo-Maja and Dikgale. Among these main clusters, Seshego is one of the clusters that experience an enormous influx from rural-urban migration (Polokwane Local Municipality, 2009b). Seshego is located in the west of Central Business District (central part) and railway line. Of all the clusters, Seshego is the one that is closest to the

economic core and therefore has the best access to the economy of Polokwane. Being closest to Polokwane' economy, Seshego happens to be one of the areas that are affected by this rural-urban migration. Seshego has a total population of 152 096 (Polokwane Local Municipality, 2009b). The municipality has to serve all these four clusters within its municipal area. It has to provide services as part of its legislative requirement.

3.5 Legal Framework and Service Provision within the Municipality

The South African government has developed legal frameworks that govern service delivery within the country. The developed legal frameworks are applicable to all spheres of government. These frameworks include numerous White Papers, Acts in the Bill of Rights and Policies. As one of the municipalities in the country, Polokwane local municipality has a Constitutional responsibility to adhere to all the duties assigned to it. It is obliged to provide services to all people within its area of jurisdiction. Since the legal frameworks give service delivery direction to the municipality, below is the discussion based on the gap between legal framework and service provision within Polokwane local municipality.

3.5.1 Housing

In South Africa, the right of access to adequate housing is modelled on the right to housing in Article 11 (1) of the International Covenant on Economic, Social and cultural Rights (ICESCR), which provides that the State has a duty to recognise the right of everyone to adequate housing. Among the seven elements that are identified by the

ICECSR, the following are of particular importance: security of tenure, access to service delivery, habitable housing, and accessible housing.

Shelter is one of the important human basic needs and it makes a contribution in defining human security. Section 26 of the South African Bill of Rights provides that everybody has a right to have access to adequate housing the (Republic of South Africa, 1996a). In addition to providing this right for every one, children are afforded extra protection in Section 28 of the constitution, which provides that every child has the right to shelter the (RSA, 1996a).

In Polokwane Municipality, the housing backlog is a very serious problem. This problem is aided by the growing influx of people from rural-urban migration, and this growing influx has contributed to the escalating housing needs throughout the city. A total of 30 579 households in the city is still on the waiting list (Polokwane Local Municipality, 2009a). In terms of total population within Polokwane Municipality, Seshego ranks the first with 22 693 households. Furthermore, 35 627 households in this Municipality are in the informal settlements, and Seshego is the third with 350 households located in such settlements (Polokwane Local Municipality, 2009a).

3.5.2 Water

The Republic of South Africa has recognised water as a fundamental human right in the Bill of Rights of the Constitution of South Africa, 1996. The Constitution assigned the local government the responsibility of providing access to water services to all. A range of municipal legislations have been developed and implemented since 1994 to transform

the local government. South Africa has passed several legislations for water; among all there is the South African Constitution, 1996, Section 27. The Section provides that everyone has the right to have access to have sufficient food and water. It further adds that the state must take reasonable legislative and other measures, within its available resources, to achieve the progressive realisation of each of the rights.

Additionally, the Water Service Act assists by obligating the municipalities to undertake their roles as water service authorities and to look after the interest of the consumer (RSA, 1997). In making sure that the right of access to basic services for all citizens is met, the South African government established a Free Basic Water policy to ensure equitable access to water. The policy stipulates that households are entitled to up to 6 000 litres of clean water every month at no cost. Those who use more than the stipulated volume must pay for the additional amount (RSA, 2001). The calculation of free water is based on an assumption of household unit containing eight members, providing each person with 25 litres of water per day (RSA, 2001). The Strategic Framework for Water Services was also developed with the aim to reduce the backlog on basic service provision.

There is a saying that ‘water is life’. Water is regarded as life because it is very important for the survival of human beings. Polokwane Municipality states that water is the most important resource to encourage both social and economic development within the communities. In Polokwane, there are ten areas where households access water, and this include inside the dwelling, inside the yard, from access point outside the yard, borehole, spring, dam/pool, river/stream, water vendor, rain water and others (Polokwane Local

Municipality, 2009b). There is no community in the municipality that is without water, however, there are 71 areas that are below the Reconstruction Development Programme (RDP) standard. It means that 21% of households do not have access to water at RDP level (Polokwane Local Municipality, 2009b).

3.5.3 Sanitation

Using a latrine is a more personal and private thing, meaning that sanitation is dignity. Beside its dignity part, the type of sanitation facility that is available to a human being determines his/her level of exposure to sanitation related diseases. Therefore, the availability of sanitation facilities not only improves people's dignity but also promotes their health and well-being. The Department of Water Affairs and Forestry stated in its White Paper on Basic Household Sanitation that the government re-affirms its commitment to ensuring that all citizens have access to basic sanitation by 2010 (RSA, 2006). The programme focuses on the eradication of the sanitation backlog in the rural, peri-urban and informal settlement areas by the year 2010.

Having said that, only 7.1% of households were using pit latrines with ventilation in 2001, leaving the amount of 43.4% of households using pit latrines without ventilation in the same year, and 13% of household with no latrines at all (Polokwane Local Municipality, 2009b). These leave a total of 35% of households without access to sanitation at RDP level (Polokwane Local Municipality, 2009b). According to the community survey, the municipality has not made a significant change as far as the provision of sanitation services is concerned.

This stable percentage comes from the fact that there is still a number of households without improved sanitation facilities. In 2007, there were 4.8% households with ventilated pit latrines, 50.8% households with pit latrines without ventilation; this figure is a disappointing increase from 43.4% in 2001, and there is 8.3% of households without latrines at all (Polokwane Local Municipality, 2009b). The backlog of 8.3% of households having no latrines could be meaning that about 10 870 households within the municipality are without access to sanitation facilities at all (Polokwane Local Municipality, 2009b).

3.5.4 Electricity

The Free Basic Electricity (FBE) policy is directed at improving electricity availability for the poor and as a result poor households have to receive a minimum amount of 50 kw/h of electricity per month for free. Free electricity services are specifically targeted at poor households. These households will be provided with a small amount of electricity for free but they must pay for any electricity that is used over the basic service level.

Poor indoor air quality is widely recognised as a problem in South Africa, mainly as a result of the reliance of many low-income households on fossil fuel combustion for heating, cooking and lighting (Muller, Diab, Binedell, Hounsome, 2003). Statistics shows that, there were approximately 5 million households in South Africa using fossil fuels for domestic purposes in 2000 (Statistics, 2000).

In 2001, 4.9% of households used paraffin for lighting and 29.9% used candles in Polokwane local municipality. Even though there are some improvements in service

delivery, 3.2% still use paraffin and 14.9% still used candles for lighting in 2007. The backlog of electrification in Polokwane Municipality is 45 000 units, and in this 45 000, 3% is Seshego.

3.5.5 Refuse Removal

Refuse removal is one of the critical services that should be rendered. The availability or unavailability of this kind of service is very crucial since it has a direct impact on the quality of life of the citizens, their health as well as their physical environment. People living in the informal settlements are not receiving this service since they are not formally recognised. Even though Section 24 (a) of the South African Constitution guarantees that everyone has the right to an environment that is not harmful to his/her health or well-being, according to the survey the community survey done in the municipality in 2001, 6.9% of households had no rubbish removal and disposal, and five and half years later when the survey was done again in mid-2007, the percentage remained the same, 6.9% (Polokwane Local Municipality, 2009a).

3.6 Conclusion

The South African Constitution through the National Environmental Management Act guarantees an environment that is not harmful to people's well-being. After studying the figures of Polokwane Municipality in terms of services, there is a doubt that people in the informal settlements are benefiting from these legal provisions. Basic human rights only become meaningful once it is accepted that rights have to be worked on towards making

them real. This means, on the other hand, that the state must follow the principles laid down in the constitution. Citizens and communities, on the other hand, must demand that their rights be respected and must demonstrate that they take up the responsibilities that come with the rights.

Chapter 4: Presentation of the findings on Vulnerability to Brown Environmental Problems within the Informal Settlement in Seshego

4.1 Introduction

Zone 6 is an informal settlement in Seshego. This settlement is also known as Rainbow Park-Shushumela. Like other informal settlements, Shushumela comprises people who are in need of a place to stay, but unable to find one due to various reasons, one of them being the affordability issue. Shushumela settlement does not have basic services. The settlement is characterised by, among others, self-made shelters, lack of sanitation facilities, inadequate water supply, lack of electricity and no waste removal services. For the past few years, the residents have been promised to be relocated to another settlement as they are deemed to be staying on a business site. The problem is, it is not known when they will be relocated. Therefore, while still waiting for the municipality to do the relocation, the residents have to continue living without basic services.

Given the living condition within the informal settlements, it became necessary to undertake a study on the relationship of informal settlements and Brown Environmental Problems. The aim being to investigate the vulnerability to Brown Environmental Problems within the informal settlement, and Shushumela was the preference. Therefore, the aim of this chapter is to present the results of the study that was conducted in Shushumela residence within Seshego. To achieve this aim, the study had to follow the

objectives stated in chapter one. In this chapter, the objectives are transformed into themes, that is, this chapter has four sections that will assist in meeting the initial aim. The four sections of this chapter are the discussion of the living conditions within Seshego's Shushumela; types and origin of the Brown Environmental Problems within Shushumela informal settlement; the prevalence rate and the level of vulnerability of Shushumela population to Brown Environmental Problems and the conclusion drawn from the discussed results.

4.2 Living Conditions within the Seshego's Informal Settlement

Shushumela settlement has the characteristics of most informal settlements. Most of the residents interviewed in Shushumela have being staying in settlement for about 2 to 4 years, majority of them being women (52.5%). The people staying in this settlement are in need of a place to stay but cannot afford decent accommodation. For Shushumela population, the affordability issue may be influenced by the fact that 11% of the households interviewed have no income at all. Even though 60% of breadwinners are employed, most households' total monthly income is between R501 and R1200. The amount of income that these households generate might be subject to their educational background since 43.6% of the heads of the families and 49.5% of the majority of the household members have obtained only secondary education. With total monthly income ranging from R0 to R1200, most households have 3 to 5 dependents.

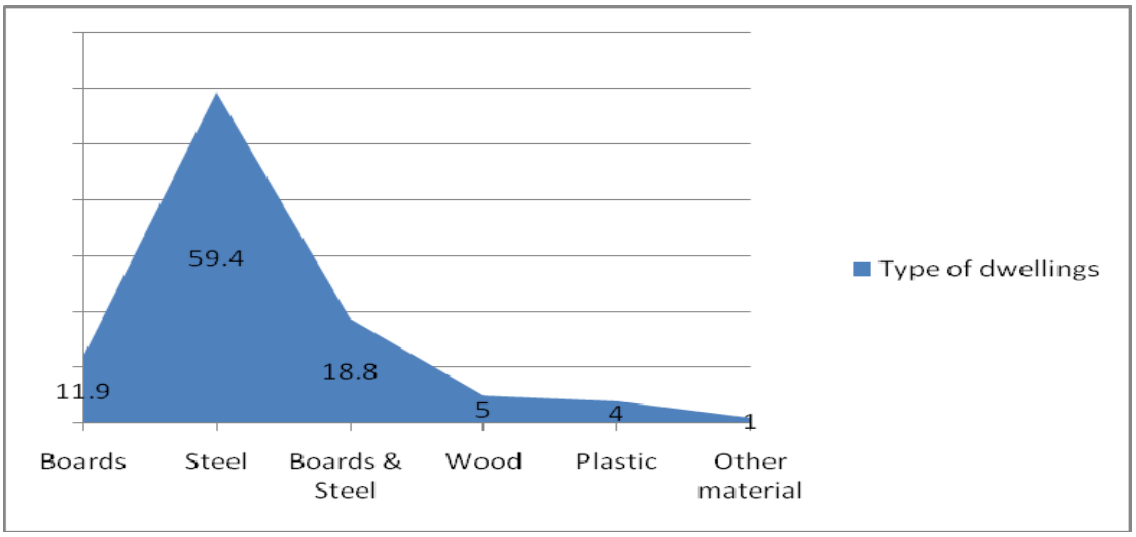
As already mentioned, Shushumela informal settlement, like most informal settlements, does not have basic services. Its residents stay in shacks. Due to lack of basic services,

the residents have established alternative ways of living without electricity, adequate sanitation and waste removal services. The alternative ways that are used in Shushumela informal settlement are discussed below.

4.2.1 Form of Dwellings within Shushumela Informal Settlement

Shelter is one of the important human basic needs. People need shelter to feel safe, not only from things like crime but to environmental conditions also. To Shushumela residents, safety is not guaranteed. The residents stay in shacks, and most of them call a shelter made from steel "home" (Figure 4: Type of dwelling and the material used to build the dwellings).

Figure 4: Type of dwellings and the material used to build the dwellings



Most of these shacks have tiny rooms that range from 1 to 3. Approximately 36% of the shacks have 4 to 6 household members who share the space within these 1 to 3 rooms. The situation of having more than two people staying in a 1 to 3 room shack worsens the

vulnerability of the households' members to Brown Environmental problems. It worsens their level exposure, mainly as a result of the sleeping arrangements that their condition forces them to practice. Some people have to sleep in the kitchen, a place where they prepare and store their food and water. Even if they sleep in the bedroom, due to their capacity, some of them are forced to sleep on the floor, inhaling dust on the floor that is not plastered or exposed to coldness on plastered floors.

The internal make-up and the living arrangements in the shacks is not the only thing that exposes the household members to Brown Environmental Problems, but the external make-up also. The material that is used to build the dwellings does not protect the residents from environmental conditions (Figure 5: Shack built from plastic material, Figure 6: Shack built from steel (zinc), Figure 7: Shack built from boards).

Figure 5: Shack built from Plastic Material

The shack is built from plastic material (Figure 5: Shack built from plastic material). The plastic material used to build the shack allows rain and dust to seep into the shack. The material is easily destroyed by among others, the weather conditions, for example, the exchange of rain and hot conditions. The plastic also increases the amount of heat in the shack. When it is hot, the plastic material affects the required food storage time and therefore contributes to the loss of quality in food. That is, foods rot easily when it is hot. The plastic is also not safe as it catches fire quickly.

Figure 6: Shack built from steel

The shack is not only built from steel but built from rusted steel, corrugated metal (Figure 6: Shack built from steel (zinc). The metal itself and the manner in which it is placed on the sides makes it easy for rain to seep in through the joints and holes when it is raining. The structure also makes it easy for dust to spread in during windy conditions and it looks like it can easily be blown down by wind.

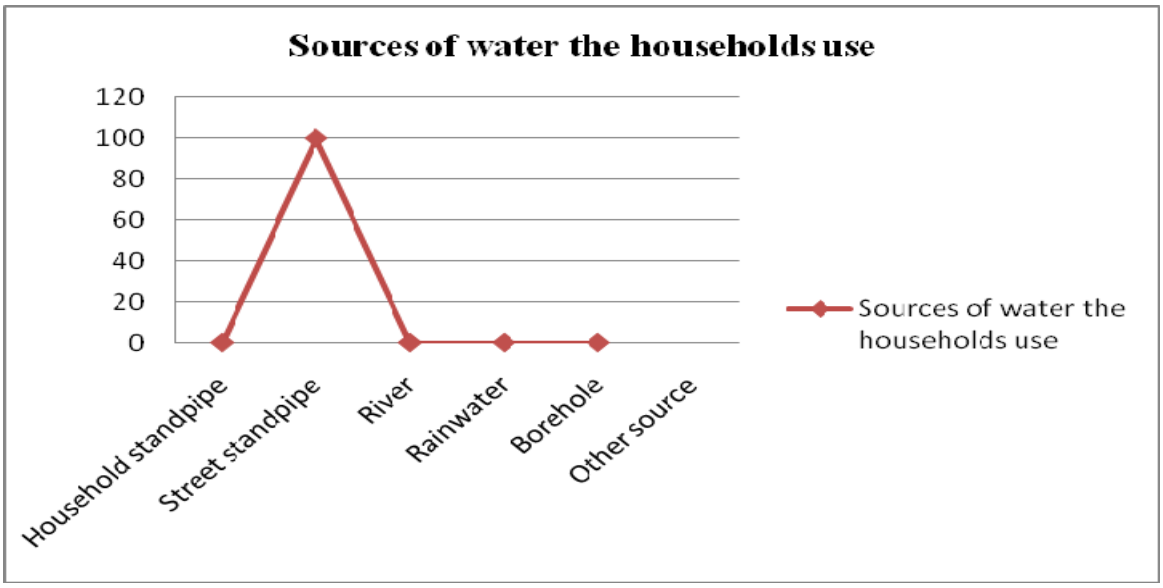
Figure 7: Shack built from boards

This is a shack that is built from boards (Figure 7: Shack built from boards). There is no safety guaranteed from shacks that are built from boards. These types of shacks are not safe as the boards absorb water when it is raining. The water absorption by the boards makes it cold in the shack. Due to this water absorption, the boards result in smell when it is hot. Living becomes difficult for household members during raining and hot seasons as they have to put up with the coldness and the smell.

4.2.2 Source of water in Shushumela

Water is an important human basic need. People need water to do most household chore, these include among other things cooking, cleaning, washing and bathing. Residents at Shushumela do not have water in their households. They collect water from the standpipes that are on the streets (Figure 8: Sources of water the households use).

Figure 8: Sources of water the households use



The residents use 25 litre buckets and other facilities that they can use to collect water. The collected water is then stored inside drums, buckets and containers for easy access when it is needed. The stored water is used for all the domestic purposes, making it necessary to for household members to conserve water. That is, the members have to make sure that they use a small quantity of water when doing other household activities like washing dishes and bathing. Some even make their children to share water when bathing, ether by taking a bath at the same time in one bathing facility or by one taking a bath after another using the same water. This sharing of water for bathing exposes people to Brown Environmental Problems.

All households collect water from a street standpipe. These standpipes are placed in a way that they are supposed to serve multiple households since there is only one standpipe per street. Due to the dependence of a number of households on one standpipe, the

surrounding areas of the standpipes are always as the standpipes are most of the time in operation.

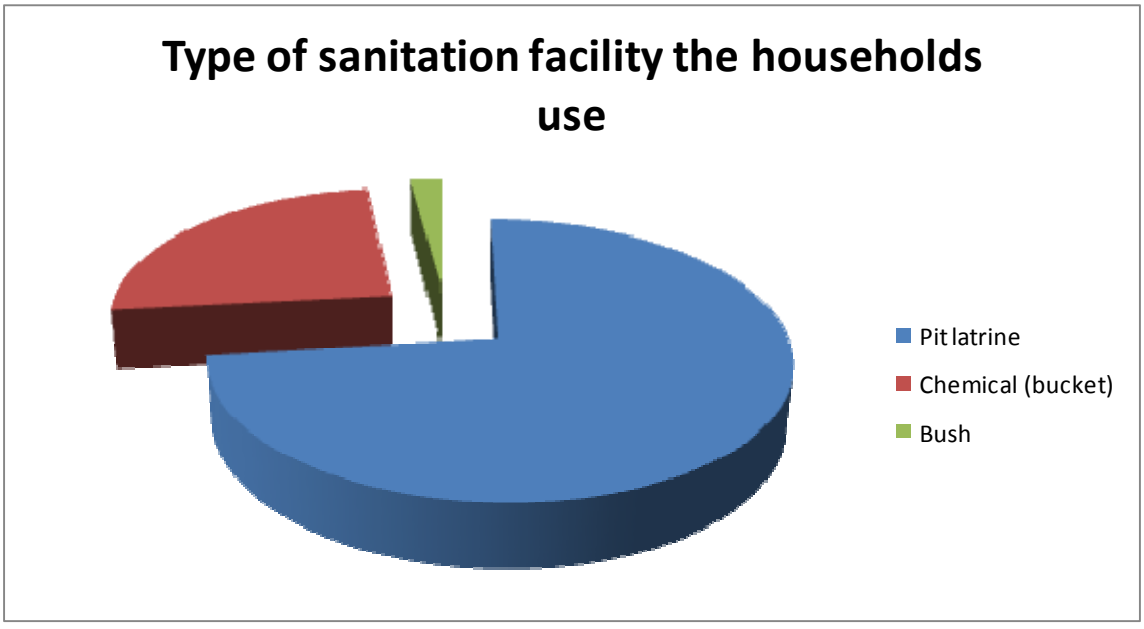
Figure 9: Street standpipe in Shushumela

This is one of the street standpipes that households use when they need water **(**figure 9: Street standpipe in Shushumela). The surrounding area is always wet due to lack of drainage. During water collection, the water collection containers are put on the bricks to avoid the water on the ground and so that the container can properly balance on the ground. This mechanism that the residents use for collecting water makes possible for households to not only bring water to their homes but the germs and bacteria also.

4.2.3 Means of sanitation in Shushumela

With lack of water within the households at Shushumela, there are no off-site sanitation facilities (flushing toilets). The residents use sanitation facilities that do not require water for operation **(**Figure 10: Type of sanitation facility the households use). Most residents who use a bush as a toilet, have been staying in the settlement for more than three years. Lack of space is the main reason for using the bush as a toilet. The households no longer have sufficient space to dig pits within their yards as they have dug before. That is, these households, had at least three toilets that are full within one yard. When the toilet is full, it is covered either with soil or any other material that can be used, and another one is dug and so forth.

Figure 10: Type of sanitation facility the households use



Even though Shushumela is an informal settlement, Polokwane municipality have seen the sanitation situation in the settlement and decided to assist the residents with toilets.

The municipality then brought chemical toilets to the settlement (Figure 11: Street bucket (chemical) toilet used in Shushumela).

Figure 11: Street bucket (chemical) toilet used in Shushumela

The chemical toilets were put on the streets by the municipality so that the residents can use them. Each and every street has only one toilet. The motivation behind the placement of only one toilet per street it is not known. The assumption is, either to assist the households that do not have toilets at all, or the toilet is supposed to be used by the all the household members in that street. Chemical toilets need regular maintenance, but in Shushumela that is not the case. The toilets are not cleaned; it takes a long time for the municipality to empty the toilets. The nearby households experience smell and flies from the toilets. This exposure is not good to their health as it makes them vulnerable to Brown

Environmental Problems, like sanitation related illnesses. Other households do not use the chemical toilets, but pit latrines (Figure 12: Pit latrine used in Shushumela). Pit latrines are used by most residents in this settlement as they are the ones that are easily accessible.

Figure 12: Pit latrine used in Shushumela

Pit latrines that are in this settlement are poorly structured, making them unstable. When the toilet is unstable, it is not safe to use, especially by children. An unstable toilet does not fulfil the dignity part of sanitation, for example, the toilet is built from rust and corrugated steel, and the plastic on the side is used as the door (Figure 12: Pit latrine used in Shushumela). These toilets are not ventilated, making it easy for flies and smell to escape from the toilets into the shacks. The other problem that the households are facing is that the toilets full-up quickly. When the pit is full, they have to dig another pit and

close the full one with either the soil or any material that can be used. The same thing happens again until the only space available is the surrounding areas near the shack.

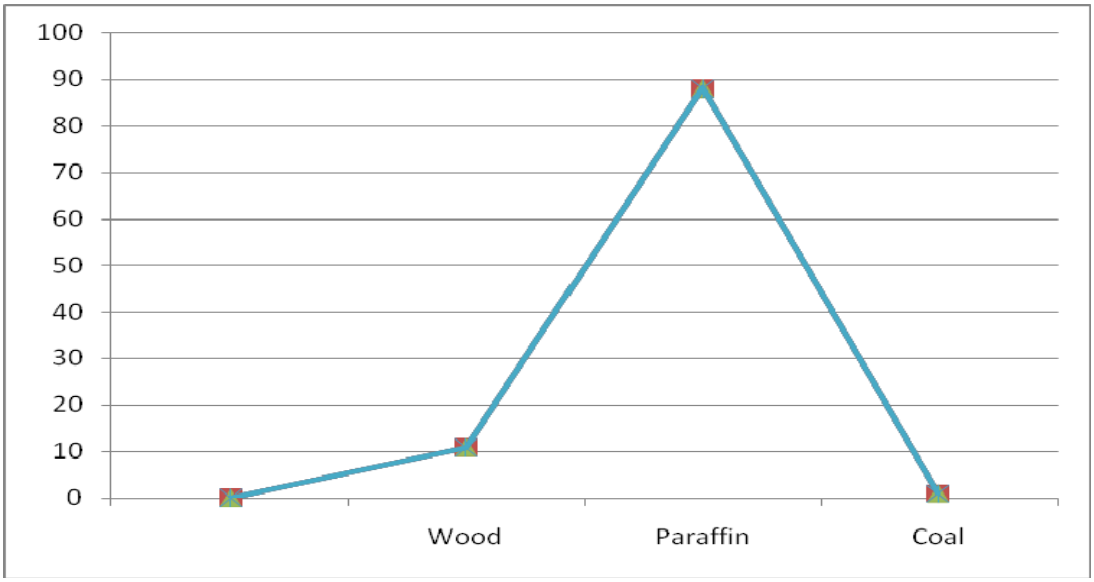
4.2.4 Energy efficiency within Shushumela settlement

Energy as a term includes lot of things. In this study, the term 'energy' is limited to electricity. Electricity is important in many ways, like lighting, heating and cooking. To Shushumela residents, life is hard as they do not have electricity. Due to lack of electricity in the settlement, the residents rely on sources of fuel like paraffin, wood, coal and candles as means of energy. Even though some residents are not employed and those who are employed do not earn much, they still have to buy paraffin to prepare food, and candles for lighting (Figure 13: Source of energy for cooking & lighting).

Figure 13: Source of energy for cooking & lighting

In this settlement, paraffin acts as a multiple source of fuel, for cooking, heating and for lighting. Due to the high demand of paraffin within the settlement, some residents took an initiative of supplying paraffin to the residents with the aim of easy access and benefit (Figure 13: Source of energy for cooking & lighting). Paraffin is always in demand because people have to eat (Figure 14: Sources of energy for cooking).

Figure 14: Sources of energy for cooking



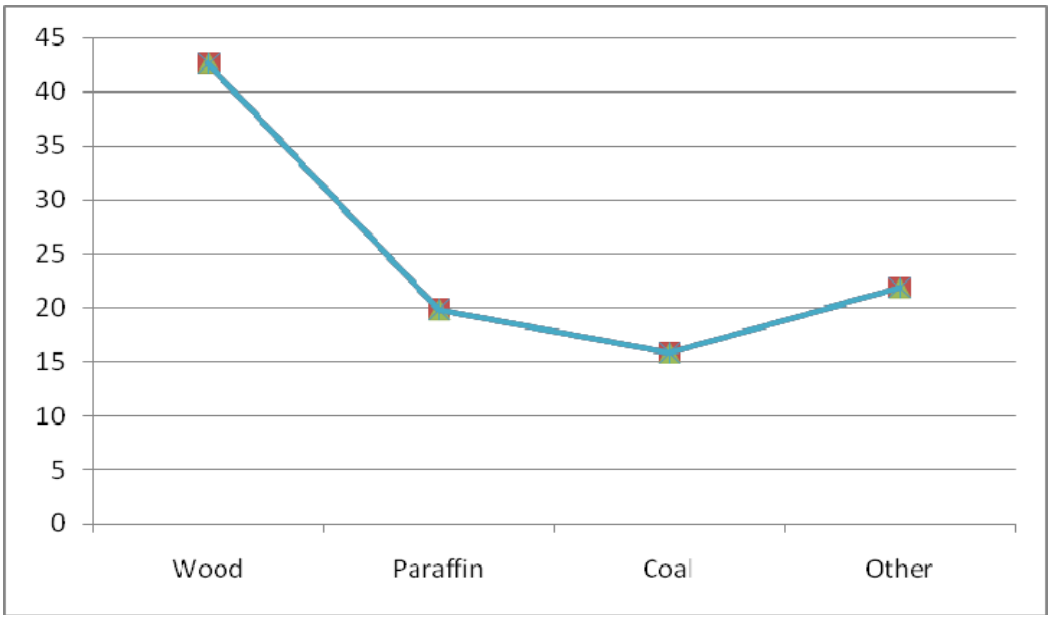
Most households use paraffin for cooking. The reason behind the use of paraffin is that even though they have to use money to have it, it is easily accessible. Other than the fact that they always have to buy paraffin, the household members mostly complain about chest pains due to the inhalation of the smoke, and sore eyes due to the direct contact with the smoke. Others feel nausea minutes after putting the paraffin stone on. Other households do not use paraffin for cooking due to the affordability issue or they can not stand the site effects of paraffin; therefore, in most cases, these households use wood for cooking (Figure 15: The use of wood for cooking).

Figure 15: The use of wood for cooking

Some households use wood for cooking. The fire is usually made outside the shack so that the smoke can be able to escape to the atmosphere (Figure 15: The use of wood for cooking). These households think it is difficult to always have to make fire when one has to cook. This situation forces them to cook once a day, eat, and leave other food for the next meal-time. The households normally cook at night and leave food for the following day. By the time they eat the left-over food, the food will be dry and cold. The condition of the left-over food exposes them to Brown Environmental Problems like unhealthy food-related problems as the food stayed all night without refrigerator. Additionally, some shacks only have 1 to 2 rooms; therefore, the household members sleep, bath and do other activities with food in the room. These other activities include sweeping, where dust goes to the food.

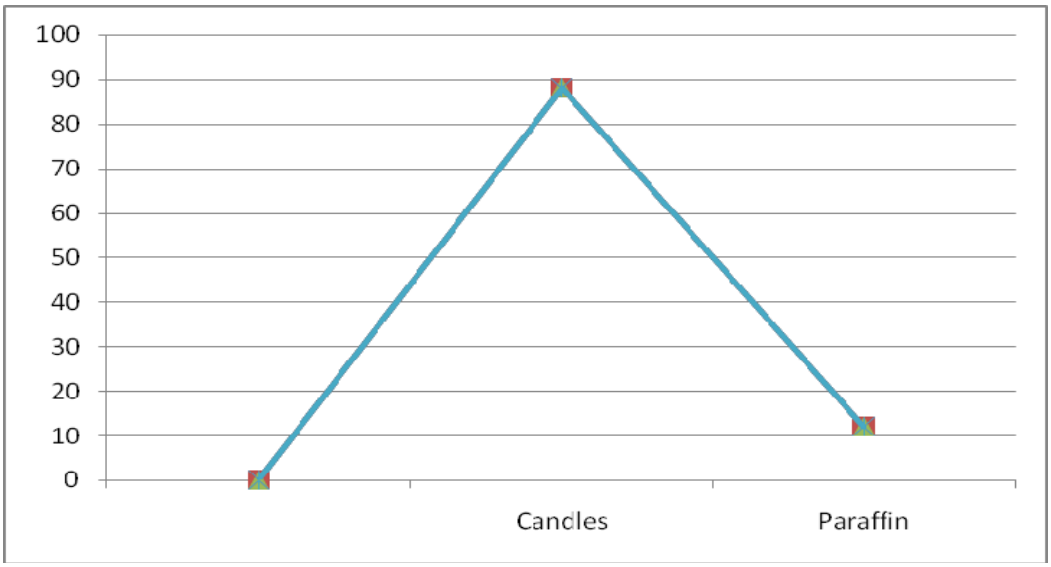
Wood is not entrusted in cooking only, but other household also use wood for heating in cold days (Figure 16: Sources of energy for heating).

Figure 16: Sources of energy for heating



Wood is mostly used to make fire when it is cold. Households use coals and wood in the coal and wood stoves, but households that do not have these stoves, make fire on the ground, outside the shack. Like when cooking, the fire is normally made outside the shacks to allow the smoke to escape to the atmosphere. Some households use blankets as sources of heat. They cover themselves with blankets to warm themselves. Paraffin is also used to generate heat. Household members usually sit around the paraffin stove when it is cold. Others just put the stove on to heat the entire room. As already mention, paraffin is multifunctional in this settlement. The other importance of paraffin in the settlement is lighting (Figure 17: Sources of energy for lighting).

Figure 17: Sources of energy for lighting

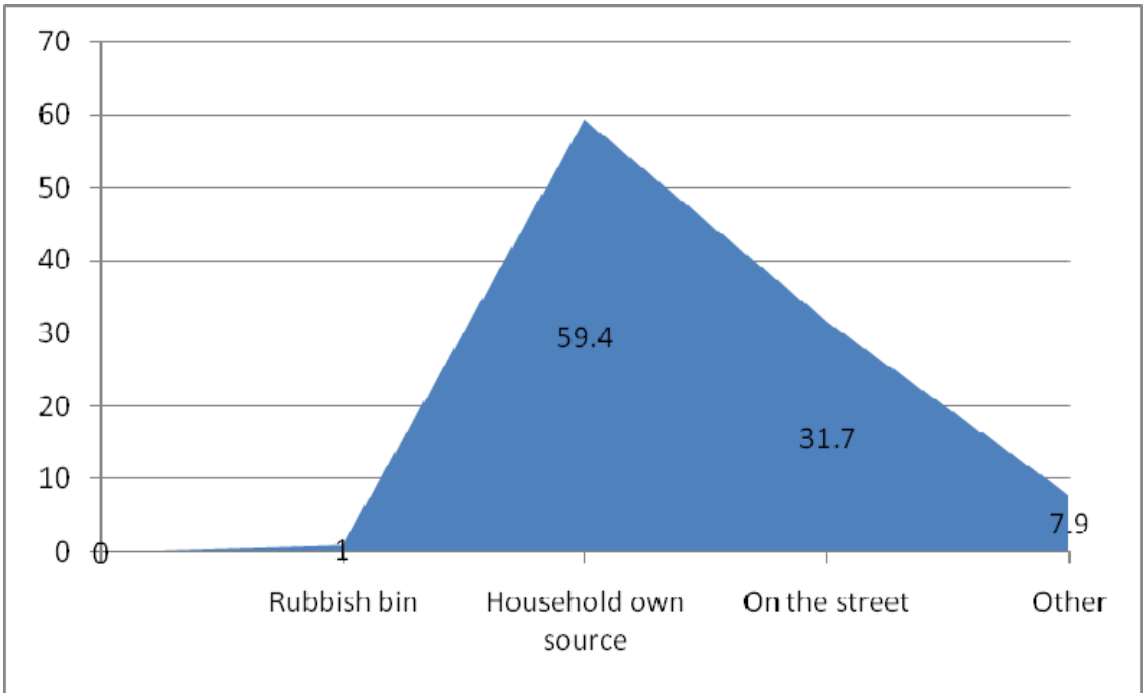


While few households use paraffin for lighting purposes within the settlement, most of the households use candles. Residents at Sushumela use only paraffin lamps and candles as sources of light in their shacks. Candles do not have serious health problems, but they can be very dangerous to the households and the community at large. They can be dangerous in the way that if forgotten, they can burn the shacks and due to the closeness of the shacks, one burning shack can lead to another.

4.2.5 Waste Management mechanism used in Shushumela

Waste is something that is produced on daily basis. It can not be avoided, but it can be managed. To Shushumela residents, waste management is one of the problems that they are facing as there are no waste removal services in the settlement. Households established alternative waste management mechanisms to help them in managing the waste (Figure 18: Waste management mechanism used).

Figure 18: Waste management mechanism used



As waste management mechanism, the household own source includes small pits that are dug in the yards to dispose waste, buckets and any other way that the households use in the yards. The residents dig small pits in their yards and dispose waste inside those pits. When the pits are full, the waste within the pits is burnt. Other households use old buckets for waste disposal and when the buckets are full, they dispose the waste on the street waste dumps (Figure 19: Waste dump used as waste disposal facility in the settlement).

Figure 19: Waste dump used as waste disposal facility in the settlement.

Some residents dispose waste directly to the street, they do not use buckets nor pits. Other ways that the households use is disposing the waste in the river. There is a river within this settlement, so, residents who stay near the river use it as their disposal facility (Figure 20: Dirty river within the settlement).

Figure 20: Dirty river within the settlement

The river that is within the settlement is filled with smell. By disposing waste in this river adds to the smell that the river already has. The river also contains dead fishes, showing that it is not in a good state. The smell that comes from the river is not good for human being. This situation of smell and the presence of mosquitoes in the river put people's health at risk of water-borne and vector-related diseases.

4.3 Type and Origin of Brown Environmental Problems

Brown Environmental Problems are problems associated with pollution (indoor and outdoor air pollution, water and land pollution), poor sanitation, poor waste management, to mention a few (Forsyth, 2002; Dasgupta et al., 2005). All these Brown Environmental Problems are common in the informal settlements. As an informal settlement, Shushumela settlement is no exception.

The shacks at Shushumela are built from steel, plastic and boards, making it easy for dust and rain to seep through. When the rain comes into contact with the surface (floor) that is not plastered or a carpet, it results in smell inside the shack, causing indoor air pollution. The inhalation of dust and bad air resulting from a wet floor can cause lung problems to the people. Dust is not the only thing that the residents inhale; they also inhale smoke from the sources of energy that they are using. Most residents cook with paraffin which is one of the causes of indoor air pollution. Some residents do not realise that paraffin can cause indoor air pollution. They do not realise that due to the invisible nature of the paraffin smoke. As other households use wood for cooking and heating, their level of exposure is high because they come into a direct contact with the smoke. People who are

exposed to indoor air pollution will, eventually, experience health problems like among others, respiratory problems.

Residents are also exposed to Brown environmental Problems like water pollution. The fact that the residents get water from taps does not mean they are safe from water related diseases. The situation of residents collecting water from street standpipes leads to people storing water in their shacks so that they can have easy access when they need water. The point is, even though water is collected from taps, the period of storage affects its biological make-up. When the biological make-up of water is compromised, the quality of water becomes poor, that is, the water becomes polluted. Water pollution leads to water-born diseases.

With lack of adequate water supply within the settlement, residents use on-site sanitation facilities (toilets that do not require water for operation). The residents find it difficult to wash hands after the use of toilets as they do not have water taps in their yards. Furthermore, they can not use the water that they have collected for household chores because they will run-out of water quickly, and it will mean that they will have to regularly collect water. Therefore, even though most residents use pit latrines, they do not wash their hands after they have used the toilet.

Not only unhygienic hands expose the residents to sanitation related diseases, and also the flies from the toilets. The flies fly from the toilets into the food. Inability to wash hands after the use of toilet, smell from the toilets, and flies from the toilet exposes residents to sanitation related diseases. This is because, when water comes into contact with human excreta, it becomes faecal contaminated due to the presence of coliform

bacteria (see subsection 2.3.1.1). The absence of adequate sanitation services not only results in water pollution but also vectors of diseases. Among these vectors of diseases are mosquitoes, such as *Culex Quinquefasciatus*, which are found in pit latrines due to the preference of polluted waters (see subsection 2.3.1.1).

The residents are also exposed to illnesses associated with land pollution. Due to the lack of waste removal services, residents who do not burn waste in their households, discard it on the street waste dumps within the settlement. The presence of waste dumps within the settlement makes it easy for vectors of diseases to multiply. When waste is accumulated on the streets, it attracts vectors of diseases like mosquitoes, and pests. Due to the presence of these waste dumps in Shushumela, the residents have the great potential of being infected with malaria.

The other condition that exposes Shushumela residents to Brown Environmental Conditions is change of seasons. After rainfall, water dumps on the streets and in the yards of other residents (Figure 21: Situation after raining condition).

Figure 21: Situation after raining condition

This illustrates water that has dumped on the street for three days after it has rained (Figure 21: Situation after raining condition). After rainfall, water dumps for a long period, exposing the residents to polluted land-related problems like diseases that are transmitted by vectors and inhalation of bad smell.

Apart from smell that comes from water that that usually dump on the streets after rainfall and from pit latrines, there is a smell that comes from a river that is within the settlement (Figure 22: State of the river that is within Shushumela).

Figure 22: State of the river that is within Shushumela

The river is dirty and it contains dead fishes and waste that is disposed by residents. Due to the bad smell from the river, residents who reside near it inhale bad smell. The smell is always there and causes air pollution in the settlement. This dirty river also contributes to the multiplication of mosquitoes within the settlement.

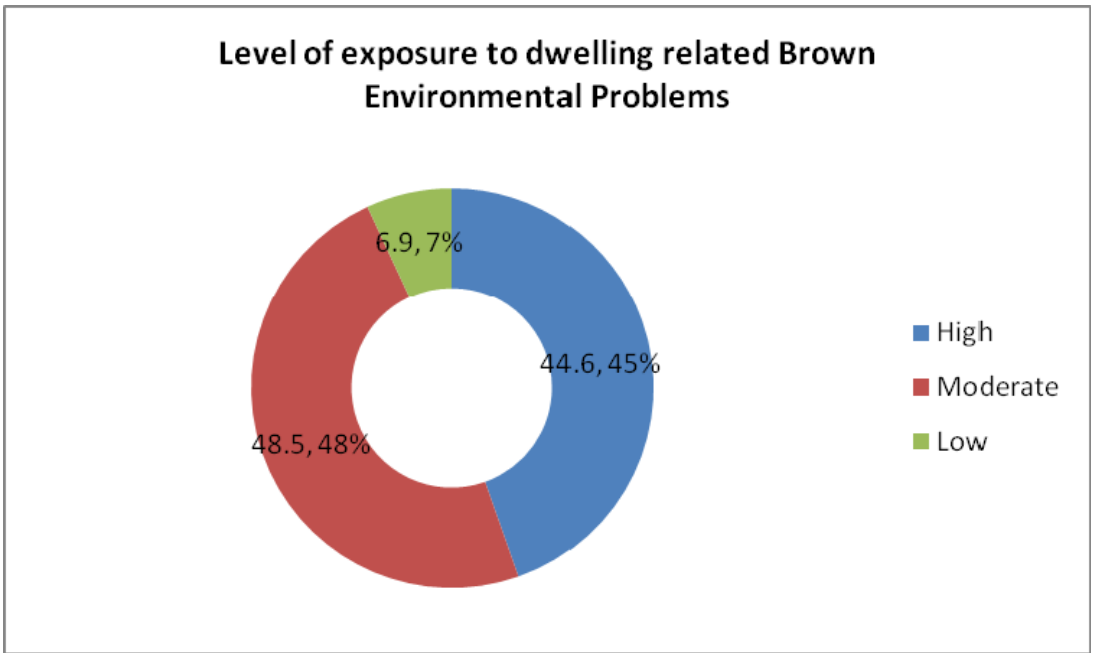
4.4 Prevalence Rate of and Level of Vulnerability to Brown Environmental Problems within Seshego's Informal Settlement

The prevalence rate and level of vulnerability to Brown Environmental Problems within Seshego's Informal Settlement was measured using the high, moderate and low categories. Below is the discussion on the vulnerability of the residence to these problems together with the prevalence rate.

4.3.1 Vulnerability to dwelling related Brown Environmental Problems

In terms of exposure to dwelling related Brown Environmental Problems, 48% of the households believe that they are moderately exposed to dwelling related Brown Environmental Problems (Figure 23: Level of exposure to dwelling related Brown Environmental Problems). Households believe that they are moderately exposed to dwelling-related Brown Environmental Problems because, they believe the only thing that that could expose them to these problems is rain. That is, rain gets seeps in their shacks through nail holes and under the door, making it wet on the inside. This wet rain seepage becomes a problem to them as 55% of households' floors are not plastered, therefore, these wet floors results in smell inside the shacks.

Figure 23: Level of exposure to dwelling related Brown Environmental Problems



Only 45% of households believe that they are exposed to dwelling related Brown Environmental Problems. The reasons behind this believe is that staying in a shack was never good for human beings, contrary to the 7% of households who believe that people can not get sick just because they are staying in a shack. It is surprising that with steel, boards and plastic shacks used as a form of accommodation (Figure 4: Type of dwellings and the material used to build the dwellings), most households (approximately 52%) just can not find the reasons behind the fact that their health is endangered. It is surprising because, approximately 66% of the shacks in Shushumela do not have ventilation, like windows (Figure 24: Form of housing).

Figure 24: Form of housing

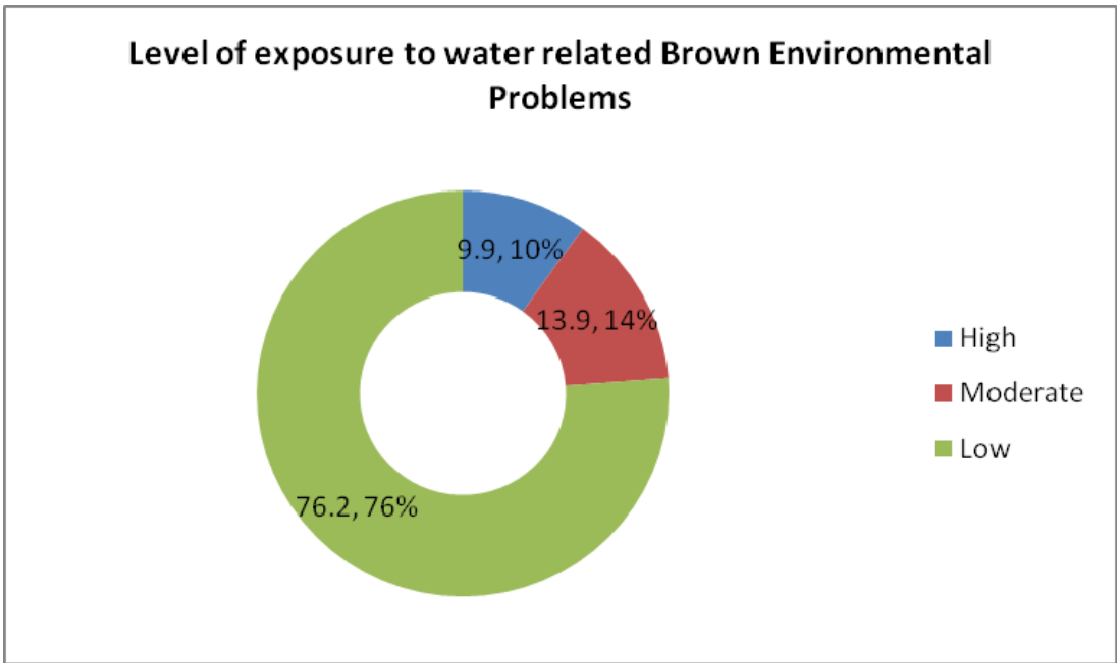
With the type of dwellings within this settlement, it could have been expected that the residents will find their level of exposure to dwelling related Brown Environmental Problems high. The reason is, the sources of energy that these residents use can be very dangerous especially to people staying in poorly ventilated dwellings. Therefore, the

residents of Shushumela can be considered at risk as they use, for example, paraffin on daily basis inside the shacks that are not ventilated. As a result of such practice, people can suffer from indoor air pollution. The same can be said about the fact that they also sleep and bath in such shacks, leaving no way to escape for the smell from overnight sleep and that from bathing. That is, the activities that happen in an average house (four rooms), do happen in a shack. Meaning, in this shack (Figure 24: Form of housing), all activities are conducted in only one room, a shack is a kitchen, bed room, dining room, sitting room and bath room. Therefore, Shushumela residents are in a great exposure to dwelling related Brown Environmental Problems.

4.3.2 Vulnerability to water related Brown Environmental Problems

Water is a very important resource; it is important to human immune system. That is, for human body to function effectively water is needed, but, water can also be dangerous to human's body. Meaning, as much as water is needed in human's body, the quality of that water is important. Water that can be dangerous to human body is the contaminated water as it disturbs the proper functioning of the immune system by adding foreign material to the body. It is therefore important for people to make sure that the water that they are drinking or consuming is of good quality. When asked about their level of exposure to water related Brown Environmental Problems, 76% of Shushumela residents responded low (Figure 25: Level of exposure to water related Brown Environmental Problems).

Figure 25: Level of exposure to water related Brown Environmental Problems



To the residents, water is not a serious problem because the water that they are using is from the standpipes and therefore clean. They reckon that the only problem that they have regarding water is the distance of the water collection point. There is no household that is collecting water within the yard. Meaning, 100% of the households collect water from street standpipes, which brings the reason the residents should consider themselves at high risk to water related Brown Environmental Problems. The residents are exposed to water diseases because of the time differences between the time of water collection and the time of water use.

That is, when water is still on the tap (before collection) it is relatively clean and of good quality, but there is a 99.9% possibility that it could be contaminated by the time it is used. This is because; sometimes (49% of the time) when residents collect water,

especially women, they put the containers without lids on their heads and carry them open to their shacks.

This creates a 50% chance that by the time the water reaches the storage point; it could be already contaminated on the way. The residents also collect water from the standpipes (Figure 26: Street standpipe for water collection), store inside storage containers and use it after days of storage, for example, a household member said “we use four 25 litre buckets to collect and store water, and it takes about three days to finish all the buckets.” She adds that “we normally do not wait for all the buckets to be finished, after we finished two buckets, we collect water again, the water that is in that other two buckets is not used for a long time, it waits for the day we are running short of water or the day we do not feel like collecting water”.

The same method is used by the households that use drums to store water, except that these drums are never empty. This means that, whenever the water seems like it is running out, they always refill other than emptying the container and cleaning it before filling it up with clean water. Therefore, small particles are formed at the bottom of the drum; as a result, the quality of water is lost, exposing the consumers to water related diseases.

Figure 26: Street standpipe for water collection

As a water collection point (Figure 26: Street standpipe for water collection), the area that surrounds the standpipe is always wet, and as a result, the grass grows around the standpipe. The availability of grass around standpipes results in mosquitoes due to the combination of water and grass. These mosquitoes become a problem to the nearby households as it stings the household members, exposing them to diseases that are transmitted by vectors. When collecting water, the water collection container is placed on the bricks (Figure 26: Street standpipe for water collection), creating a 100% possibility that the household members carry bacteria with them to their shacks. Wherever they put that collection container, they also put the bacteria, which they will eventually ingest as it is in their shack and with their and food.

4.3.3 Vulnerability to sanitation related Brown Environmental Problems

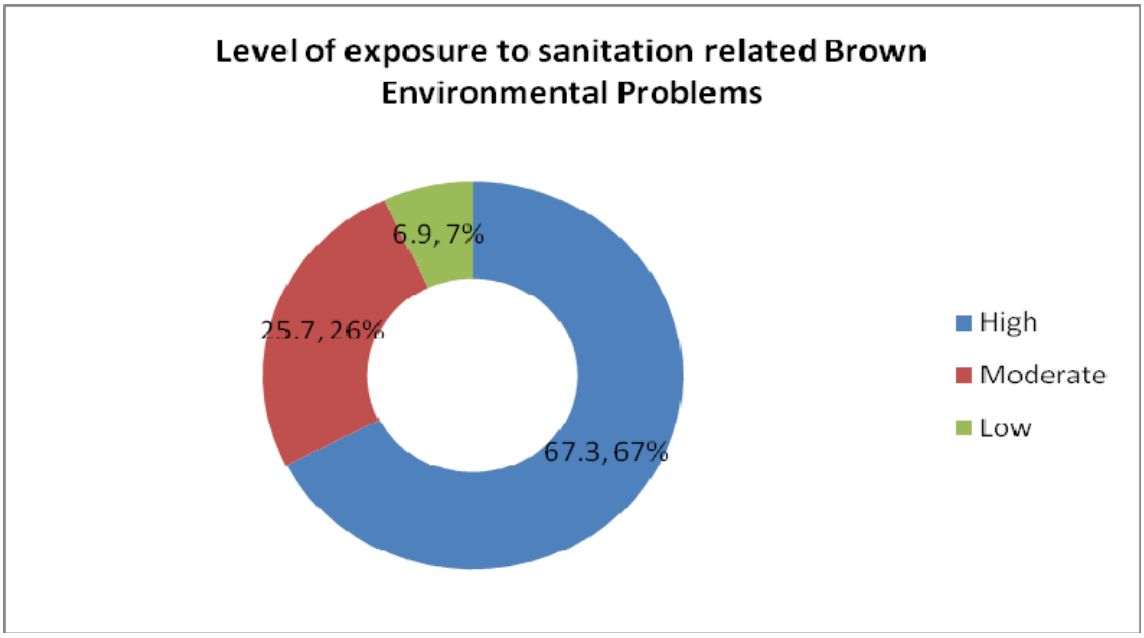
The availability of water in a settlement determines the type of sanitation facility that is to be used by the residents. In Shushumela, pit latrines are used by 90% of the households, 7% use bucket toilets and the remaining 3% go to the bush when they need toilet (Figure 10: Type of sanitation facility the households use). The yards at Shushumela are small and therefore, there is no enough space in the yard. With lack of space within the yards, households are forced to dig pits for toilet purposes very close to their shacks (Figure 27: Distance between pit latrine and the dwelling). As the toilets are very close to the shacks, households are concerned about their health.

Figure 27: Distance between pit latrine and the dwelling

With lack of adequate sanitation facilities, 67% of the households believe their level of exposure to sanitation related Brown Environmental Problems is high (Figure 28: Level

of exposure to sanitation related Brown Environmental Problems). According to the reasons that were given when the households were asked about their level of exposure to sanitation related diseases, 100% of the households mentioned smell as one of the reasons they will catch diseases as they inhale it whenever they are home.

Figure 28: Level of exposure to sanitation related Brown Environmental Problems



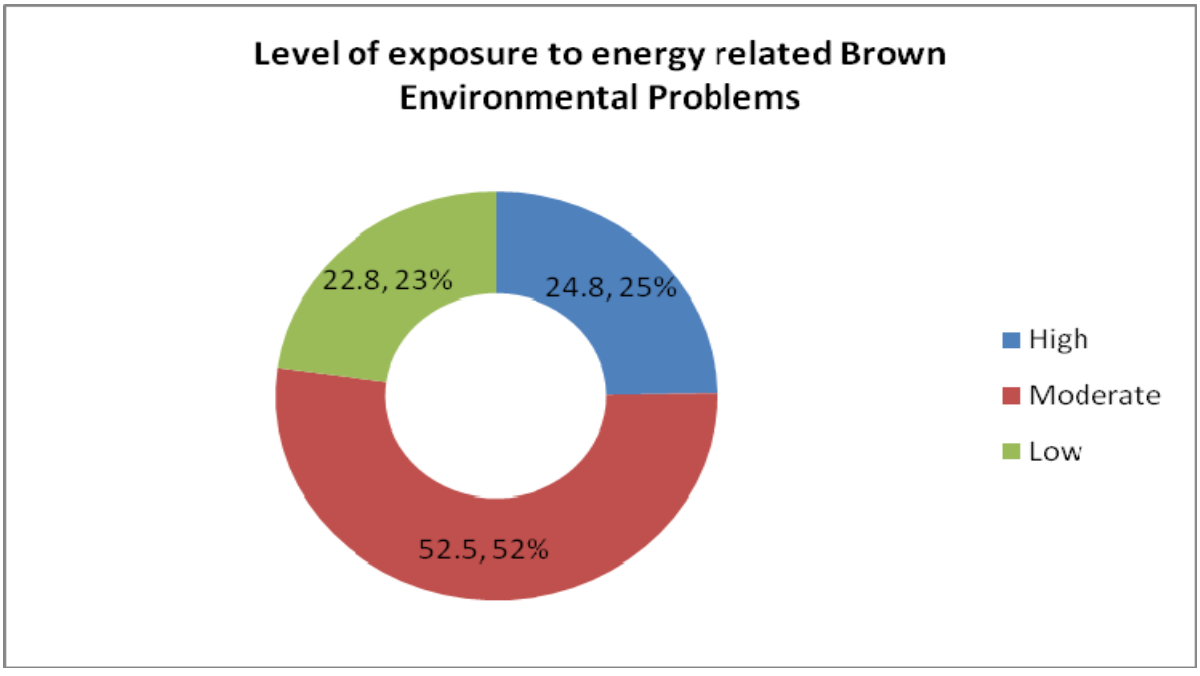
In addition to smell, 98% of the households have the problem with flies. They complain that flies come from the toilets and go to their food, exposing them to diseases associated with the ingestion of human excreta.

4.3.4 Vulnerability to energy related Brown Environmental Problems

Within the settlement, 90% of the households use paraffin for cooking. Due to the use of paraffin, the households' members complain about the smell that the paraffin stoves are causing. The household members mentioned that the use of paraffin has severe side-

effects on the. These side-effects include the experience of headaches, suffering from sinuses, feeling nausea and sore eyes during or after the use of paraffin. Wood is used by 10% of the households who can not stand the use of paraffin due to reasons like affordability and severe side-effects. Chest pains, sore eyes and headaches are the reasons that were mentioned by households that use wood for cooking. These chest pains, sore eyes and headaches are due to the direct inhalation of smoke that takes place during the cooking process. Even though households experience difficulties with regard to the sources of energy that they are using, 52% of them still think they are moderately exposed to energy related Brown Environmental Problems, and only 25% believe that their exposure is high (Figure 29: Level of exposure to energy related Brown Environmental Problems).

Figure 29: Level of exposure to energy related Brown Environmental Problems



Like cooking, wood and paraffin are also used for heating purposes. To generate heat, 86% of households use wood, 40% use paraffin, 30% use coals and 44% is other sources like blankets. Their experiences with paraffin, coal and wood are similar to that of cooking. For lighting, 90% of the households use candles and only 10% use paraffin. Even though candles do not have much health problems, the residents feel that every time they light a candle they put their lives at risk. The fear is of fire as household members were burnt to death in one of the shacks after forgetting put the candle off at night. One of the household members stated that “even if we as a family can be very careful by making sure that the candles are off before we sleep; we still have the fear due to the closeness of the shacks”. That is, the burning of one shack can lead to another as the shacks are close to one another.

4.5 Conclusion

An organised and clean environment is one of the most important things that guarantee good health and well-being. Shushumela residence is neither ogarnised nor clean, meaning, the residents’ good health and well-being is not guaranteed. There is no adequate housing within the settlement because the concept of ‘adequate housing’ includes access to safe water, sanitation, safe energy sources and refuse removal, and these are the things that Shushumela residents do not have. Shushumela residents are vulnerable to Brown Environmental Problems at all times.

Their vulnerability to Brown Environmental Problems is high at each and every season, for instance, during hot conditions, it becomes very hot where food that are prepared the previous day loose the quality since there are no fridges due to the lack of electricity within the settlement. Even so, households are forced to eat that food because throwing it will mean that they have to throw food everyday and preparing small amount of food will mean that they have to prepare another food the following morning and this is costly to them as buying a litre of paraffin is too expensive, so they rather cook a large amount of food at once.

During cold season, the sources of energy they use put them at risk of being infected by Brown Environmental Problems related diseases. In windy season, the dust from dirty and contaminated soil spread in their water and food, gets in their eyes, ears, noses and mouth and that itself puts them at greater risk to these environmental problems. And during rainy season, the streets becomes really dirty with the mixture of soil and dirt because the streets are also the dumping sites. The rain gets in the dwellings, wetting the floors making it smelly and resulting in household members to inhale polluted air. Therefore, the situation or living condition at Shushumela is a deviation to government policies of free basic services for all.

Chapter 5: Conclusion and Recommendation

5.1 Introduction

Literature demonstrates that poor people, due to their living conditions are vulnerable to various environmental problems, particularly, the Brown Environmental Problems (Forsyth, 2002; Satterthwaite, 2002; Madulu, 2006). As informal settlements and poverty are closely related, people living in the informal settlements are no exception. These settlements are usually found around the cities as people look for economic activities. As many people move to the cities to search for economic opportunities so that they can be able to earn a living, the population in urban areas increases. As a result, people who do not have financial resources, establish their own settlements with a purpose of having shelter (Satterthwaite, 2002). Instead of being assisted, these people are excluded when basic services are provided and when formal opportunities are offered to other urban citizens (Anan, 2003).

Seshego Township is close to Polokwane City, which is Limpopo Province's economic hub. The fact that Polokwane City is the core of economy in the province is the reason behind the establishment of Shushumela settlement in Seshego. The settlement was established by people who are in search of better life but can not afford decent accommodation. Like other informal settlements population, Shushumela residents are excluded from service provision. The residents were promised that they will be provided with services after they are relocated, but the relocation does not seem to happen. While

waiting to be relocated so that they can have services, these people have no choice but to continue using the alternative ways of survival that they have established.

As the residents at Shushumela informal settlement continue to live without basic services, the aim of this study was to investigate levels of vulnerability to various Brown Environmental problems within Shushumela informal settlement in Seshego. The study was conducted, the results were presented and therefore, the aim of this chapter is to relate the results of the study to the general assumption analysed in Chapter 2 and draw conclusions and make recommendations with regard to the study.

5.2 Analysis of Findings on Vulnerability to Brown Environmental Problems within Shushumela Informal Settlement

As poverty is recognised as one of the reasons behind the establishment of informal settlements, people living within these settlements are forced to lead a life that is unhealthy. This unhealthy life is due to the alternative ways of living that the informal settlements residents use as they do not have basic services. Due to the lack of basic services, Shushumela residents also use the alternative ways of living that are practiced by most informal settlements population. As a result, this study was conducted in Shushumela to investigate the vulnerability to Brown Environmental Problems within the informal settlements population.

- Provision of adequate housing

Literature demonstrates that informal settlements are usually characterised by self-made shelters; shelters that are poorly constructed, and some with no windows or any form of ventilation (Hill, 1997; Gilbert, 2002). This is the case in Shushumela informal settlement. Dwellings that are in this settlement include shacks that are built from steel, boards and plastic. The combination of the manner in which the structure is constructed and the material used to construct the shacks allow some aspects of the environmental conditions, like rain and dust to seep into the shacks, resulting in some Brown Environmental Problems.

Brown Environmental Problems are associated with pollution, including, indoor air pollution, water pollution, land pollution and poor sanitation (Forsyth, 2002; Dasgupta et al., 2005). As rain seeps into the shack and comes into contact with the carpeted surface or surface that is not plastered, the surface becomes wet and begins to smell inside the shack. This presence of smell contaminates the air that is in the shack resulting in indoor air pollution. Dust also contaminates the air, and when it is in the shack, it forms indoor air pollution. The inhalation of dust can result in n blocked nose and chest pains. Heavy rainfall and strong wind can blow the shacks away, leaving households members homeless.

In terms of vulnerability and prevalence rate, 100% of the household are exposed to dwelling related Brown Environmental Problems. The households' vulnerability to Brown Environmental Problems that are associated with their type of dwellings is high.

- Supply of clean reliable water

In informal settlements, water is usually collected from unreliable sources and stored in drums and other storage facilities for domestic purposes (Madulu, 2005; Mugisha, 2006). This is the case in Shushumela, water is collected from street standpipes and stored in drums and buckets for easy access when it is needed.

Due to the periods that water is stored in the storage facilities, small particles are formed at the bottom of the facility. As a result, the biological make-up of water is compromised, and the water becomes contaminated. Such water is not safe for human consumption as it has lost its quality. Shushumela residents are also at risk of water-borne diseases resulting from the water conservation techniques that they have established. These techniques include storing water in storage facilities like drums so that they do not suffer from water shortages. Children share water when bathing, either by taking a bath at the same time or by one taking a bath after the other. Furthermore, after washing dishes in the morning, the water is kept for later use (for washing lunch dishes). That is, the same water is used for washing the dishes that were used the whole day, even when the dishes were used on different occasions.

According to most households (76%), the prevalence rate to water-related Brown Environmental Problems is low. This is because they do not believe that there could be something wrong with water that is collected from taps. These households do not consider the status of the collection point, the distance that they travel from the collection point to their shacks, the storage facilities and the period of storage before the water can be used.

- Provision of adequate sanitation services

Due to the lack of water within the informal the settlements, there is no adequate sanitation; therefore pit latrines are used (Anan, 2003; Mugisha, 2006). This is also the case in Shushumela. Pit latrines, chemical/bucket toilets and open defecation are used as sanitation facilities.

The use of these sanitation facilities makes households vulnerable to sanitation-related diseases. The households are vulnerable to these diseases due to their exposure to smell that they inhale every time as the pit latrines are closer to their shacks. Flies also play a role in making households members vulnerable to diseases like cholera and diarrhoea. These diseases occur when there is an ingestion of coliform bacteria, which in the case of Shushumela, is transmitted by flies that comes from the toilets to the food. The food then becomes faecal contaminated, and therefore making Shushumela household members vulnerable to sanitation related Brown Environmental Problems. The absence of adequate sanitation services also results in vectors of diseases such as mosquitoes, for example, Culex Quinquefasciatus, which are found in pit latrines due to their preference of polluted waters (Kay, 1999; Forsyth, 2002). In shushumela, mosquitoes are present especially in summer season.

- Provision of adequate electricity

Literature demonstrates that informal settlements usually do not have electricity (Anan, 2003). Informal settlement population usually use paraffin stoves, wood stoves and animal wastes like cow dung as fuel for cooking and heating purposes (Anan, 2003; Forsyth, 2002; Dasgupta et al., 2005). These means of fuel are usually combusted or

used inside the shacks. The electricity condition that exists in the informal settlements was found to be the case in Shushumela. Household members are using paraffin and wood for cooking, candles and paraffin for lighting, paraffin, wood, coal and other things like blankets to generate heat.

All these sources of energy were discovered to be bad to the residents' health as the residents complained about the side effects of using them. The mentioned side-effects include the experience of headaches, suffering from sinuses, feeling nausea and sore eyes during or after the use of paraffin. The chest pains, sore eyes and headaches are subject to the direct inhalation of smoke that takes place during the cooking process.

Even though households experience difficulties with regard to the sources of energy that they are using, 52% of them still think they are moderately exposed to energy related Brown Environmental Problems, and only 25% believe that their exposure is high. The assumption is that these households do not understand the extent of their exposure. They somehow think these side-effects are minor issues.

- Provision of effective waste Management mechanism

Due to the lack of formal service provision in the informal settlements, there are no waste disposal facilities, nor the waste collection facilities (Daniere & Takahashi, 1999). In this regard, informal settlement populations use their waste management mechanisms to manage the waste generated. There are no waste removal services in Shushumela settlement; therefore, households are forced to develop alternative ways of waste management. According to literature, informal settlements population normally use big tins or buckets to dispose waste and when full, they dispose the waste within the

settlement, developing dumping site (Forsyth, 2002). Shushumela households also use the same mechanism to manage the waste accumulated.

Households use own sources like small pits that are dug in the yards to dispose waste, buckets and any other way that the households use in the yards. The residents dig small pits in their yards and dispose waste inside those pits and burn the contents when the pits are full. Other households use old buckets for waste disposal and when the buckets are full, they dispose the waste on the street waste dumps that the residents developed.

The waste dumps act as the breeding zone for pests and vectors of diseases like mosquitoes. During hot seasons, residents suffer from mosquitoes. Apart from the pit latrines and the water collection points, mosquitoes are generated from the waste dumps. The households complain about being stung by the mosquitoes that makes easy entry to their shacks due to the built-up (structure and material) of the shacks. The mosquito stinging exposes residents to diseases that are transmitted by vectors, for example, malaria.

Generally, some of the responses that the households give and the believes that they have illustrates that that there is an extensive lack of knowledge about hygiene practices and issues around Brown Environmental Problems.

5.3 Recommendation

Literature demonstrates that the establishment of informal settlements around cities is intricately associated with poor living conditions that enforce circumstances of perpetual risk and high levels of vulnerability to Brown Environmental Problems (Hamza & Zetter, 1998; Satterthwaite, 2002; Anan, 2003; Dasgupta et al., 2005). Due to the involvement of Brown Environmental Problems in the situation of informal settlements, there is a serious need of intervention to help the situation.

- To informal settlements like Shushumela, the residents have to be relocated to another location as the current settlement (Shushumela zone 6) is close to a river that has a bad smell and contains dead fishes;

- Due to the lack of information and knowledge of the household members within the settlement, the authorities have to equip the residents with information that will boost their knowledge on measures that they could use to reduce their vulnerability to Brown Environmental Problems. However, these measures should not be used as substitute to service delivery; they should be used as the protective measure for the time that the service provision is still being organised for Shushumela residents;

- The measures should include the disinfection of water by boiling it, safe disposal of waste, and good hygiene practices;

- Above all, the residents want water provision. They believe that living without water at the household level is a torture. Water provision in a household level will reduce the period of storage before use since the residents store water in storage containers as a way of minimising the trips to the water collection points;

- Sanitation facilities must be provided to the residents so that the level of exposure to sanitation-related diseases will be reduced. The residents believe adequate sanitation provision will free them from the smell that they are dealing with on daily basis. Residents need adequate sanitation facilities that do not attract flies, do not produce smell and that reduce their level exposure to sanitation related diseases. They added that even if the sanitation facilities do attract flies or do have a smell, it has to be at a minimum and tolerable level;

- Electricity supply is also an issue. According to the residents, having electricity will not only reduce their level of exposure to Brown Environmental Problems associated with the use of dirty fuel, but will also reduce the costs as they currently spend more on candles and paraffin. It will also save among others, food as they would not have to discard it subject to the food being rotten or to the loss of quality. Provision of electricity will eliminate the use of candles, paraffin and other sources of energy that are used as energy alternatives to the lack of energy. Electricity provision will reduce the residents' exposure to indoor air pollution;

- On their recommendations, the residents put emphasis on housing. They need government to provide them with houses; they further mentioned that even the low cost housing will be appreciated as they feel like they are trapped inside the shacks. Provision of houses will help with the reduction of the level of exposure to unhealthy conditions that come with the changing of seasons;

- Provision of waste removal services by providing rubbish bins and collecting the waste on weekly basis to reduce the establishment of waste dumps within the settlement.

- The living conditions within the informal settlements is a deviation to government policies since the White Paper on Housing clearly states the responsibility of the government to provide accommodation and basic services for all. Therefore, it can be recommended that to reduce vulnerability to Brown Environmental Problems, the government should adhere to all the basic service provision that it developed.

- These policies includes among others, Section 26 of the South African Bill of Rights which provides that everybody has a right to have access to adequate housing. Additionally, children are afforded extra protection in Section 28 of the constitution, which provides that every child has the right to shelter. In terms of water, the local government has to fulfil its Constitutional responsibility of providing access to water services to all because the South African Constitution, 1996, Section 27 states everyone's right to have access to sufficient food and water; and it further adds that the state must take reasonable legislative and other

measures, within its available resources, to achieve the progressive realisation of each of the rights.

- As the Department of Water Affairs and Forestry stated in its White Paper on Basic Household Sanitation that the government re-affirms its commitment to ensuring that all citizens have access to basic sanitation by 2010, it has to fulfil its promises and not stop in 2010 but go beyond that. In terms of energy, the Free Basic Electricity (FBE) policy is directed at improving electricity availability for the poor and as a result poor households have to receive a minimum amount of 50 kw/h of electricity per month for free, therefore this Free Basic Electricity policy should not be in paper only, but be in practice also. One of the effective measures that could be used to reduce the informal settlements population's exposure to Brown Environmental Problems is acknowledging that a safe and a healthy environment, an environment that is not harmful to people's health or well-being is not just a Constitutional right, but a human right.

On their recommendations, the residents and the Environmental-based Institution believe that all the services mentioned above should be provided by government as it is responsible for service provision and serving the people in general.

5.4 Conclusion

This study supports and adds to the idea that the establishment of informal settlements around cities within developing countries is intricately associated with poor living conditions that enforce circumstances of perpetual risk and high levels of vulnerability to Brown Environmental Problems (Hamza & Zetter, 1998; Satterthwaite, 2002; Anan, 2003; Dasgupta et al., 2005). For what the study determined in Shushumela, it supports the assumption that the physical appearance of informal settlements demonstrates that informal settlements and poverty are closely related and mutually reinforcing (Dasgupta et al., 2005). The reason this study supports the idea that there is a relationship between informal settlements and poverty is because informal settlements can be, among other things, distinguished by the poor quality of housing, the poverty of the inhabitants, the lack of public and private services and the poor integration of the inhabitants into the broader community and its opportunities (Gilbert, 2002; Anan, 2003).

Literature demonstrates that informal settlements population rate far lower on human development indicators than other urban residents, and that they have more health problems (Anan, 2003). According to the findings on the research done in Seshego's Shushumela, it is possible that the informal settlements population rate far lower in human development indicators and have more health problems because majority of Shushumela residents do not even have the matric in terms of education and their educational background might be the reason most of the households' total monthly income is below R1 200. It is therefore true that one of the reasons for poor housing conditions within the informal settlements is the population's financial status, the poor do

not have access to the financial resources needed to buy houses because the existing housing finance systems are not accessible to them and subsidies for housing are not properly targeted (Gilbert, 2002).

The incomes, of the informal settlements population are indeed, in most cases, too low for formally regulated markets to provide them with permanent housing (Anan, 2003) as it is the case for Shushumela residents. As a way of survival, in Shushumela informal settlement, water is collected from unreliable sources and stored in drums and other storage facilities for domestic purposes, particularly, for drinking and cooking. Due to lack of adequate sanitation, pit latrines and open defecation are used as sanitation facilities.

In terms of waste management, there are no waste disposals nor waste collection facilities, therefore, the residents use big tins and buckets to dispose waste and when full, they dispose the waste within the settlement, developing dumping sites. For sources energy, informal settlements population usually use paraffin stoves, wood stoves and animal wastes like cow dung as fuel for cooking and heating purposes (Anan, 2003; Forsyth, 2002; Dasgupta et al., 2005).

Like other informal settlements residents, Shushumela residents also use the above mentioned sources of water, energy, sanitation, and waste management as their ways of survival. Therefore, as far as the health problem is concerned, their overall living condition exposes them to Brown Environmental Problems.

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APPENDIX A

Household Survey Questionnaire

Vulnerability to Brown Environmental Problems within the Informal Settlements in Seshego, Limpopo Province

The purpose of this survey is to collect information on the general conditions about the relationship between the informal settlements living conditions and the levels of vulnerability to Brown Environmental Problems in Seshego. The information collected will be used solely for academic purposes and anonymity is guaranteed. The respondents (household representatives) are requested to assist with information as per question asked and most importantly thanked for their participation in this study.

Section A: Demographic Profile of the Household

1. What is the gender of household members (please provide numbers)?

male	**Female**	**Domination: male =1 : female=2**

2. Please provide the status of household members in the household (mark with an X)

Breadwinner		**Dependents**		**Total no. of household members**	
Father	1	0-2	1	1	1
Mother	2	3-5	2	2-3	2
Both	3	6+	3	4-6	3
Other (relative)	4			7+	4

3. What is the age composition of household members?

55 and above		**0-7**		**8-13**		**14 and above (ladies)**	
No	1	No	1	No	1	No	1

Yes	2	Yes	2	Yes	2	Yes	2

4. What is the Educational Background of household members (mark with an X)?

Head of the Family		**Majority of household members**	
No formal education	1		1
Primary education	2		2
Secondary education	3		3
Matric	4		4
Diploma/Degree	5		5

5. What is the Occupation Status in the household (mark with an X)?

Head of the Family		**Breadwinner**	
Unemployed	1	Unemployed	1
Student	2	Student	2
S/employed	3	S/employed	3

Pensioner	4	Pensioner	4
Employed	5	Employed	5

6. What is the total monthly income in the household (mark with an X)?

No income	**Below R500**	**R501-1200**	**R1201-2500**	**Over R2500**
1	2	3	4	5

Section B: Types & Conditions of dwellings, water, energy, sanitation and waste management

1. What is the type of the dwelling (mark with an X)?

Boards	**Steel**	**Boards & Steel**	**Wood**	**Plastic**	**Other (material)**
1	2	3	4	5	6

2. What is the number of years that you have been staying in the settlement (mark with an X)?

0-1 year	**2-4 years**	**5-7 years**	**8 years and above**
1	2	3	4

3. What source of water does the household use? (mark with an X)

Source	
Household standpipe	1
Street standpipe	2
River	3
Rainwater	4
Borehole	5
Other source	6

3.1 What is the general condition of this source of water?

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4. What sources of energy does the household use? (mark with an X)

	Cooking	**Lighting**	**Heating**
Wood			
Paraffin			
Cow dung			
Coal			
Electricity			
Candles			
Other than the mentioned			

4.1 What is the general condition of these sources of energy?

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5. What sanitation facility does the household use? (mark with an X)

Facility	
Pit latrines	1
Bush	2
Chemical toilets	3
Off-site sanitation	4
Other	5

5.1 What is the general condition of this sanitation facility?

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6. What waste management mechanism does the household use? (mark with an X)

Waste disposal facility	
Rubbish bin	1
Household own source	2
Other than the mentioned	3

6.1 How can you describe the general condition of waste management in the household?

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Section C: Types and Origins of Brown Environmental Problems

1. With the type of dwelling you live in, what Brown Environmental Problems do you think you are exposed to?

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2. With the water that you are using, what Brown Environmental Problems do you think you are exposed to?

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3. With the sources of energy that you are using, what Brown Environmental Problems do you think you are exposed to?

3.1 What Brown Environmental Problems do you think you are exposed to with regard to the sources of energy you use for cooking?

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3.2 What Brown Environmental Problems do you think you are exposed to with regard to the sources of energy you use for heating?

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3.3 What Brown Environmental Problems do you think you are exposed to with regard to the sources of energy you use for lighting?

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4. With the type of sanitation facility that you are using, what Brown Environmental Problems do you think you are exposed to?

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5. With the waste management mechanism that you are using, what Brown Environmental Problems do you think you are exposed to?

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Section D: Prevalence Rate of Brown Environmental Problems

1. What do you think your level of exposure to dwelling related Brown Environmental Problems is?

High	**Moderate**	**Low**
1	2	3

Give reasons for your answer

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2. What do you think your level of exposure to water related Brown Environmental Problems is?

High	**Moderate**	**Low**
1	2	3

Give reasons for your answer

……

……

……

3. What do you think your level of exposure to sanitation related Brown Environmental Problems is?

High	**Moderate**	**Low**
1	2	3

Give reasons for your answer

.....

.....

.....

4. What do you think your level of exposure to energy related Brown Environmental Problems is?

High	**Moderate**	**Low**
1	2	3

Give reasons for your answer

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5. What do you think is your overall level of exposure to Brown Environmental Problems?

High	**Moderate**	**Low**
1	2	3

Give reasons for your answer

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Section E: Vulnerability to Brown Environmental Problems

1. Based on the sources of water you use, what do you think your level of exposure to Brown Environmental Problems is?

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2. Based on the sources of energy you use, what do you think your level of exposure to Brown Environmental Problems is?

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3. Based on the sanitation facility you use, what do you think your level of exposure to Brown Environmental Problems is?

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4. Based on the waste management mechanism you use, what do you think your level of exposure to Brown Environmental Problems is?

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5. Given the conditions of your dwelling, how exposed is your household to the following environmental conditions:

Level of exposure	**Hot conditions**	**Cold conditions**	**Windy conditions**	**Rainy conditions**
High				
Moderate				
Low				

Section F: Measures that could be used to reduce vulnerability to Brown Environmental Problems

1. What do you think could be done to reduce the vulnerability to Brown Environmental Problems?

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2. Who do you think could take that action, as recommended in your response above?

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Appendix B

Questionnaire for the Community Representatives

Vulnerability to Brown Environmental Problems within the Informal Settlements in Seshego, Limpopo Province.

The purpose of this questionnaire is to collect information on the general conditions about the relationship between the informal settlements living conditions and the levels of vulnerability to Brown Environmental Problems in Seshego. The information collected will be used solely for academic purposes. The respondent(s) will be asked if they will allow their names to be revealed. The respondents (community representatives) are requested to assist with information as per question asked and most importantly thanked for their participation in this study.

1. **Types and Conditions of dwellings, water, energy, sanitation and waste management within the Settlement**

   1.1 How will you describe the nature of the settlement?

   1.2 Can you describe your challenges as the community representative regarding the living conditions within the settlement?

   1.3 In general, what are the living conditions and challenges that households face in this settlement (considering dwellings, water, energy, sanitation and waste management)?

2. **Types and origins of the Brown Environmental Problems within the settlement**

   2.1 What are the types of Brown Environmental Problems that are, on average, prevalent in the settlement?

3. **Vulnerability of Seshego's informal settlements population to Brown Environmental Problems**

   3.1 How vulnerable are the households to the variety of Brown Environmental Problems?

   3.2 What type of health concerns will you be able to link to the various Brown Environmental Problems in the settlement?

3.3 Did you ever have any case resulting from the exposure to the Brown Environmental Problems within the settlement?

Yes	**No**	**Do not know**

Explain:

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3.4 Please mark the applicable environmental condition (in terms of changing of seasons)

Hot conditions		**Cold conditions**		**Windy conditions**		**Rainy conditions**	
Very hot	1	Very cold	1	Very windy	1	Very rainy	1
Hot	2	Cold	2	Just windy	2	Average rain	2
Mild/warm	3	Mild	3	Mild	3	Less rain	3
Other	4	Other	4	Other	4	No rain	4

(specify)		(specify)		(specify)			
						Other (Specify)	5

3.5 What health facilities are accessible to the community?

Type of health facility		**Placement/location**	
Hospital	1	Within the settlement	1
Clinic	2	Near the settlement	2
Other	3	Average distance	3
		Far	4
		Very far	5
		Other (specify)	6

3.6 What is the level of vulnerability to Brown Environmental Problems within the settlement?

High	Moderate	Low
1	2	3

Explain

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4 Measures that could be taken to reduce the vulnerability of Seshego's informal settlements population to Brown Environmental Problems

4.1 What do you think should be done to help the population get out of this situation, and by whom?

Appendix C

Interview Schedule for the Environmentally-Based Institutions

Vulnerability to Brown Environmental Problems within the Informal Settlements in Seshego, Limpopo Province.

The purpose of this interview schedule is to collect information on the general conditions about the relationship between the informal settlements living conditions and the levels of vulnerability to Brown Environmental Problems in Seshego. The information collected will be used solely for academic purposes. The respondent(s) will be asked if they will allow their names to be revealed. The respondents are requested to assist with information as per question asked and most importantly thanked for their participation in this study.

1. As a specialised unit, how can you describe the Brown Environmental Problems faced by the community?
2. What are the common types and the origins of the Brown Environmental Problems?
3. Which sections of the population are most likely to be affected by Brown Environmental Problems?
4. What are the levels of vulnerability to the Brown Environmental Problems within the community?
5. What are the measures that could be implemented to reduce the vulnerability to Brown Environmental Problems within the community?
6. Who do you think could take such action as recommended in your response to question 5 above?

Appendix D

Interview Schedule for the Local Medical Institution

Vulnerability to Brown Environmental Problems within the Informal Settlements in Seshego, Limpopo Province.

The purpose of this interview schedule is to collect information on the general conditions about the relationship between the informal settlements living conditions and the levels of vulnerability to Brown Environmental Problems in Seshego. The information collected will be used solely for academic purposes. The respondent(s) will be asked if they will allow their names to be revealed. The respondents are requested to assist with information as per question asked and most importantly thanked for their participation in this study.

1. What are the types and origins of Brown Environmental Problems associated with living in the informal settlements?
2. Which types Brown Environmental Problems have you been able to identify in the settlement?
3. How vulnerable is the population to of Brown Environmental Problems?
4. What are the common sources of the health problems that have being reported and treated at your institution?
5. What is the estimated proportion/percentage of the health cases reported and treated to your institution that are related to the Brown Environmental Problems over the past 5 years?
6. What is the average prevalence rate of Brown Environmental Problems-related health cases in the settlement presently?
7. What do you think could be done to reduce the vulnerability to Brown Environmental Problems?
8. Who do you think could take that action, as recommended in your response above?