

**A COMPARATIVE STUDY OF POVERTY AND
THE SOCIAL COST OF POLLUTION IN
LEITRIM AND RATHANDA WITH REFERENCE
TO DIFFERENT POLICIES AND
TECHNOLOGIES THAT MAY REDUCE
POLLUTION IN A POOR COMMUNITY**

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VAN DER BIJLPARK

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SUMMARY

This dissertation studies the social cost of pollution in Leitrim, which is a township in the Vaal Triangle area. Policies and technologies that may be implemented to reduce pollution in poor communities are also discussed.

The study focuses on three areas namely pollution, unemployment and poverty. Leitrim experiences a high rate of both unemployment and poverty. Residents in this area also experience high levels of pollution. Compared to Rathanda township which is more rural, Leitrim is worse off in terms of unemployment, poverty and pollution.

Unemployment is a major determinant of poverty in Leitrim. The main component of any policy aimed at alleviating poverty in Leitrim should therefore focus on employment creation. Unemployment and poverty are defined and measured in this dissertation and the poor in Leitrim are profiled in terms of their gender, qualification, employment, unemployment and their spending methods. For measuring poverty, the Household Subsistence Level (HSL) is used as poverty line to determine the headcount index and the poverty gap.

Pollution is identified as one of the factors which affect the wellbeing of the poor negatively. Reducing the level of pollution will therefore also reduce the depth of poverty in poor communities. This dissertation focuses on the following types of pollution: land-based pollution (littering), dust pollution, noise pollution and air (indoor smoke pollution & air pollution from coal fire) pollution. Alternative technologies such as BM implemented in full scale can reduce the level of air pollution by more than 50 percent. It will also reduce the monthly household expenditure of poor households on coal by at least 4.5 percent.

Key terms

Poverty, unemployment, pollution, air pollution, littering, dust pollution, noise pollution, Rathanda, Leitrim, Metsimaholo, Lesedi, poverty alleviation, technologies, reduction in pollution, unemployed, poor, unemployment rate, headcount index, non-poor, average income, poverty line, HSL,

OPSOMMING

Hierdie verhandeling bestudeer die sosiale koste van besoedeling in Letrim. 'n buurt in die Vaal Driehoek. Beleide en tegnologie wat moontlik geïmplimenteer kan word om besoedeling in die arm gemeenskappe te verminder, word ook bespreek.

Die studie fokus op drie gebiede, naamlik besoedeling, werkloosheid en armoede. Letrim beleef 'n hoë vlak van beide werkloosheid en armoede. Verder beleef inwoners van Letrim ook hoë vlakke van besoedeling. Wanneer vergelyk word met die plattelandse Rathana buurt, is Letrim slegter af in terme van werkloosheid, armoede sowel as besoedeling/

Werkloosheid is 'n belangrike determinant van armoede in Letrim. Die hoof komponent van enige beleid wat daarop gemik is om armoede in Letrim te verminder, behoort dus op werkskepping te fokus. Werkloosheid en armoede word in hierdie verhandeling gedefinieer en die armes in Letrim word geklassifiseer in terme van hulle geslag, kwalifikasie, werk, werkloosheid en hulle bestedingspatroon.

Om armoede te meet, word die Huishoudelike Substansie Vlak (HSV) gebruik as armoedelyn om te bepaal wat die per capita indeks en armoede gaping is.

Besoedeling is geïdentifiseer as een van die faktore wat die gesondeheid van die armes negatief beïnvloed. Deur die vlakke van besoedeling te verminder sal die intensiteit van armoede in die arm gemeenskappe ook verminder. Die verhandeling fokus op die volgende tipe besoedeling: land-gebaseerde besoedeling (rommelstrooi), stofbesoedeling, geraasbesoedeling en lugbesoedeling (binnemuurse rookbesoedeling en lugbesoedeling van koolvure). Alternatiewe tegnologie soos BM wat op vol skaal geïmplementeer word, kan die vlakke van lugbesoedeling met meer as 50% verminder. Dit sal ook die maandelikse huishoudelike uitgawes van arm huishoudings aan steenkool, met minstens 4.5 persent verminder.

Slutelwoorde

Armoede, werkloosheid, besoedeling, lugbesoedeling, rommelstrooi, stofbesoedeling, geraasbesoedeling, Rathana, Letrim, Metsimaholo, Lesedi, armoede verligting, tegnologieë, vermindering in besoedeling, werkloosheid, armoede, werkloosheidsyfer, per capita indeks, nie-arm, gemiddelde inkomste, armoedelyn, HSV

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LIST OF ABBREVIATIONS

AIDS	Acquired immune-Deficiency Syndrome
BM-	Basa Magogo
CEAS-	Central Economic Advisory Services
CPS-	Current Population Survey
DME-	Department of Mineral and Energy Affairs
EAP-	Economically Active Population
FBT-	Former Black Townships
GDP	Gross Domestic Product
GGP-	Gross Geographic Product
GNP-	Gross National Product
HEL-	Household Effect Level
HIV	Human Immune-Deficiency Virus
HSD-	Household Scale Development
HSL-	Household Subsistence Level
IDP-	Intergraded Development Plan
ISCOR-	Iron and Steel Corporation of South Africa
LEC-	Local Economic Development
MHSL	Minimum Humane Standard of Living
MLL	Minimum Living Level
NGO	Non-Governmental Organisation

NO ₂	Nitrogen dioxide
OHS	October Household Survey
O ₂	Oxygen
PDL	Poverty Datum line
RDP	Reconstruction and Development Programme
SLL	Supplementary Living Level
STATS SA	Statistics South Africa
Ur	Unemployment Rate
VRG	Vaal Research Group

CHAPTER ONE

THE PROBLEM AND ITS SETTING

1.1 Background

At the end of the 19th century huge coal deposits were discovered near Vereeniging. In the 1940s iron and steel plants gave birth to the towns of Vanderbijlpark and Meyerton, while one decade later the chemical industry created Sasolburg. The dynamics of the gold mining industry, as well as the finance and commerce sectors in the nearby Witwatersrand also stimulated the economy of Vanderbijlpark and Vereeniging. Economic development in the past had been accompanied by the creation of corresponding black labour force reservoirs on the urban boundaries. The oldest township, Evaton, was created at the beginning of the 20th century. During the apartheid years Sharpeville, Sebokeng, Bophelong and Boipatong in the Vanderbijlpark area were established, while Zamdela and Refenkgotso developed near Sasolburg in the 1970s. Extensive road systems link the above-mentioned towns with the sources of labour and inputs, and with markets in the Johannesburg area. Forced and voluntary migrations and increasing net birth rates resulted in most of the area's population being concentrated in the townships (Pelupessy, 2000:1). The former Vanderbijlpark and Vereeniging municipal areas now forms the Emfuleni local municipality, and the former Sasolburg municipal area now forms the Metsimaholo local municipality. Together these two local municipalities form the Vaal Triangle.

In 2001 the total number of inhabitants residing in Metsimaholo Municipality amounted to 115,976 (Statistics South Africa, 2003). The population of Metsimaholo forms 15 percent of the total population in the Vaal Triangle. **Table 1.1** below represents the population living in the two municipalities that comprise the Vaal Triangle.

Table 1.1 Population of the Vaal Triangle - 2001

	Population	Households	Household size
Emfuleni	658,422	187,044	3.52
Metsimaholo	115,976	32,266	3.59
Total Vaal Triangle	774,398	219,310	3.53
Lesedi	71,544	18,853	3.79

Source: Sedibeng Integrated Development Plan, 2002; Statistics South Africa, 2003

According to Statistics South Africa (2003), the average annual growth rate of the Metsimaholo population for the years 1996 to 2001 was 2.5 percent compared to the national average annual growth rate of 2.0 percent per annum.

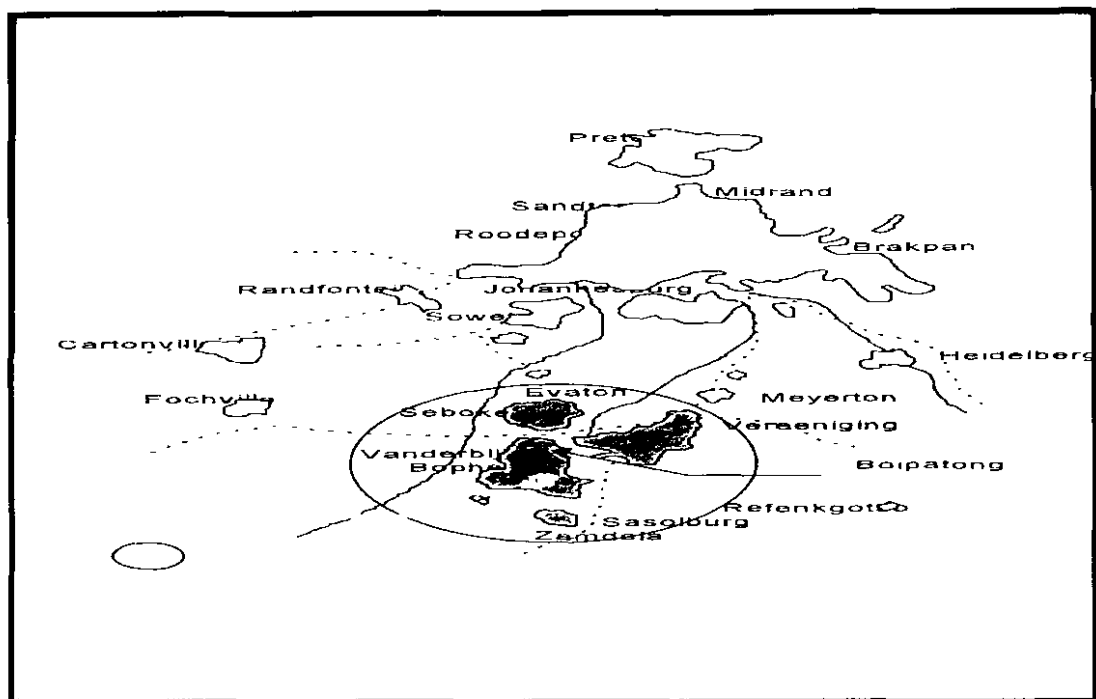
The number of households in Metsimaholo in 2001 is estimated at 32,266 (Statistics South Africa, 2003), and the average household size in Metsimaholo, calculated from Statistics South Africa (2003) data, is 3.53 persons per household. Leirim is situated south of Zamdela in Metsimaholo local municipality. In Leirim the number of households is estimated at 4,758, while the average household size is 4.27 persons per house and the population estimated at 20,310 (Statistics South Africa, 2003).

The Lesedi municipality, together with Emfuleni and Midvaal municipalities, forms part of the Sedibeng District and has a total population of 71,542. The number of households in Lesedi is estimated at 18,853 and the average household size is estimated at 3.79 persons per household (calculations based on Census figures from Statistics South Africa, 2003).

1.1.1 Geographical area of the study

In **Figure 1.1** below, Leirim and Rathanda are indicated in the provincial and local context. The Vaal Triangle is located in the northern part of the Free State Province and in the southern part of Gauteng. Sedibeng is located in the southern part of Gauteng. Zamdela is a township near Sasolburg. Leirim is a township next to Zamdela, and Rathanda is a township in Heidelberg.

Figure 1.1 Leitrim and Rathanda's geographical location



Source: Adapted from Slabbert (1997: 12).

1.2 Statement of problem

Concern about the health effects of air pollution has been noted for centuries (at least since the 13th century), but increased significantly during and after the industrial revolution when the problem assumed greater proportions (Fuggle & Rabie, 1999:596).

In most African countries atmospheric pollution has only emerged as a problem in the past few decades. Its severity and impact is still largely unknown, although it is believed that gaseous pollutants and acid rain have adversely affected vegetation, soils and water in some areas. The main sources of atmospheric pollution in Africa are bush fires, vehicle emissions, mining and industry. Major industrial sources include thermal power stations, copper smelters, ferro-alloy works, steel works, foundries, fertilizer plants, and pulp and paper mills. If the projected growth of demand for vehicular transport and electricity was to be met with current technologies, emissions from thermal power stations were to increase eleven-fold and from vehicles, five-fold, between 1992 and 2003 (World Bank, 1992).

The use of leaded fuel in vehicles is also a major concern. The region's ageing vehicles, most of which are more than 15 years of age, worsen lead pollution. They are also said to emit five times more hydrocarbons and carbon monoxide, and four times more nitrogen oxides, than new vehicles (World Bank, 1995c).

Air pollution is most significant in the more urbanized and industrialized countries of Northern and Southern Africa. In Southern Africa, air pollution is largely from thermal power stations. About 89 percent of electricity generation in the Southern African Development community (SADC) region is from coal, which is mostly produced in South Africa, where it accounted for 97 percent of total electricity generation in 1994 (Vernier, 1995). As South African coal contains about one percent sulphur, the country emits more sulphur dioxide than any other in the SADC region and is ranked as the 15th largest emitter of greenhouse gases in the world (USAID, 1997). During 1990-91, South Africa contributed 66 percent of all sulphur emissions in the SADC region, whereas Lesotho, Swaziland and Mozambique jointly contributed only 0.9 percent (Vernier, 1995). As this dependence on coal-based thermal power will persist for years, sulphur dioxide pollution will remain a problem unless measures are taken to reduce the levels of sulphur in coal or incentives are provided for developing alternative energy sources such as hydropower, wind, geothermal and solar.

Mining is a major source of income in Southern Africa, but also of air pollution. The mining industry employed more than 800,000 people in year 1992, generated 60 percent of foreign exchange earnings, and contributed about 11 percent to GDP in the SADC region (SADC, 1992). Sulphur emissions from mining are estimated at one million tonnes per year and are a growing concern, particularly among people with respiratory problems (SADC, 1992). Indoor air pollution caused by the widespread use of biomass as a cooking fuel is also a major contributor to the high incidence of respiratory diseases because of the exposure to smoke and other pollutants in a confined space. In sub-Saharan Africa, biomass use is expected to provide nearly 80 percent of the total energy used, even in 2010. In Northern Africa, the corresponding figure is much lower: in 1995 traditional fuel use was only some three percent of the total (World Bank, 1998).

In West Africa, the Harmattan winds often result in high atmospheric dust loading and poor visibility, and contribute to respiratory and other diseases. The continual build-up of mineral dust concentrations since the 1960s is likely to have a climatic impact through a land-atmosphere feedback mechanism (Ben Mohamed & Frangi, 1986; Ben Mohamed, 1985, 1998).

Poverty is not just a matter of being relatively poorer than others in the society. It also involves not having some basic opportunity of material well-being and the failure to have certain minimum capabilities (Meier & Rauch, 2000:30). Economic growth that improves opportunities for the poor to earn an income requires two sets of policies. The one should stimulate rural development; the other must promote employment creation in urban areas. However, policies aimed at benefiting only the rural poor did not invariably succeed. For example, the taxes on agriculture were often excessive, leading to low production; land reform usually provided only moderate benefits for the poor; and subsidy schemes tended to benefit the relatively wealthy and

lead to further debt problems for the poor. Efforts to assist the urban poor by means of minimum wages, job security rules and other similar measures, generally resulted in a reduction in employment opportunities in the formal sector (World Bank, 1990).

From 1994 to 1996 the Vaal Triangle economy (of which Metsimaholo is an integral part) experienced a negative real GDP growth of -4.1 percent per annum. After 1996 the Vaal Triangle economy recovered but the average annual real GDP growth from 1996 to 2001 remained low at 0.8 percent (Urban-Econ: calculations based on data by Global Insight). Between 1991 and 1996 there was a huge decrease in employment opportunities. In the Vaal Triangle alone, this decrease in employment opportunities amounted to a substantial 54,000. The manufacturing sector shed almost 39,000 jobs in this period (Bloch & Dorfling, 2000:15).

Against this background, the future possibilities for formal employment in both Metsimaholo and Lesedi appear to be bleak and thus opportunities for school leavers to acquire formal employment seems to be exceptionally slim. It is probable that most of them will end up unemployed or “hanging around”, especially in the township/squatter areas. The majority of these people have never been exposed to any formal technical or entrepreneurial skills or skills training. With the slim possibility of formal sector employment in Metsimaholo and Lesedi, there is an urgent need for the quality of life to be improved by introducing programmes that create jobs and alleviate poverty. In addition, the poor, in particular, have no means to combat pollution. The effect of reducing pollution on the poor is the major focus of investigation in this dissertation.

1.3 Aim of the research

In 2003 a survey was undertaken in the Vaal Triangle which revealed that 49.3 percent of all the households living in the Vaal Triangle lived in poverty (Vaal Research Group, 2003). The main cause of poverty was determined to be unemployment. The same survey showed that 95.7 percent of all the poor of the Vaal Triangle lived in the townships, and therefore it can be concluded that the greatest need is likely to be in the townships. The aim of the research is to determine the state of affairs in Leirim, Metsimaholo, in terms of unemployment (as the major determinant of poverty), poverty, level of air pollution, noise pollution, littering and how all this impacts on the quality of life in Metsimaholo's township area. This data will be compared to data from a survey conducted outside the Vaal Triangle, namely in Rathanda close to Heidelberg in Lesedi. The purpose of comparing the data from Rathanda with that of Leirim is to determine if a location closer to an industrial area (Leirim) means a higher level of pollution than a location far from the industrial areas (Rathanda). The study will also determine if the community is willing to make an effort to change their environment and to find solutions to the problem.

Practical solutions that can be implemented will be formulated (once the state of affairs is determined with the aim of improving the quality of life in the area), as will various ways to reduce air pollution, noise pollution and the level of littering.

Questionnaires were used to obtain the necessary data for the analysis of:

- unemployment;
- poverty;
- household income; and
- consumption patterns.

The opinion of the residents of Leitrim and Rathanda townships about the following environmental issues will also be reflected:

- the cleanliness of the environment and responsibilities to clean it;
- air pollution and responsibilities for reducing the level of pollution;
- noise pollution and responsibilities for reducing it;
- the value attached by residents to different kinds of pollution; and
- how households are affected by crime.

1.4 The importance of the study

The study will endeavour to empower the poor community (township/squatter areas) of Metsimaholo to improve the quality of their lives.

1.5 Hypothesis

Poverty, unemployment and pollution reduce the quality of life. The impact of pollution on the Metsimaholo townships has immense cost implications. Because the cost of pollution and the cost of preventing pollution are not known to the authorities, and because poor communities lack the funds to improve their environment, no measures are being taken to reduce pollution in order to improve the quality of life in the township areas.

1.6 Methodology

The study consists of a literature review and empirical research.

1.6.1 The literature review

The formal literature on pollution, poverty, unemployment (as a major determinant of poverty) and technologies to reduce pollution have been studied in order to provide a sound base with regard to theoretical and contemporary approaches in respect of these concepts.

Useful information was obtained from various publications such as textbooks, journals, articles in the newspaper, and previous studies on the subject. Information not obtainable from the publications, and which was relevant to the specific study purpose, was gathered through the use of questionnaires directed at the target group of this study.

1.6.2 Empirical research

For the purpose of the study, a household survey was undertaken in Leitrim (this area is characterised by RDP houses and squatter houses) and in Rathanda by means of questionnaire-based interviews.

1.6.2.1 Household survey

The household survey was conducted in the following manner. Large-scale maps of the study area were obtained from the Metsimaholo and Lesedi municipality in order to make a stratified selection of five hundred households. The face-to-face communication method was employed to individually interview respondents through the use of a structured questionnaire. The household survey was structured to determine details about the following:

- unemployment and poverty in the area;
- skills level and employment interests;
- the cost of air pollution, noise pollution and littering in the Metsimaholo society;
- willingness of the households to change their environment; and
- willingness to take ownership of a project aimed at uplifting the area by reducing pollution and poverty.

A questionnaire was designed to obtain the desired information (see **Annexure B**). The area was divided into different sections and the questionnaires were apportioned evenly among the inhabited sites.

Two fieldworkers interviewed a total of 500 households (200 households were interviewed in Leitrim and 300 households were interviewed in Rathanda). All of the households approached

were willing to take part in the survey, and all 500 questionnaires were completed in August 2004.

1.6.2.2 Measuring unemployment

Different methods can be used to measure unemployment. The following are the standard methods of measurement:

- Sample surveys: surveys are undertaken on a sample basis to obtain the data required to calculate the unemployment rate for specific groups of people (Slabbert, 1997:69-70). This method was used for the purposes of this study
- Registration method: this method provides for the unemployed to register at placement offices in South Africa, the offices of the Department of Labour. Registration is compulsory to qualify for unemployment benefits. In South Africa, this includes some categories of civil servants, domestic workers, farm workers, casual and seasonal workers. Those earning more than the ceiling income, and those whose period of benefit (six months) has run out, are excluded from the fund. Therefore many Black unemployed persons have no reason to register. Registered unemployment figures published by the Department of Labour in South Africa consequently do not reflect the level of unemployment accurately, particularly not for Blacks. For that reason, this method was not considered for the purposes of this study.
- The census method: this is used for measuring the economic status of the entire population. However, the census takes place only periodically and even then only a limited number of questions pertaining to unemployment can be included. For that reason, this method was not used in this study.

1.6.2.3 Measuring poverty

For the purpose of this study, poverty is defined as the inability to attain a minimum material standard of living. The standard of living is usually expressed in terms of household income and expenditure. Household income and expenditure is an adequate yardstick for the standard of living. The minimal material standard is normally referred to as the poverty line. It is determined by the income (or expenditure) necessary to buy a minimum standard of nutrition and other basic necessities. The cost of minimum adequate caloric intake and other necessities can be calculated by looking at the food and other necessities that are necessary to sustain a healthy standard of living. A poverty line can therefore be calculated for a specific geographical area (World Bank, 1990:26).

By comparing total income and expenditure of a household with the calculated cost of the minimum adequate caloric intake and other necessities of the household, poor households can be distinguished from non-poor as a proportion of the population. This is called the headcount index (World Bank, 1990:27).

1.7 Outline of chapters

The study is divided into different chapters and the following is a brief outline of the entire study.

Chapter One discusses the problem and its setting or context. This chapter is the introduction to the dissertation. It focuses on matters such as the statement of the problem, the background, the aim of the study, the importance of the study, the research methodology and the outline of the chapters.

In **Chapter Two** the focus is on the theory, concept and definitions of poverty and unemployment. A literature review of concepts such as poverty definitions and measurement, and employment/unemployment form part of this chapter.

Chapter Three focuses on different types of pollution and its measurement. The profile of the poor population is presented.

Chapter Four. This chapter focuses on the analysis of household indicators in Leitrim compared to that of Rathanda, and outlines the comparative evaluation of key household indicators. This chapter compares the results of the survey, assessing the social capital of Leitrim with the results of a similar survey conducted in Rathanda. It also gives a description of the methodological policy and procedures used in this study. The purpose is to provide information about the nature and scope of the methodology used in the empirical research.

Chapter Five focuses on the development of policies and technologies that may be used to reduce pollution in the townships.

Chapter Six includes a summary, conclusion and recommendations. This chapter focuses on policy development for pollution reduction and technologies.

CHAPTER TWO

DEFINITION, EXPLANATION AND MEASUREMENT OF THE CONCEPTS OF POVERTY AND UNEMPLOYMENT

2.1 Introduction

In per capita terms South Africa is an upper-middle income country. Despite this relative wealth, the experience of most South African households is of outright poverty or of being continuously vulnerable to poverty. In addition, the distribution of income and wealth in South Africa is amongst the most unequal in the world, and many households still have unsatisfactory access to education, health care, energy and clean water. This situation impacts on the country's social and political stability, but also the development path it follows: countries with a less equal distribution of income and wealth tend not to grow as rapidly as those with a more equitable distribution. The Poverty and Inequality Report (PIR) reviews the extent and nature of poverty and inequality in South Africa, and assesses the current policy framework for the reduction of both. It attempts to provide clear conceptual and practical guidelines concerning the issues which need to be taken into consideration in the formulation of policy, its implementation, and when monitoring its impact (May, 1998:1).

A definition of employment is an effort to distinguish those people who are eligible to work from those who are not fit enough to work or not working. These different categories of people have been explained at this chapter. The different types of employment have also been explained and named in this chapter. It is important to understand the nature of unemployment in South Africa so that appropriate policies or strategies may be selected to overcome it. Finally, the chapter looks into the four different methods that can be used to measure unemployment, and problems associated with each one of them.

This chapter deals with the theoretical background of unemployment and poverty. It outlines the definitions, types, causes, dimensions and measurements of unemployment and poverty.

2.2 Unemployment

The South African economy is in a crisis. This is illustrated by ever decreasing formal employment. Only 29.0 percent of the South African workforce is formally employed, compared to 69.0 percent a decade ago, while the proportion of workers active in the informal sector has grown from 14.0 percent to 21.0 percent. By the year 2001 the economy needed to generate about

450,000 net new jobs per year, compared with an average of 240,000 net new jobs to be created annually since 1994 (Altman, 2003:20).

Koch (1991:1-2) attributes the decrease in formal employment to the import substitution policies of the government since World War Two, which have resulted in more capital-intensive modes of production. This has had the effect of capital and labour becoming substitutes rather than complements. Other factors, both prior to and occurring concurrently with import substitution have exacerbated the crisis. These include repressive labour legislation and regulations, recession, sanctions and disinvestment. In South Africa, it can be seen that the above factors have had an adverse effect on the welfare and employment scenario of a large majority of the population. Poverty and unemployment are a fact of life for a large percentage of the population. The policy of import substitution had culminated in the creation of a large formal sector geared to meet the consumption needs of the affluent White sector of the population.

One could conclude that the outlook with regard to formal employment opportunities for a large proportion of the population of working age is rather bleak. This has resulted in increasing informal business activity. The formal sector is not in a position to provide sufficient employment or, as some would argue, it is not focused on employment creation. Instead, profit maximization is the primary objective. According to Koch (1991:2), informal sector and small-scale producers can play an important role in employment creation and the alleviation of poverty.

2.2.1 Definition of unemployment

There are two definitions of unemployment, namely, the strict definition and the expanded definition.

2.2.1.1 Strict definition

According to Barker (1992:81), the strict definition of unemployment states that “The unemployed are persons who are fifteen years of age and older that are

- not in paid employment or self employment, that is, did not work for five or more hours for a wage salary or for profit and family gain during the seven days preceding the survey;
- available for paid employment or self-employment during the reference week (the seven days preceding the interview);
- taking specific steps during the four weeks preceding the interview to find paid employment or self-employment; or

- had the desire to work and to take up employment or self-employment.”

This explanation or definition has some disadvantages or shortcomings. The first shortcoming is that this criterion for seeking work is not always realistic in developing countries because it may be costly for people who are not employed to take steps to search for a job or even to take reasonable steps to look out for employment because they may be discouraged. The International Labour Organization has made provision for the problem by indicating that the definition can be applied by waiving the criterion or relaxing this requirement of taking steps to seek work (Barker, 1992:83).

2.2.1.2 Expanded definition

In 2001 Statistics South Africa used the following definition of employment as its official definition and also to calculate the official unemployment rate in South Africa (Statistics South Africa, 2001:4).

“The unemployed are those people within the economically active population who:

- did not work during the seven days prior to the interview;
- want to work and are available to start within a week of the interview;
- have taken active steps to look for work or to start some form of self-employment in the four weeks prior to the interview.”

These general criteria are translated into statistically meaningful criteria, namely.

- the population of potential age (i.e. 15 years and older);
- the economically non-active (i.e. those who prefer not to or who cannot work – for instance housewives; persons of 65 years old and older; the disabled; and so on).
- the economically active population (all those who are fit to work; wish to work; have no employment and are ready for and actively looking for work; plus the employed and self-employed).

The unemployment rate can be calculated according to the standard equation: Slabbert (1997:71)

$$Ur = U/L * 100/1$$

- Ur = Unemployment rate.
- U = number of unemployed people.
- L = number of people in the labour force/economically active population.

2.2.2 Types of unemployment

Various types of unemployment must be distinguished in order to be understood and even to help one to give an indication of the causes of unemployment, the consequences of unemployment, and also some idea as to how to tackle this problem. People who do not want to work are not regarded as part of the labour force; accordingly, they cannot be classified as unemployed (Mohr, Fourie & Associates, 1995:610). The unemployment rate is expressed as the percentage of the labour force (i.e. people who are willing and able to work) that cannot find a job. Strictly speaking, all unemployment should therefore be classified as involuntary unemployment.

The following are four different kinds of unemployment namely, seasonal, structural, frictional, and demand-deficient (cyclical) unemployment.

2.2.2.1 Seasonal unemployment

This kind of unemployment is determined by changes in seasons throughout the year. Each year is composed of four seasons, that is summer, winter, autumn and spring, and during each specific season there are changes in the demand for output by consumers. Seasonal unemployment is similar to cyclical unemployment in that it is also determined by changes in the demand for labour due to changes in the demand for the output that labour produces.

Fluctuations in unemployment may arise, reflecting seasonal changes; however, they are anticipated as they follow a systematic pattern over the course of the year. For example, the demand for farm labourers falls after the planting season and increases during the harvesting season (Ehrensburg & Smith, 1991:600).

But the shortcomings can be minimised by using appropriate measures since it is recurring and usually anticipated – for example, by producing a large amount of stock during the off season for that output. In order to have the ability to acquire enough labour during the peak season it may mean employing more labour or avoiding retrenchment during the rest of the year (Sadie, 1980:336).

2.2.2.2 Structural unemployment

This type of unemployment occurs as a result of changes in the pattern for labour demand and causes a mismatch of the skills supplied in a given area or causes imbalances between the supply of labour and the demand for workers across areas. The following paragraphs are examples of structural unemployment:

- Changes in production methods or techniques could cause a drop in the demand for people with particular qualifications or skills. Nowadays, machines can perform many tasks that previously required qualified or skilled people. For example, the introduction of automatic teller machines reduced the number of job opportunities for bank tellers. Automation has also resulted in the loss of many jobs in the manufacturing sector. People who are replaced by labour-saving machines are sometimes classified as being technologically unemployed.
- Certain workers lack the necessary education, training or skills required to obtain a job, even when the economy is booming.
- Changes in the types of goods and services being produced (e.g. as a result of changing consumer preferences) could also cause unemployment. Thus a fall in the demand for cigarettes because of the health risk associated with smoking can lead to unemployment in the tobacco industry.
- Foreign competition could also result in the loss of jobs. For example, the growth of the highly competitive textile and clothing industries in Asia has destroyed many jobs in the textile and clothing industrial countries (as well as in South Africa).
- Discrimination could also cause unemployment. In South Africa, many jobs were reserved for whites during the apartheid era. Qualified people from other population groups did not have access to these jobs. Similarly, affirmative action can cause unemployment among qualified, skilled and experienced people who happen to belong to particular race group.
- Jobs could also be lost as a result of a structural decline in certain industries. In South Africa, for example, the closure of gold mines and general decline in gold production has destroyed many job opportunities.
- Structural unemployment is a serious problem for which there is no easy solution. It cannot be combated by stimulating aggregate economic activity (for example, by increasing government spending, reducing taxes, increasing the money supply or reducing interest rates).
- Workers who are structurally unemployed have to be trained or retrained, or they have to move to locations where their experience, qualifications or skills are in demand (Mohr *et al*, 1995:611-613).

Many economic experts have expressed concern about the apparently clear inappropriate factor mix in the South African economy. The mining, agriculture, construction and manufacturing sectors have become increasingly capital-intensive, while labour-intensive unemployment has

increased sharply. In other words, factor prices are distorted such that capital has come to substitute labour, thus affecting negatively the capacity of the formal economy to absorb more job seekers (Abedian & Standish, 1989:21).

2.2.2.3 Frictional unemployment

This type of employment arises as a result of the normal turnover that happens in any dynamic economy, and the time lags involved in the re-employment of labour; that is, the labour market is always in a state of flux. Even when aggregate demand is high enough to employ all of the nation's labour force and those who are unemployed but have the skills that match those demanded by firms having job openings, the nation's unemployment rate will remain positive because some people will remain between jobs. This means that there is considerable unemployment - not all active job-seekers will have yet found employment and not all employers with job-openings will have yet found suitable people to fill these vacancies. Frictional unemployment is usually unavoidable and is not considered a serious problem by economists (Haydam, 2002:198).

Barker (1992: 73) argues that frictional unemployment normally occurs over a short space of time and can be reduced further by improving information flows and placement services in the labour market, thereby eliminating the time lags involved in the re-employment of labour.

According to McConnel and Brue (1995:545-546), not all-frictional unemployment is of a search nature. In some instances; unemployed workers willingly wait to be recalled from temporary lay-offs or willingly wait in job queues to obtain union jobs, which normally command a high wage rate. This type of frictional unemployment might be described as "wait" unemployment.

2.2.2.4 Demand-deficit (cyclical) unemployment

Cyclical unemployment is also known as demand-deficient unemployment. This kind of unemployment differs from previously mentioned types of unemployment (frictional and structural) because it is caused by a decline in aggregate demand, which in turn causes a decline in the demand for labour. This implies that demand-deficit unemployment is associated with short-term fluctuations in the level of the formal economic activity; hence it is called cyclical unemployment. Frictional and structural unemployment appear even when aggregate demand equals aggregate supply. According to Enhrenburg and Smith (1991:591), cyclical unemployment is associated with short-term fluctuations in the level of formal economic activity.

When there is a shortage or lack of demand for the goods and services that may be produced by certain types of labour, it results in retrenchment or the lay off of the workers from their specified

jobs in the firms. In this instance an important question arises: Why do workers become unemployed rather than wage rates falling every time aggregate demand declines?

At reduced wages the producers are able to produce more goods cheaply and could combat the change in demand for their products by selling them at a reduced price. This would sustain demand for the producer's output and so maintain the demand for labour.

2.2.3 Measurement of unemployment

Dawson (1992:32) postulates that the main aim of measuring unemployment is to discover how many people satisfy the essential conditions of being without a job and being interested in finding one. However, Barker (1992:75) says that the data concerning unemployment in South Africa is very unsatisfactory. This is common in developing countries.

Unemployment can be measured in a number of ways. The accepted international norm focuses on the strict (or official or narrow) measures that include only workers still actively looking for work. The broad (or expanded) definition includes those segments of the labour force that say they would like to work but have become discouraged. In South Africa, the majority of discouraged workers are African rural women. Of 7.7-million workers who were unemployed in 2001, 3.2-million workers were discouraged (Altman, 2003:159).

The unremitting nature of unemployment is demonstrated by the fact that 41.0 percent of urban men and 32.0 percent of urban women were defined as strictly unemployed, and had previously had a job. One-third to one-half of those strictly defined unemployed had been out of work for more than three years. Labour force participation rates are quite high and many people are looking for work; this may mean that people are more desperate, as the picture is still quite bleak. Even according to the strict definition, unemployment is increasing each year. While unemployment is rising for all groups, the racial incidence is enormous, with African workers being most affected (Altman, 2003:160).

Table 2.1 Unemployment trends in South Africa 1994-2001 (%)

	1994	1995	1996	1997	1998	1999	2000	2001
Strict definition	20.0	16.9	19.3	21.0	25.2	23.3	25.8	29.5
Broad definition	28.6	26.5	34.9	38.9	37.5	36.2	35.9	41.5

Source: Adapted from Altman, 2003: 160.

Table 2.1 presents unemployment trends in South Africa from 1994 until 2001. As noted, care must be taken in reviewing these figures, and year on year trends deserve less attention than the overall trend throughout the period. The official unemployment rate rose by almost ten percent between 1994 and 2001, reaching 29.5 percent of the labour force. The broad definition of unemployment that includes discouraged workers, increased from 28.6 percent to 41.5 percent over the same period. The recorded unemployment rate would have grown much faster had it not been for the massive growth in the informal sector (Altman, 2003:160).

The following are four methods of measuring unemployment:

2.2.3.1 Census method

This method is used for measuring the economic status of the entire population by inserting certain questions in the census population questionnaire. However, the census only takes place periodically and even then only a limited number of questions pertaining to employment are included. These questions are not detailed enough to accurately indicate the complex phenomenon of unemployment.

Further, the instructions given to those who do the counting can in some ways influence the data. For example, people working in subsistence agriculture could be classified as employed although they consider themselves as unemployed people (Barker, 1992:75).

This kind of census (including questions about unemployment) started in South Africa in 1996 after the scrapping of the Central Statistical Services, and took place again in 2001.

2.2.3.2 Registration method

This method provides for unemployed people to register at placement offices. for example. in South Africa these are offices at the Department of Labour. The registration is compulsory in order to qualify for unemployment benefits. Those earning more than the ceiling income and those whose period of benefit (6 months) has run out are excluded from the fund.

Knight (1987:2-8) argues that those who are not eligible to register are: those individuals who leave their job voluntarily or who have been dismissed for industrial misconduct; the self employed; those who are not eligible for the benefit and choose not to register; especially married woman who retain the option not to pay the full national insurance contribution; and those who are regarded as unavailable for work by the Department of Labour.

However, there are some shortcomings in using this method of registration as it does not show the real number of those in employment, for example, there are those people who do not know about this registration processes and these offices and those who do not have any faith in being placed on a job list by the Department of Labour or maybe discouraged from registering because they also did not qualify for unemployment benefit (Barker, 1992:77).

2.2.3.3 Sample surveys

This method is used to obtain the data required to calculate unemployment rates for specific groups of people. In earlier years the government's Central Statistical Services conducted surveys on a monthly basis especially for Blacks, Coloured and Asians, and it was called the Current Population Survey (CPS). However, the release of Current Population Survey statistics for Blacks was suspended in April of 1990. Barker (1992:83) states that this was because of a continuous fall in the Black unemployment rate which was not compatible with the general economic scenario. In 1994 the Current Population Survey was terminated and the October Household Survey (OHS) was introduced and conducted by Statistics South Africa instead (it has been called Statistics South Africa since the 1996 October Household Survey).

Because of the lack of a reliable source of information on a regional basis, a number of surveys were conducted in the Vaal Triangle by Slabbert (1991; 1994 and 1999) to determine the unemployment and poverty rate in the region.

2.2.3.4 Difference method

According to this method, unemployment is measured by subtracting the total number of persons actually employed in the formal sector from the economically active population or EAP.

If this method is scrutinized it can be seen that it tends to exclude people active in the informal sector, except if presumed estimates are made for the number of people involved in these activities and if such persons are considered as actually having a job (Barker 1992:76).

2.3 Poverty

As far back as 1906, a government commission was appointed in the Transvaal to look into the matter of "indigency" or poverty. For this reason, they regarded the methodology dealing with general, social and economic causes of poverty as important. However, in their terms of reference, the commission was limited in outlook and considered only the "indigency" of the White population. Very little attention was paid to Black poverty (Slabbert, 2004:26).

Poverty has many complex roots and causes. The creation of the conditions for its decline therefore requires concerted action in a number of functional spheres of government and civil society. Poverty knows no boundaries of race, creed, gender or citizenship. The alarming march of unemployment and poverty in South Africa, and indeed in the entire Southern African region, is testimony to the socio-economically inefficient application of the resources of the continent. Particularly through the instability it engenders, poverty is one of the most significant and enduring threats to the fabric of society on the continent.

2.3.1 Urban poverty/rural poverty

Urban poverty differs from rural poverty in a number of ways. One of these ways is the fact that the poverty line and consumption patterns of the rural poor differ markedly from those of the urban poor in most developing countries. Separate poverty lines for both urban and rural poverty is specifically considered due to the nature of the area being studied. Jegasonthy (1999:1034) states that in respect to urban poverty the physical manifestations thereof are evident in all cities of developing countries in the form of slums and squatters. In this respect, South Africa is no different, and the same applies to the area of this study.

The following table, **Table 2.2**, represents some of the main characteristics of the urban poor.

Table 2.2 Characteristics of the urban poor

Illegitimacy of their residence and work: the majority of the urban poor live in informal settlements. Furthermore, poor urbanites are likely to be engaged in casual and informal sector work. Policy and regulatory frameworks regarding service provision, housing and land, labour rights and safety nets do not address them.

Insufficient channels of information: The urban poor do not have sufficient access to channels of information about jobs, legal rights to services, etc.

Not being treated as “citizens”: the urban poor are not given rights and responsibilities that go with being citizens. They are often assumed to be passive consumers rather than active participants with something to contribute.

Negative contact with authorities: while government policies can have an important positive impact on poverty alleviation, many poor people experience the impact of the state in negative ways: for example, as an oppressive bureaucracy which attempts to regulate their activities without understanding their needs.

Geographical isolation: The urban poor have a trade-off between the cost of housing and living a long distance from city centers. Communities on the outskirts of cities are disconnected from job opportunities and urban services.

Source: Mokoena (2004: 23)

2.3.2 Definition of poverty

Defining poverty is not an easy task. Scott (1994:17) points out that poverty is a highly contested term. Many works on the subject become so technical that it is very difficult to draw conclusions from them or to employ them in policy-making activities. How poverty is defined and measured tends to determine the types and direction of policies aimed at reducing it. Mokoena (2004:15) states that a key fact about the definition of poverty is that definitions drive policies. Alcock (1997:1-2) concurs with the argument that underlying the discussions of poverty is the assumption that identifying the problem provides a basis for action upon which all will agree. Poverty is perceived by poor South Africans themselves to include alienation from the community, food insecurity, crowded homes, usage of unsafe and inefficient forms of energy, a lack of jobs that are adequately paid and/or secure, and the fragmentation of the family (May, 2000:3-6).

The following factors are important to include in the attempt to define poverty:

- **Deprivation and basic needs.** Most definitions of poverty are grounded in the idea of a state of deprivation. What the poor are deprived of is not often clear. What is seen as basic needs or necessities is not clear-cut and may differ from researcher to researcher, and indeed, from place to place. What is perceived as a basic need in one community may not necessarily be a need in another area. According to the International Labour Organisation, basic needs include two elements. Firstly, it includes certain minimum requirements of a family for private consumption, such as adequate food, shelter, and clothing, as well as certain household equipment and furniture. Secondly, it includes essential services provided by and for the community, such as safe drinking water, sanitation, health and education, and public transport facilities. Streeten (1982) states that “there is nothing yet that could be described as a fully articulated Basic Needs Strategy, even as an adjunct to other strategies”. There is therefore little agreement as to what constitutes a basic need and therefore a state of deprivation from basic needs (Mokoena, 2004:10).
- **Political and cultural influences.** Poverty is not only a social issue, but also a highly political one, where power and interest groups have a significant influence. Definitions of poverty therefore normally vary geographically and territorially depending on the politics of the area. For example, in sharp contrast with an economist like Schumpeter, Karl Marx explained poverty as the exploitation of the masses, which is explained by the phenomenon of surplus value, linked to the institution of private property (Mokoena, 2004:10). Wilson (1996:24) states that poverty is a highly emotive issue, where power and interest groups have had a significant influence on the patterns of distribution. Indirectly, these power and interest groups influence the existence of poverty. The analysis of poverty, therefore, is contested territorially. Social scientists cannot be completely unaffected by or neutral about the factors causing poverty. There is a need for all social scientists to be open to critical attacks on their most cherished theories. They should also recognize the corrective value of a range of different hypotheses in the search for an understanding of poverty (Wilson, 1996:24)

In South Africa, the proposition that poverty is a political issue is punctuated by the elevation of income and wealth inequalities and disparities resulting from past policies in many definitions of poverty. The Poverty and Inequality Report (May, 1998:1) does not, for example, divorce poverty from inequality. There seems to be an unquestioned assumption in the report that a cause and effect relationship exists between the two. The prevailing political climate therefore underpins definitions of poverty. Even within the same political environment, people may be

seen as poor or well-off depending on the cultural group to which they belong (Mokoena, 2004:10).

The above factors are fundamental to note, as they may be indicative of bias in a number of poverty definitions. Many definitions of poverty are based on income or material-based poverty (Atkinson & Bourguignon, 1999:1). This then argues in favor of income-based policies in poverty reduction. There are other dimensions to poverty, though, as pointed out by Max-Neef, Elizalde and Hopenhayn (1989). A few illustrative definitions of poverty proposed in some of the prominent works on the subject are presented below.

May (1998:3) defines poverty as the inability to attain a minimal standard of living, measured in terms of basic consumption needs or the income required in order to satisfy them. The definition runs in tandem with the measurement of poverty, employing the Minimum Living Level (MLL) as the accepted poverty datum line in South Africa.

The World Bank (2001:1-2) defines poverty, as being a lack of command over commodities in general that are deemed essential to constitute a reasonable standard of living in a society, or the lack of ability to function in a society. This definition also emphasizes command over resources as well as the lack of participation or “voice” in governance and civil matters.

The examples of definitions given above show that poverty may be defined either based on income or non-income dimensions. Schiller (1984:5-10) makes the point that although non-economic aspects are understood, they are not easily quantifiable. It is therefore much more convenient to employ an income-based measure for ease of measurement. It has nevertheless become imperative and equally important to attempt the measuring of non-income indicators as well. The World Bank (2000) has specifically developed the HDI (Human Development Index) for this purpose.

Kanbur and Squire (1999:1) state that: “Any reasonable definition of poverty implies that significant numbers of people are living in intolerable circumstances where starvation is a constant threat, sickness is a familiar companion, and oppression is a fact of life.” This approach raises some fundamental issues with regard to poverty, namely, the lack of command over resources, vulnerability, insecurity, social exclusion, and lack of participation. Most definitions of poverty contain these issues.

The debate on poverty, especially in the Third World, is part of a wider debate on development and underdevelopment. The definition of development is crucial here. The people-centered approach suggests that development is about people and not objects (Van Zyl 1995:14). This has major implications for strategies to alleviate poverty.

According to Petmesidou (1994:20), both the populist model of development and the technocratic model, when trying to speed up development, generate their own vicious circle in Third World countries. In the case of the populist model, growing public expenditure limits economic growth and increases social conflict as more groups participate in the political game. In their efforts to share a stagnant or slowly growing 'pie', social and political instability is the result. With the technocratic model, a high rate of growth can be achieved, but only at the expense of participation and social unrest. There is a complex relationship between development and participation. This increases polarization and social unrest. The complex relationship between development, participation and equality will provide the key to policy formulation. This does not imply that a substantial reduction of poverty is impossible. However it serves as a reminder of the political context and constraints within which particular policies unfold.

Understanding the causes of poverty, and devising strategies to reduce it, is therefore a central component of the development debate. Recognition therefore reinforces appreciation of the difficulties of the problem, and serves as a reminder that the search for strategies and understanding of poverty must draw on the wider body of knowledge accumulated in the general field of development. Insights from development theory can be useful when considering specific instances of poverty. The possibility of reducing poverty through an effective reduction policy is a good example.

2.3.1.1 Subsistence, inequality and externality

Subsistence, inequality and externality are concepts linked to poverty as defined by Rein (1971:46-52). Subsistence has to do with the basic necessities required to provide adequate health and working capacity. The concepts correlate with Scott's (1994:54) and others' 'absolute poverty' concept, which has to do with the basic physiological needs of a household. The problem with the approach lies in the definition of the basic needs or necessities, as well as the determination of the basket of necessities required which enable a family to cross the poverty line to a non-poor state.

Holman (1978:2) refers to this as subsistence poverty, implying that those who are classified as such live below the subsistence level. It also refers to the poor (with bare minimal income) and the very poor (who for some reason fall below this standard). George and Lawson (1980:1) state that this type of poverty involves a cross-nationally and historically constant and fixed threshold, which distinguishes poor from non-poor.

At the heart of this type of poverty is the notion of people with less than adequate nutritional provision or access. The immediate and obvious problem with this approach is the definition of

what constitutes 'adequate nutrition'. Furthermore, as pointed out by Sen (1981:12), it is necessary to determine how such nutritional requirements are translated into food requirements. Schiller (1984:4-5) points out that there is another problem with regard to the absolute definition, namely the issue of who defines the nature of basic needs: is it the poor themselves, policy-makers or researchers who are to determine what basic needs are? People will tend to define basic needs based on their current socio-economic situations. It thus does not seem prudent to define poverty purely in absolute terms.

Inequality refers to the stratification of society along wealth, means and income lines or, as Rein (1971:46) describes it, the relative position of income groups to each other. Scott (1994:54-55) refers to relative poverty by describing the essence of this approach as being the fact that the poor are poor in relation to the community to which they belong. Holman (1978:14-20) states that the relative approach includes four main elements: firstly, comparison with other people, secondly, the contemporary environment, thirdly, inequality, and fourthly, value judgment referring to the standard of living society dictates as normal. Desia and Shah (1988:508) characterize this type of poverty by stating that there is a community to which those who are deprived, and those who are not, belong. The non-deprived set the living pattern, customs and activities, which, if practiced, constitute "belonging to the community".

Brady (2003:721) points out that relative measures generate specific poverty thresholds for each society in each time period from patterns in the income distribution. They reflect the differences in living conditions between the poor and the majority of society, rather than some abstract standard. This approach has also been criticized. Hazlitt (1973:33) points out that, if based on the definition that poverty means being worse off than somebody else, then all but one of us are poor. On the question of value judgments and standards, which also form part of this approach, Sen (1981:16-17) contends that the question "what are the contemporary standards?" rather than "what should contemporary standards be?" needs to be asked. In other words, descriptive rather than prescriptive research needs to be pursued to ensure objectivity rather than subjectivity in judging values and standards, and in setting being and well-being standards.

Razafindrakoto and Roubaud (2003:4) state that in practice there is a tendency to favour relative measures in the developed countries, whereas in the developing countries, where many basic needs are not met, the preference is to use measures of absolute poverty. This is nevertheless not conclusive nor really scientific as poverty also has a strong regional dimension, that is, what Alcock and Graig (2000:58) refer to as the spatial dimensions of the poverty problem. Atkinson and Bourgiugnon (1999:30) propose that a relative threshold takes account of the social standing of the individual, and an absolute threshold makes it possible to rank priorities. There is, therefore, a strong tendency to combine the two approaches into a complementary whole. Sen

(1981:16-17) points out that “the approach of relative deprivation cannot really be the only basis for the concept of poverty. There is an irreducible core of absolute deprivation in our idea of poverty. Thus the approach of relative deprivation supplements rather than supplants the analysis of poverty in terms of the absolute dispossession.”

Externality refers to the social consequences of poverty for the rest of society (Rein, 1971:46-47). This has more to do with how the rest of the population experiences the presence of the poverty problem rather than the effects on the poor themselves. For recent works on the subject see social exclusion, whether based on subjective feelings or objective considerations, as real issues (Razafindrakoto & Roubaud, 2003:8).

2.3.1.2 Social exclusion

A relatively new concept in poverty analysis is the idea of social exclusion. The Poverty Group (2001:20) led by Martin Ravallion at The World Bank stated that social exclusion refers to the social arrangements or structures within a society that systematically exclude disadvantaged groups from economic opportunities for reasons other than their potential productivity. The group further attests that social exclusion appears to be an important but under-researched impediment to pro-poor growth, implying that left unattended and excluded from policy imperatives, social exclusion has the potential to minimise the effect of such policies.

Mokoena (2004:19-20) points out the following issues regarding social exclusion in relation to developing countries’ social policies:

- inherent within the concept of exclusion is the idea of systemic isolation. Such isolation may not apply in developing countries as it is applied in developed countries for a number of reasons;
- developing countries do not have as advanced social security and safety nets as developed countries. This is due to a number of factors, not least of which is the socio-economic structure in these countries;
- exclusion from promotive social security. Promotive social security refers to measures concerned with the promotion and enhancing of normal living conditions. In developing countries, many are excluded from these, such as people who do not achieve a certain minimum standard of functioning related to health, nutrition and education;
- exclusion as defined in relation to employment: while it is relatively easy to classify the unemployed in developed countries as socially excluded, it is not as straightforward in developing countries. What may be considered as unemployment

in developed countries may not be the norm in developing countries, questioning the assertion of social exclusion; and

- concepts paralleling 'social exclusion' – these include exclusion from basic services (e.g. water and electricity), exclusion from employment, human rights and income.

From the issues listed above, it follows that social exclusion is a prominent feature in developing countries.

2.3.1.3 Human scale development

The works of Max-Neef (in, for example, Max-Neef, Elizade & Hopehayn, 1989) have led to what is now known as Human Scale Development (HSD), where poverty is seen as being multidimensional (i.e. different poverties). HSD thus also refers to satisfaction of basic human needs. The Sore Feelings website (2004) refers to HSD as "focused and based on the satisfaction of fundamental human needs, on the generation of growing levels of self-reliance, and on the construction of organic articulations of people with nature and technology, of global processes with local activity, of the personal with the social, of planning with autonomy, of civil society with the state."

HSD is based on the satisfaction of fundamental human needs, and on the generation of a growing level of self-reliance. It is also about the constriction of organic articulations of people with nature and technology, of global processes with local activity, of the personal with the social, of planning with autonomy, and of civil society with the state (Mokoena, 2004:21-23). **Table 2.3** lists the Fundamental Human Needs, their qualities, and their explanations.

Table 2.3 Fundamental Human Needs

Fundamental Human Needs	Being (qualities)	Having (things)	Doing (actions)	Interacting (setting)
Subsistence	Physical and mental health	Food, shelter, work	Feed, clothe, rest, work	Living environment. social settling
Protection	Care, adaptability, autonomy	Social security. health systems	Co-operate, plan, take care of, help	Social environment. dwelling
Affection	Respect, sense of humor, generosity, sensuality	Friendship. family, relationships with nature	Share, take care of, make love, express emotions	Privacy, intimate space of togetherness
Understanding	Critical capacity, curiosity, intuition	Literature, teachers, policies educational	Analyze, study, meditate	School, families, universities, communities
Participation	Receptiveness, dedication, sense of humor	Responsibilities, duties, work, rights	Co-operate, dissent, express opinions	Associations, parties, churches, neighbourhoods
Leisure	Imagination, tranquility, spontaneity	Games, parties, peace of mind	Day-dream, remember, relax, have fun	Landscapes, intimate spaces, place to be alone
Creation	Imagination, boldness, inventiveness, curiosity	Abilities, skills, work, techniques	Invent, build, design, work, compose, interpret	Space for expression, workshops, audiences

Fundamental Human Needs	Being (qualities)	Having (things)	Doing (actions)	Interacting (setting)
Identity	Sense of belonging, self-esteem, consistency	of Language, religions, work, customs, values, norms	Get to know oneself, grow, commit oneself	Place one belongs to, everyday settings
Freedom	Autonomy, passion, esteem, open-mindedness	Equal rights	Dissent, choose, run risk, develop awareness	Anywhere

Source: Mokoena (2004: 21)

This approach identifies human needs and their 'satisfiers'. Human needs are seen as few, finite and classifiable, and constant through many human cultures and across historical time periods. What changes over time and between cultures is the way these needs are satisfied. As an example from the **Table 2.3**, the need for participation includes aspects such as receptiveness and dedication. The satisfiers for this need include having rights and responsibilities which can be achieved by co-operation, and openly expressing views and opinions. An enabling framework and institutions for the achievers of the satisfiers include churches, political parties and associations. The main contribution of this approach is to show that there is no single type of poverty; people may be poor in a number of ways, including spiritual poverty. The scope of this dissertation, however, is restricted to material poverty.

2.3.3 Measuring poverty

The exercise of defining poverty is undertaken in order to be able to employ appropriate tools of measurement. It is not an easy task to measure poverty. Poverty measurements have also changed with time. As with the definition of poverty, there are issues that need to be clarified in order to arrive at an accurate measure of poverty. These are discussed next.

- **Individuals and households:** Individuals experience poverty. The state of deprivation is essentially an individual matter. Having stated that, individuals are members of family units or households with whom they share their resources (Alcock, 1997:99). This phenomenon is particularly acute among Blacks in South Africa as they tend to have strong extended family systems. The household is important in measuring poverty. The concept of household is used instead of the

family concept. The two differ in that a family is constituted of members with compulsory moral obligations and responsibilities towards one another (e.g. through marriage), while a household is a looser concept implying any arrangement of the sharing of resources.

- **Income:** A further aspect that needs to be considered is the life-cycle hypothesis of income. An individual receives varying resources over his/her life span. Earlier in life (child) and in late (old age and retirement) years an individual may find that he or she depends on other family members more than during early adulthood and middle age. (Alcock, 1997:107) Many measurements of poverty make use of the concept of income. It is therefore important to outline what is being understood by income. Beeghley (1984:325) argues that income should also include 'in-kind or cash benefits' such as benefits that understate income.

The Central Economic Advisory Services (CEAS) (1986:16) includes the following in income:

- salaries, wages, overtime pay and commissions before deduction of pensions and taxes;
 - net profit for business activities;
 - estimated cash value of fringe benefits; and
 - any other income such as interest and dividends.
- **Qualitative and quantitative approaches:** Some researchers prefer non-income measures of poverty because of the uncertainty involved in the use of income as a measure. Wealth, or the lack of it, has also been used as a measure of poverty. Measurements of poverty can be divided into qualitative and quantitative measures. Mokoena (2004:20) argues that qualitative measurements of poverty draw from the experience of poverty by those individuals actually suffering from it. Such experiences give life and meaning to the seemingly dry and impersonal mathematical tables and graphs. Quantitative measures make use of data independent of feelings and emotions.

The World Bank (1997:1-4) has compared the two approaches in terms of their inherent characteristics. Some of its findings include the following:

- the philosophical underpinning of the quantitative approach is a positivist paradigm rejected by qualitative approaches;

- quantitative determination of poverty is done by external surveyors whereas in qualitative approaches it is done by participants and facilitators:
- geographic coverage of quantitative approaches is wide and national whereas the qualitative one is small in selected communities.

The two approaches have difficulties, advantages and disadvantages and are best used together as they complement each other.

The following sections outline the main poverty measures used in this study.

2.3.3.1 Poverty lines

The use of poverty lines to measure poverty is an age-old practice. Some of these lines are antiquated and irrelevant in modern societies. Generally, poverty lines show the level of income necessary to offer a minimum subsistence level, or what Fisher (1995) calls the “get-along” amount. They demarcate a group of households whose income or consumption is too low in comparison with that of the general population.

Poverty lines are income and price elastic, i.e. they are adjusted for changes in the medium or mean income or consumption of the general population as well as change in the general price level. Fisher (1995) reasons that as technology progresses and new products are introduced, the upper income households may initially buy them, but they generally diffuse to the lower income households. This causes the income elasticity of these goods. The goods may initially be seen as conveniences but end up as necessities. For example, computers are slowly becoming necessities in modern society. The price elasticity occurs as a result of inflation. Thus poverty lines are normally adjusted upwards with the passage of time due to technology and inflation.

Until 1973, the term Poverty Datum Line (PDL) was used to determine the subsistence level in South Africa (Slabbert, 1997:43). Since then other poverty lines have been introduced.

Table 2.4 below show examples of poverty lines used in South Africa, and their composition. The Minimum Subsistence Level (MSL) is the minimum level at which a non-White family would be able to maintain the health of its members and conform to western standards of decency. It includes the cost of items such as tax, medical expenses, education and household equipment, in addition to the items included by the PDL. The Supplementary Living Level (SLL) includes items such as recreation, personal care, pension, unemployment, insurance fund, medical aid and burial contribution plus 30 percent more of the items included by the MSL. (Mokoena, 2004:22).

Table 2.4 Examples of poverty lines used in South Africa (poverty lines compared)

Poverty lines	Coverage
HEL	HSL plus 50 percent
HSL	Same as PDL
SLL	MSL plus: more of each plus recreation, personal care, pension, unemployment, insurance fund, medical aid, burial contributions.. Approximately MSL plus 30 percent.
MSL	PDL plus: tax, medical expenses, education, household equipment replacement
PDL	Food, clothing, fuel/lighting, washing/cleaning, rent, transport

Source: Adapted from Mokoena, 2004:22.

The Household Subsistence Level (HSL) was used by Potgieter (1980) and contains the Household Effective Level (HEL). Potgieter (1980:4) defines the HSL as an estimate of theoretical income needed by an individual household to maintain a defined minimum level of health and decency in the short-term and is calculated at the lowest retail cost of a 'basket' of necessities of adequate quality. The basket includes: food, clothing, fuel and lighting, and washing and cleaning material for each individual in a household and for the whole household and the cost of rent and transport.

The HSL will be employed in this study because, as Slabbert (1997:45) postulates, it covers all major centers in South Africa. Secondly, the HSL is the most frequently used measure in recent years. Thirdly, as this study includes a comparison between Leirim and Rathanda the HSL offers a common measure. The HEL is calculated as the HSL plus 50 percent and thus gives a higher cut-off point (Mokoena, 2004:22).

2.3.3.2 Dependency ratio

The dependency ratio refers to the ratio or number of non-income earners that depend on income earners. This tendency is particularly acute in the extended family system. The proportion of the total population falling between 0 to 15 and 65+ years of age is considered economically unproductive (inactive) and is therefore not included in the labour force. In many less developed countries (LDCs), the population under the age of 15 years accounts for almost half the total

population, thus posing a burden to the generally small productive labour force and the government (Todaro, 1994:669). One of the causes of poverty in South Africa is the high rate of dependency in Black families and high rate of unemployment. Those who earn an income have to support many non-earners with the result that their income is spread so thinly that the food, clothes and shelter they can afford amounts to less than the minimum regarded as essential (Levin & Sofisa, 1993:10).

Dependency ratios are usually calculated by dividing the total number of non-income earners by the total number of income earners. However, this calculation of dependency ratio is very insensitive because it is based on averages.

2.3.3.3 The headcount index and the poverty gap

The depth of poverty is measured by the poverty gap measure, in conjunction with the headcount index. The poverty gap measures the average shortfall of the income of the poor from the poverty line while the headcount index is concerned with the number of poor people or households whose incomes fall below a given poverty line as a ratio of the whole population. The poverty gap measures the average shortfall of incomes from the poverty line.

The poverty gap index measures the extent of the shortfall of income below the poverty line, that is, the difference between the poverty line and the mean income of the poor, expressed as a ratio of poverty line. The larger the value, the larger the gap between the poverty line and the mean income of the poor, and this indicates a greater depth in poverty levels.

The headcount index is defined as the fraction of the population below the poverty line. In this study, the headcount index is adapted to indicate the fraction of households falling below their individual poverty lines, and is described by means of the following equation:

$$H(y; z) = M/N$$

Where: H = the fraction of households below the poverty line;

y = household income;

z = the poverty line of households;

M = the number of households with income less than z ;

N = the total number of households.

The headcount index has been criticized by Sen (1981:32-34) for not measuring the extent of poverty. To make up for this shortcoming, the poverty gap ratio is normally used. The poverty gap measures the average shortfall of the income of the poor from the poverty line while the poverty gap index measures the extent of the shortfall of income below the poverty line. The poverty gap of an individual household (in monetary terms) can therefore be expressed by the equation:

$$G_i(y, z) = z_i - y_i$$

Where: G_i = the income shortfall of a household;

y_i = the income of the specific household; and

z_i = the poverty line of a specific household.

From the equations above, it is clear that the poverty gap can only be reduced by an increase in the household income (Slabbert, 1997:47). The poverty gap index is concerned with the depth of poverty (its magnitude) and therefore measuring the extent of the shortfall of income below the poverty line.

The poverty gap ratio (R) can be described by the following equation (Slabbert, 2004: 43).

$$\text{Where: } R(y, z) = \sum_{i=1}^M (z - y_i) / z$$

R = Mean income shortfall of the poor expressed as a proportion of the poverty line;

z = the poverty line;

y_i = the income of a household; and

M = the number of households with income or equal to the poverty line (z).

However, measuring poverty amongst households where not all members are earning an income and where all members have to live from the combined income, makes the adaptation of this measure compulsory.

2.4 Summary and conclusion

In this chapter it has been argued that unemployment and poverty are increasingly seen as multidimensional concepts, resulting in a much wider range of factors being considered.

Unemployment is perceived as a situation where members of the labour force are without employment but are currently available for employment, and are seeking employment. There are four different types of unemployment, namely, frictional, structural, demand-deficit and seasonal of which structural unemployment is the most prominent in South Africa. Unemployment in South Africa is higher for African workers than for other groups. There are three methods for measuring unemployment, namely, the census method, the registration method and the sample survey method. The sample survey is the method employed for the purposes of this study where surveys were undertaken on a sample basis to obtain the data required to measure the unemployment rate for the Rathanda and Leitrim communities.

Poverty can be defined in a number of ways, and has many complex roots and causes. The creation of conditions for the reduction of poverty therefore requires concerted action in a number of functional spheres of government and civil society. It is widely accepted that poverty includes deprivation in a range of capabilities, such as health, human and civil rights, and education. One may argue that deprivation is a result of unemployment. The past regime is heavily held accountable for the persistence of poverty in South Africa, but there has also been an increasing level of unemployment since 1994. Women and children experience higher vulnerability to poverty. Measurements of poverty include the following concepts: the poverty line, the poverty gap, headcount index and the dependency ratio.

Poverty is measured at a household level by calculating an individual poverty line (Household Subsistence Level) for each household. Once the poverty line for a household has been determined, the total household income can be calculated and compared to the poverty line for the household. The headcount index is defined as the population below the poverty line, and its purpose is to quantify the individuals or households that fall below the poverty line.

The poverty gap index measures the extent of the shortfall of income below the poverty line, that is, the difference between the poverty line and the mean income of the poor, expressed as a ratio of poverty line. The larger the value, the larger the gap between the poverty line and the mean income of the poor, and this indicates a greater depth in poverty levels.

CHAPTER THREE

THEORIES ON POLLUTION

3.1 Introduction

In economics the environment is viewed as a composite asset that provides a variety of services. It is a very special asset, to be sure, since it provides the life support systems that sustain our very existence, but it is an asset nonetheless (Tietenberg, 2000:17).

Concern for the environment is a modern-day social phenomenon. Throughout the world governments, international organizations, major corporations as well as ordinary citizens are insisting that planning and decisions must take cognizance of the impact of human actions on the environment. For several decades economists were concerned with topics such as exhaustible resources and pollution. The rise of this concern has not been without setbacks or varied opinions, nor has it been a steady linear process. Environmental concerns have swelled up in much the same way as water moves up a beach on a rising tide (Goodstein, 2000:375).

Isolated injunctions and attempts to control the misuse of the environment can be traced from biblical times. Laws specifically designed to regulate environmental deterioration have been a product of the last 300 years. However, until the late 19th century, environmental laws were directed at specific forms of pollution, particularly air pollution, water pollution, land pollution (littering) and noise pollution. For poor people, many environmental problems are simply problems associated with poverty. The biggest environmental health threat facing most people in poor countries is unsafe drinking water, compounded by inadequate sewerage facilities. Around one-billion people worldwide are without access to safe water, and over 1.7-billion are without adequate sanitation. A multitude of illnesses each year and millions of deaths are attributed to water pollution. Exposure to indoor air pollution (smoke) from cooking and heating sources ranks close to urban air pollution as a concern. Some 400-million people worldwide are exposed to unsafe levels of indoor smoke, as against 700-million that are exposed to outdoor air pollutants. Exposure to indoor pollution is typically more intense. Smoke inhalation contributes to about 4-million deaths per year among infants and children (Goodstein, 2000:449-450).

3.2 Definition of pollution

Clearly, 'pollution' is by no means a straightforward concept. Fuggle and Rabie (1999:488) define pollution as detrimental alteration or variation of the physical, chemical, biological or

aesthetic properties of the environment, which result in or may result from an act or omission over which the legislature has jurisdiction. 'Pollute' has the same meaning.

Tietenberg (2000:336) refers to pollution, as the residuals of production and consumption and these residuals must eventually return to the environment in one form or another. Since their presence in the environment may depreciate the service flows received, an efficient allocation of resources must take this cost into account.

According to Stephen, Stephen and Stuart (2002:133-136), pollution is defined as the ambient quality of the environment. The term pollution is applied to situations in which man-made activities reduce the ambient quality of a particular environment. In this view, the introduction of any substance or energy form that lowers the ambient quality of the environment (i.e. 'pollutant') can be regarded as 'pollution'. The following are the types of substances and energy forms which result in a lowering of the ambient quality of natural environments and which we regard as pollutants:

- Stock pollutants (cumulative pollutants) take into account the fact that the pollutants accumulate in the environment over time and the damage caused by its presence increases and persists as the pollutants accumulate. Cumulative pollutants tend to be retained in the environment over time in roughly the same amounts as where first emitted. Radioactive waves decay so slowly (e.g. the half-life of the carbon-14 isotope is 5,700 years) that they can be regarded as almost permanent. Most plastics and some chemicals are non-biodegradable (i.e. cannot be broken down by micro-organisms in the soil) and so are often placed in the category 'cumulative pollutants'.
- Non-cumulative pollutants tend to dissipate quickly after being emitted, for example, noise. A few plastics and many chemicals are biodegradable and may therefore be placed in this category.
- Global pollutants are those, which while emitted from a local source, have potentially worldwide impacts. The impact of CO₂ (carbon dioxide) and CFC₁₁ (chlorofluorocarbon) emissions on the ozone layer in the world's stratosphere are global pollutants.
- Regional pollutants are those, while emitted from a local source, have impacts which extend 'regions' within a country, but more usually 'regions' involving geographically adjacent countries. For example, oxides of sulphur and nitrogen emitted via the combustion of fossil fuel in particular localities have been held as responsible for 'acid rain' deposited by various types of precipitation (rain, snow or hail), which has degraded lakes and buildings in geographically adjacent countries.

- Local pollutants are those, which are emitted from a local source, and which have impact on the local scale. For example, pollutants such as noise and those affecting the visual appearance of the environment fall within this category.

3.3 Types of pollution

Stephen, Stephen and Stuart (2002:36) state the following as types of pollution: water pollution, air pollution and land-based pollution (littering). According to Nurnberger (1999:84), pollution presents a much more serious problem than the depletion of resources. The places where waste and pollution are deposited are called 'sinks'. These sinks are neither unlimited nor watertight. He further states that the following are four remaining problems with regard to cleaning:

- cleaning up often simply means that toxic materials are transferred from one sink to another, say from water to air;
- avoiding or cleaning up pollution is expensive and is often unaffordable for the poorer societies;
- the ecological concern has not become part of the economic concern. The mandate of the institution created to combat pollution is restricted to fighting the symptoms of the problem, while the roots are not tackled. Much of their work has of necessity been 'after the fact' repair of damage: reforestation, reclaiming desert lands, rebuilding urban environments, restoring natural habitats, and rehabilitating wild lands;
- many gains are neutralized by higher population growth rates.

3.3.1 Land pollution (littering)

Land-based pollution is mainly due to the disposal of human refuse and contamination by agricultural chemicals. Dumped refuse in landfill sites is a problem because it destroys natural habitats, is a breeding ground for disease and releases methane (a greenhouse gas) as the refuse decomposes. Fertilizer, pesticides, and herbicides are deliberately sprayed on crops and the soil in many sectors of agricultural production. When it rains, they will be washed into the rivers and eventually into the sea. Pesticides and herbicides are persistent and they remain active in the environment for a long period of time according to Stephen, Stephen and Stuart, (2002:151). Eutrophication is the nutrient enrichment of rivers, lakes and groundwater, mainly applied to arable land. This problem results mainly from using increased amounts of fertilizers in order to raise agricultural productivity (e.g. output per hectare) especially in cereal production. Nitrates are highly soluble and easily washed out of the soil profile into drainage water and groundwater.

Although phosphate is less soluble, it readily attaches itself to soil particles, which can also enter the drainage system. The leaching of nitrates and phosphates into the water system has many adverse environmental impacts, resulting in declining amenity use and the need to treat water for domestic consumption (Stephen, Stephen & Stuart, 2002:192).

According to Fuggle and Rabie (1999:509), littering is waste that has been misplaced: it must be recovered and brought into the formal waste stream, where it can be managed with the resources that are available for the task.

Callan and Thomas (1996:522-523) refer to land pollution (hazardous solid wastes) as any unwanted materials or refuse capable of posing a substantial threat to health or the environment (ecology). The following are the types of hazardous substances:

- acids and bases: acids are characterized as having a low pH of between 0 and 6, and bases as having a high pH of between 8 and 14. Highly acidic or basic substances are corrosive. In the waste stream, discarded acids and bases can corrode the containers in which they are stored and leach into land and nearby waterways. Both acids and bases are frequently used in processes such as plating procedures and metal stripping;
- heavy metals: heavy metals include lead, arsenic, cadmium, barium, copper, and mercury. They are highly toxic and do not readily break down in the human body. These metals possess properties that are useful in plating and production processes and in numerous commodities. Some have special properties, such as copper, which is an excellent conductor of electricity and is highly resistant to corrosion;
- reactives: reactives are substances that behave violently when combined with air or water. Included are explosives and flammables. Common examples are petroleum or natural gas by-products. The instability of reactive substances makes them potentially harmful in the waste stream. Reactives are useful in certain industrial processes. For example, laboratories use these chemicals to accelerate a reaction, and plastics manufacturers use them to speed up polymerization to harden plastics;
- synthetic organic chemicals: synthetic organic chemicals are man-made substances that are hydrocarbon based, some created from relatively new processes like chemical splicing and molecular engineering. Two important subcategories of synthetic organic chemicals are solvents and pesticides. Many synthetics are highly resistant in use, making them valuable to industrial applications. Polychlorinated biphenyls (PCBs) were formerly used as insulators in transformers because of their resistance to heat and electrical charges;

- solvents: solvents are liquids that can dissolve or disperse one or more substances. Examples include ethylene, benzene, pyridine, and acetone. Solvents are used for a variety of industrial processes, such as degreasing, stripping, cleaning, and thinning procedures;
- pesticides: pesticides are used to prevent, destroy, or repel any unwanted form of plant or animal life. These include insecticides, rodenticides, herbicides, and fungicides. Some are highly resistant, which allows them to persist in the environment for a long time without the need for frequent reapplication. Some are nearly insoluble in water, making their use as insecticides on crops resistant to rainfall. Many are acutely toxic. These substances are used mainly in agriculture but also in industries as textiles, paper, and wood production treatment (Callan & Thomas 1996:522-523).

The above-mentioned substances serve important functions in productive activity. Often, the properties that make them useful in production are precisely those that make them dangerous to society once they enter the waste stream. The waste stream refers to the series of events starting with waste generation and proceeding through the transportation, storage, treatment, and disposal of these materials. Environmental and health risks arise both because of excess generation and improper management of these materials once they enter the waste stream (Callan & Thomas, 1996:522).

3.3.2 Noise pollution

Noise pollution is a particular category of sound. According to Fuggle and Rabie (1999:569), noise pollution may be defined as undesirable sound. Fuggle and Rabie (1999:571-572) state the following factors as those that are influencing the degree of undesirability of sound.

3.3.2.1 Physical effects

Physical effects occur at the most severe end of the scale, that is, when intense noise of a continuous nature causes severe trauma in human beings and can cause material fatigue effects in structures and components. Fortunately, such intense noise level only exists in the immediate vicinity of sources such as rockets and gas turbine engines where they are of concern originating organization. Noise from such sources can propagate over considerable distances, at lower levels, and give rise to other undesirable consequences. Intense noise of a transient nature, usually in the form of a shock wave, is rather more common and typically results from blasting operations or aircraft fly-pasts at supersonic speeds. Physical damage to structures, particularly weak ones such as historical buildings, is possible but unlikely. Damage is more likely to be caused by the ground

vibration that accompanies many shock waves. In general, physical damage by intense noise is rare in South Africa, Fuggle and Rabie (1999:571).

3.3.2.2 Physiological effects

These effects are further down the severity scale. The most important is loss of hearing acuity caused by repeated exposure to high noise levels. Such exposure occurs primarily in the work place. An exception to this is the high level of noise found in certain places of entertainment, such as discotheques, where regular patrons might run the risk of incurring hearing damage (Fuggle & Rabie; 1999:571).

3.3.2.3 Effects on communication and productivity

The noise levels that can result in hearing damage are quite loud. Even at the limit below which labour legislation does not require hearing conservation measures, it is necessary to raise one's voice considerably in order to communicate to a person standing next to one. Clearly at these and even at much lower noise levels there is significant interference with communication. At the one end of the scale conversation becomes impossible (e.g. on a busy street corner) and at the other it becomes difficult to communicate in a meeting, conference or classroom situation. In between these extremes the quality of telephone communication is impaired. Such interference with communication leads to quantifiable production losses (Fuggle & Rabie; 1999:571).

3.3.2.4 Psychological effects

These occur towards the lower end of the severity scale and are by far the most significant from an environmental point of view. Noise causes annoyance, which leads to negative community reaction. Because of the relatively low levels of sound that can result in annoyance, the offending sound may propagate over considerable distances and consequently affect a large group of people. For example, a single noisy motorcycle may wake almost an entire suburb or more in the early hours of the morning. On the other hand, seemingly quiet sources may cause isolated complaints, such as an automatic swimming pool cleaner operating close to a neighbour's bedroom window. It should be made clear that most annoyance effects occur at sound levels well below those of all the aforementioned effects, and apart from the as yet unproven allegations of stress and hypertension, there are no other consequences. It is simply a matter of the right of the individual to '... live, work and relax in a(n) ... aesthetically and culturally acceptable environment (Fuggle & Rabie; 1999:572).

From the above it may be deduced that the negative influences of noise are limited to human beings and the built environment; their activities are also the predominant causes. Control measures are hence confined to human-generated noise, and humans are the principal beneficiaries of these measures.

3.3.3 Air pollution

For poor people, many environmental problems are problems associated with poverty. Goodstein (2000: 449450) state that exposure to indoor air pollution (smoke) from cooking and heating sources ranks close to urban air pollution as a concern. Smoke inhalation contributes to about four million deaths per year among infants and children. Some four hundred million people worldwide are exposed to an unsafe level of indoor smoke, as against seven hundred million for outdoor air pollutants, but exposure to indoor pollution is typically more intense.

Air pollution refers to the contamination of air in an environment where people and animals live. Air pollution emanates from those everyday activities which are an integral part of modern and technologically advanced societies. Air pollution can not only be attributed to the mechanization processes that took place during man's efforts to survive, but also to phenomena such as dust blown from ash dumps situated mostly in the backyards of major industries, for instance the Viljoensdrift Eskom ash dump (Detwyler 1971:92).

Stephen, Stephen and Stuart (2002:140-141) mention two ways of categorizing air pollutants. The first way is by focusing on their chemical and physical properties:

- organic substances: oxides of carbon, nitrogen and sulphur, volatile organic compounds;
- inorganic substances: suspended particulate matter, lead acids; and
- energy forms: radioactivity (some would add heat and noise).

The second method of categorizing air pollutants is to focus on whether they are released directly into the air as gasses or fine particles or are the indirect result of reactions in the atmosphere:

- primary pollutants are produced directly and released into the air;
- secondary pollutants are formed in the air from chemical reactions between primary pollutants.

The secondary and primary air pollutants and their effects to the environment are reflected in table 3.1 below.

Table 3.1 Primary and secondary air pollutants and their effects

Air pollutant	Source	Damaging effects
Primary pollutants		
Sulphur dioxide	Combustion of fossil fuels (mainly industry)	'Dieback' in trees, reduced crop plant growth
Nitrogen oxides	Combustion of fossil fuels	'Dieback' in trees, reduced crop plant growth
Carbon monoxide	Combustion of fossil fuels	Human respiratory diseases
Carbon dioxide	Combustion of fossil fuels	Global warming
Chlorofluorocarbons	Aerosol cans, refrigerators	Destruction of ozone layer
Particulate matter	Smoke (mainly from industry)	Human respiratory diseases, cancer
Radioactive substances	Nuclear tests, nuclear power stations	Increased mutation rates
Lead	Lead vehicle exhaust, from leaded petrol	Mental development in children
Secondary pollutants		
Acid rain	Mixture of sulphuric and nitric acids, derived from sulphur dioxide and rainwater	Death of freshwater fish, corrosion of stone buildings
Ozone	Formed from the chemical reaction with nitrogen oxides and UV light	'Dieback' in trees, reduced crop plant growth, skin cancer

Source: Stephen, Stephen & Stuart (2002:141).

According to Fuggle and Rabie (1999:417-418) the following are activities that generate air pollution in South Africa.

3.3.3.1 Fuel combustion and gasification from stationary sources

Examples of processes that fall into this category include the combustion of coal or oil for electrical power generation, steam generation and industrial energy requirements, coal gasification for production of metallurgical coke and 'syn-gas' (a mix of hydrogen and carbon monoxide used in the production of synthetic fuels and ammonia), and domestic coal combustion for space heating.

3.3.3.2 Fuel combustion in mobile sources

The transport sector dominates this category. Pollutants are combustion products, unburned fuel, and volatile lead species. The spectrum of pollutants is a function of fuel type.

3.3.3.3 Industrial chemical processes

This category is reserved for pollution generated by processes other than combustion or gasification. Here one considers such pollutants as alkali metals and fluorides from the ferro-alloy industries, nitrogen and phosphorus compounds from fertilizer production, and organic vapours from chemical production.

3.3.3.4 Solid waste disposal

Incineration of industrial, residential, and hospital wastes contributes significantly to air pollution. In addition to normal products of combustion, incinerators produce a wide spectrum of heavy metals as well as a host of toxic chlorinated organics and alkali chlorides.

3.3.3.5 Land surface disturbances

These include mining and construction activities, waste dumps, agricultural practices and veld fires. Particulate matter is the primary pollutant.

In all the above thermal processes, carbon dioxide is produced. According to Masindi (2002:26), air pollution in the Vaal Triangle could be attributed to the existence of major chemical producing industries found in the area. The phenomenon derives from the burning of fuel for heat and power, and from the processing of material, which occurs in almost all existing industries in the area, and from the disposal of waste.

In the following sections, the causes, effects and solutions to the incidence of especially air pollution will be examined.

3.4 Energy hazards

According to Terblanche (1998:5), particulate emissions from household coal and wood burning were identified as the major cause of poor air quality in urban areas. The survival of mankind depends on different forms of energy that can be used to prepare food. Some of the energy sources are coal, wood, paraffin and electricity. Depending on the prevailing conditions, people often use any form of energy that is readily available in order to survive. The majority of people, especially Blacks, who reside in shacks, make use of wood and coal for heat. It may be noted that some Black residents make use of coal, which is a toxic mixture. Residents are forced to use such coal because in such squatter camps, facilities such as electricity are not available.

Spannhake (2001), for example, during his research in Washington, found that the breathing in of polluted air during the cold season makes one feel twice as bad. He reckons that cold viruses and certain pollutants can prompt cells to release the kinds of inflammatory agents that make people feel lousy. Further, when human cells confront cold viruses or pollutant, they release chemicals that cause inflammation (Star, 2001).

In the modern world, vehicles, primarily passenger cars, are by far the largest source of hydrocarbons and nitrogen oxides. A large volume of petrol that is presently in use is the leaded variety, which is a serious threat to human life. These types of air pollutants that are mostly emitted into the environment contribute to the formation of photochemical smog. Workers from Evaton, Sebokeng, Zamdela and Sharpeville townships use a large number of different buses and vehicles and during such a process, more exhaust fumes are emitted thereby polluting both the air and the environment (Detwyler, 1971:92).

A direct outflow of poverty and unemployment in the townships and squatter areas is that people use coal stoves ('braziers') in a haphazard manner, which results in the pollution of air. It is apparent that such people are aware of the consequences of air pollution, but because they do not have any other means of surviving, they accept any other consequences that will emerge further down the line. Invariably, the majority of people who stay in shacks and who use wood and coal are victims of unemployment. The use of coal and wood for heat exacerbates the deforestation problem that plagues the environment. Some residents use only wood for heat because of poverty (Opperman & Davies, 1992:16).

Alan (1999:48) places economic losses due to air pollution in the following categories:

- direct medical losses;
- lost income resulting from being absent from work;

- decreased productivity;
- increased travel costs and time of travel due to reduced visibility;
- increase of cost of artificial illumination;
- repair of damage to buildings and other structures;
- increased cost of cleaning;
- losses due to damaged crops and ornamental vegetation;
- losses due to injury to animals of economic importance;
- decreased property values;
- losses due to inefficient combustion of solid, liquid, and possibly gaseous fuels.

Various monetary estimates of these losses have been made, and all of them have been significant.

3.5 Human activities and air pollution

The Vaal Triangle is faced with the problem of a shortage of houses and severe homelessness. Shacks, most of them illegal, are emerging in various parts of the townships with a result that basic urban services cannot be provided to them. When people flock into an urban area, as was the case in the Vaal Triangle, especially in the 1990s, most of them find themselves on the street as they cannot easily find accommodation. This leads to a problem of land invasion as well as the destruction of various forms of vegetation. The problem is solved by natural and man-made efforts. Vegetation reduces the risk of erosion. During rainy days, vegetation holds soil together with its roots. In newly mined areas, efforts are made to cover soil with nets in order to promote the germination of seeds.

3.6 Summary and conclusion

This chapter defines and outlines the most common types of pollution and it also outlines types of substances and energy forms which result in a lowering of the ambient quality of natural environments, and which are regarded as pollutants.

Pollution is defined as the residuals of production and consumption and these residuals must eventually return to the environment in one form or another. Since their presence in the environment may depreciate the service flows received, an efficient allocation of resources must take this cost into account. In the study certain types of pollution were identified. Firstly,

littering, which is land-based pollution, is mainly the result of the disposal of human refuse and contamination by agricultural chemicals. The second type is noise pollution and is a particular category of sound that may be undesirable sound. In this study the focus is mainly on the sound that is made by motor vehicles and by community members when they play loud music with amplifiers in the township.

The third type of pollution is dust pollution. This type of pollution occurs because of rubble around as a result of uncovering the earth surface.

The fourth type of pollution is air pollution and for the purpose of the study it is defined as contamination of air in an environment where people and animals live. The focus in this study is on indoor air pollution (smoke) from cooking and heating sources that rank it close to urban air pollution. Air pollution emanates from those everyday activities which are an integral part of modern and technologically advanced societies. Air pollution is not only attributed to the mechanization processes that took place during man's efforts to survive, but also to issues such as dust that is blown from ash dumps situated mostly in the backyards of major industries.

CHAPTER FOUR

ANALYSIS OF HOUSEHOLD INDICATORS IN LEITRIM COMPARED TO RATHANDA

4.1 Introduction

This chapter makes use of different indicators to measure poverty, welfare and pollution in Leitrim. The results are compared with those in Rathanda.

Many believe that most pollution (air pollution) comes from industries. The rationale behind the choice of Rathanda lies in the fact that it is located in an area where there are no industries, while Leitrim is located in an industrial area, or close to industrial area. The objective of the study is to establish the context of pollution (i.e. land, air and sound pollution) in the townships. In order to achieve this, surveys have been conducted in both townships to establish the origin of pollution and to assess the welfare and the poverty levels in the two townships.

This chapter used various household level indicators to assess the level of poverty, unemployment and the level of pollution (i.e. littering, noise pollution, dust pollution and air pollution) in Leitrim. This was done mainly in comparison with Rathanda, a township that is located in an environment where there are not many industries.

The information presented in this chapter for both Leitrim and Rathanda is the result of the analysis of data gathered through the use of five hundreds household questionnaires administered in the areas during July/August 2004, henceforth referred to as Survey (2004).

4.2 Demographic and employment profile of Leitrim and Rathanda

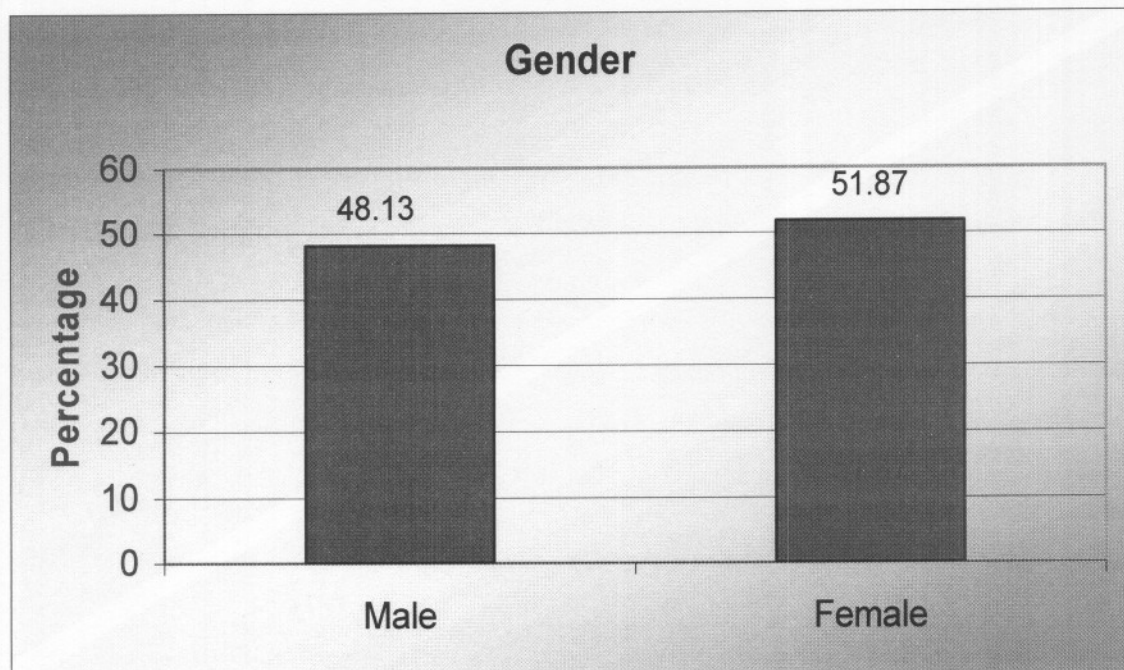
Any change in the economy of a region will have an effect on its population in terms of employment opportunities, income (remuneration), expenditure patterns, the level of poverty and social services (Slabbert, 2004:61).

This section employs various indicators to develop a profile of Leitrim and Rathanda.

4.2.1 Demographic profile

The demographic analysis is in terms of gender, age, the length and reasons of stay in the Vaal Triangle area, as well as education level of the Leitrim community, compared to the Rathanda community.

Figure 4.1 Gender distribution of Leitrim - 2004



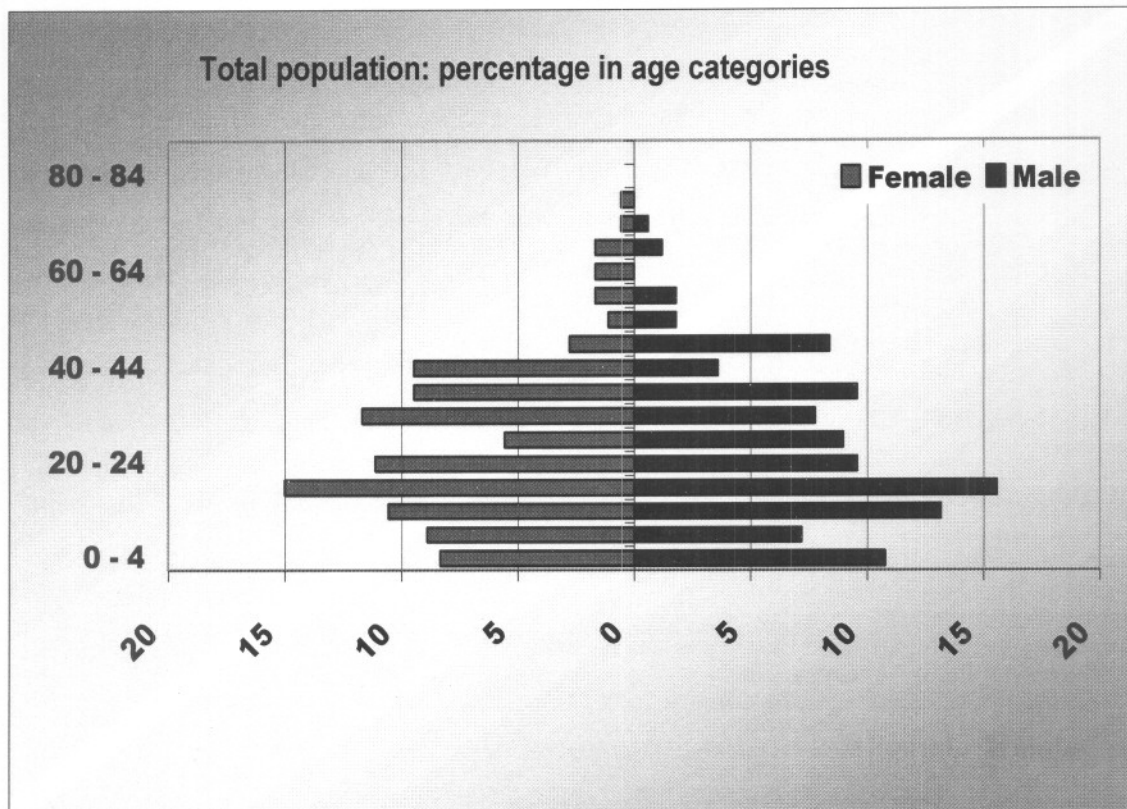
Source: Survey (2004).

Figure 4.1 shows the gender distribution of the population of Leitrim. It shows that approximately 48.1 percent of the population is male, while 51.9 percent is female. The figures for Rathanda show that 45.5 percent of the population is male, while 54.5 percent of the population is female. For South Africa, the national figure is 47.7 percent male whereas the population figure for females is 52.3 percent (Statistics South Africa, 2003:7). For the Gauteng Province, the percentage of males and females are 51.0 percent and 49.0 percent respectively - it is the only province with a slightly higher number of males than females (Statistics South Africa, 1999:8-9). The figures for Leitrim are therefore similar to those for Rathanda and South Africa as a whole, in that there is a higher percentage of females than males.

Figure 4.2 shows the age distribution of the population of Leitrim. It shows that 37.8 percent of the female population is between 20 and 40 years of age, while 35.9 percent of the male population is between the ages of 20 and 40 years of age. More than 46.8 percent of the male population is younger than 20 years of age and 82.6 percent is younger than 40 years of age. 80.6

percent of the Female population is less than 40 years of age, while 37.8 percent of the female population is between the age of 20 and 40 years of age. The male population is therefore relatively young (certainly in comparison to the female population). For Rathanda, most of the male and female population is also concentrated within the 20 to 40 years of age range, whereby 28.4 percent of male population is between 20 and 40 years of age while the female population in this age group is 30.9 percent. In Rathanda 66.9 percent of female population is younger than 40 years of age. 70.3 percent of male population in Rathanda is younger than the 40 years of age.

Figure 4.2 Total population of Leitrim in age categories - 2004



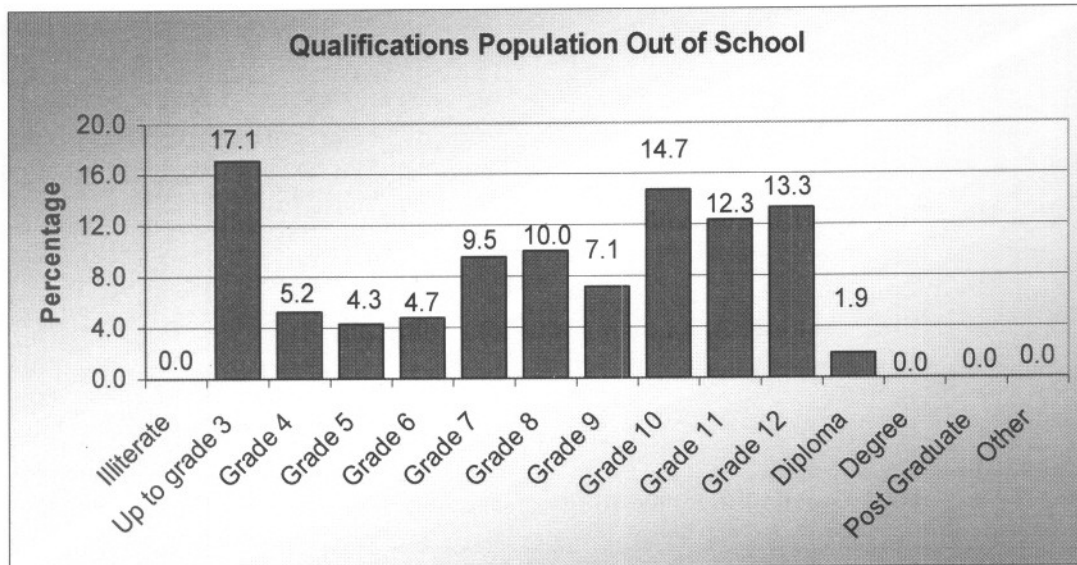
Source: Survey (2004).

The qualifications for people who are out of school in Leitrim are shown in **Figure 4.3**. The figure shows that over 15.2 percent of the population has a Grade 12 or higher qualification. The figure for Rathanda is 30.0 percent which is 14.8 percent higher than that of Leitrim. If members of the households with a Grade 11 qualification are also added, then the figure rises to approximately 27.5 percent for Leitrim and 39.5 percent for Rathanda. There thus seems to be quite a difference between the two communities with respect to the level of education.

A notable point is also observed in terms of the category 'illiterate' (this category refers to no schooling, rather than illiteracy). For both Rathanda and Leitrim, zero percent was recorded for

this category, while the comparative category was recorded as approximately 12 percent for Gauteng (for Blacks) (Statistics South Africa, 1999:39).

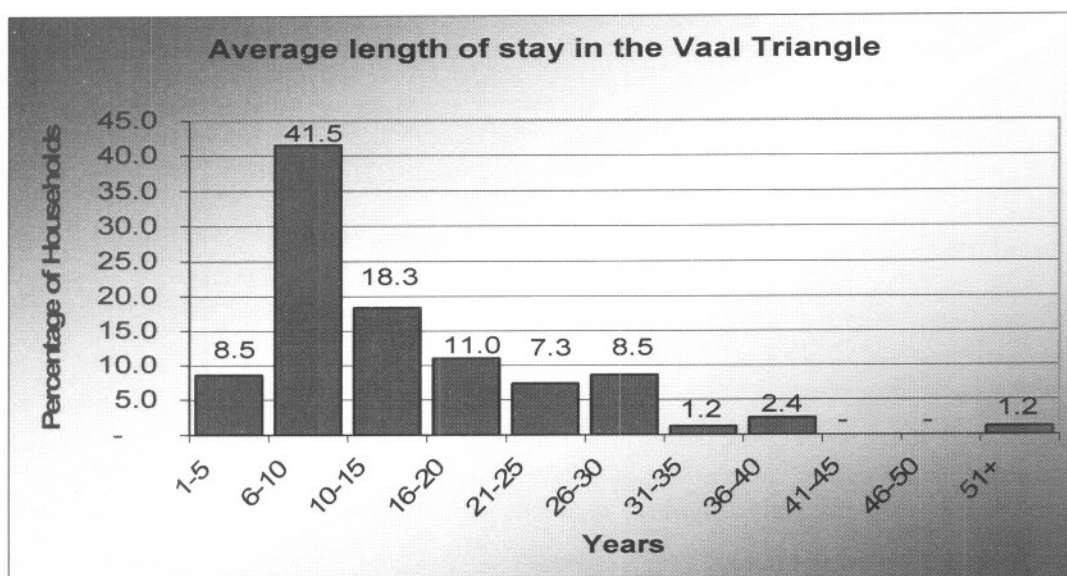
Figure 4.3 Qualifications of population out of school in Leitrim - 2004



Source: Survey (2004).

Figure 4.4 shows the average length of stay of the population of Leitrim in the Vaal Triangle. The figure portrays that 50 percent of the population have been living in the Vaal Triangle area for a period of less than ten years, while 20.3 percent of the population of Rathanda have been staying in the Lesedi area for a period of less than ten years. This shows there is a stable population in Rathanda than in Leitrim.

Figure 4.4 Average length of stay in the Vaal Triangle - 2004



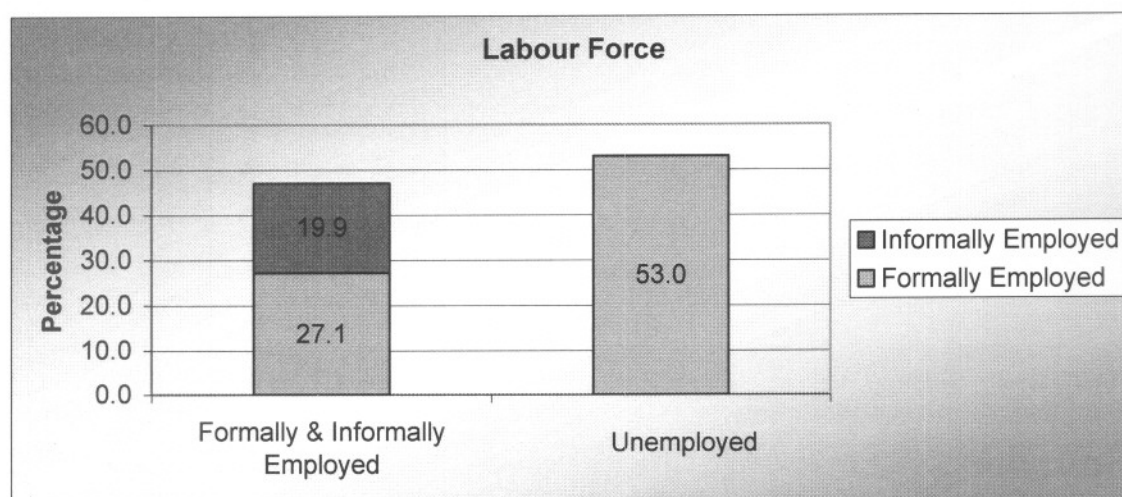
Source: Survey (2004).

4.2.2 Labour force

From the survey data, unemployment in Leitrim was calculated at 53.0 percent of the labour force (for the year 2004). This is depicted in **Figure 4.5**. This rate is higher than that of the Free State Province, which is depicted at 31.8 percent (Global Urban Observatory, 2001:2). The unemployment rate for Leitrim is much higher than that of Rathanda. The figure for Rathanda was determined at 46.3 percent, which is higher than that of Gauteng Province (31.5 percent) in 2003 (Mokoena, 2004: 104). In Leitrim the average size of the household is 4.3 persons of which, on average, 1.07 persons are unemployed. The average size of the household in Rathanda is 4.3 persons and on average 0.89 persons is unemployed. This shows that on average less people depend on each income in Rathanda, when compared to Leitrim.

Figure 4.5 shows that, of the total labour force in Leitrim, 27.1 percent of the sample works in formal employment while 19.9 percent is employed in the informal sector. The formal employment figure for Rathanda is higher at 40.8 percent and the informal employment figure lower at 12.8 percent.

Figure 4.5 **Composition of the labour force in Leitrim - 2004**



Source: Survey (2004).

Most of the employed in Leitrim are employed in low income, vulnerable and short-term jobs. This exacerbates poverty levels. Global Urban Observatory (GUO) (2001:2) points out that the urban poor are likely to be engaged in casual and informal sector work. They are therefore exposed to the risk of employment insecurity and irregularity of income. The lack of skills is a common characteristic of the urban poor, implying an inability to acquire well-paid jobs.

GUO (2001:2) also points out the lack of safety nets and labour protection as a problem facing the urban poor. The urban poor are not protected via health and unemployment benefits or worker safety regulations and the like because most of them are employed in informal sector jobs. Furthermore, their low and irregular income prevents them from having access to private insurance and pension schemes. This lack of protection exacerbates the vulnerability of the urban poor.

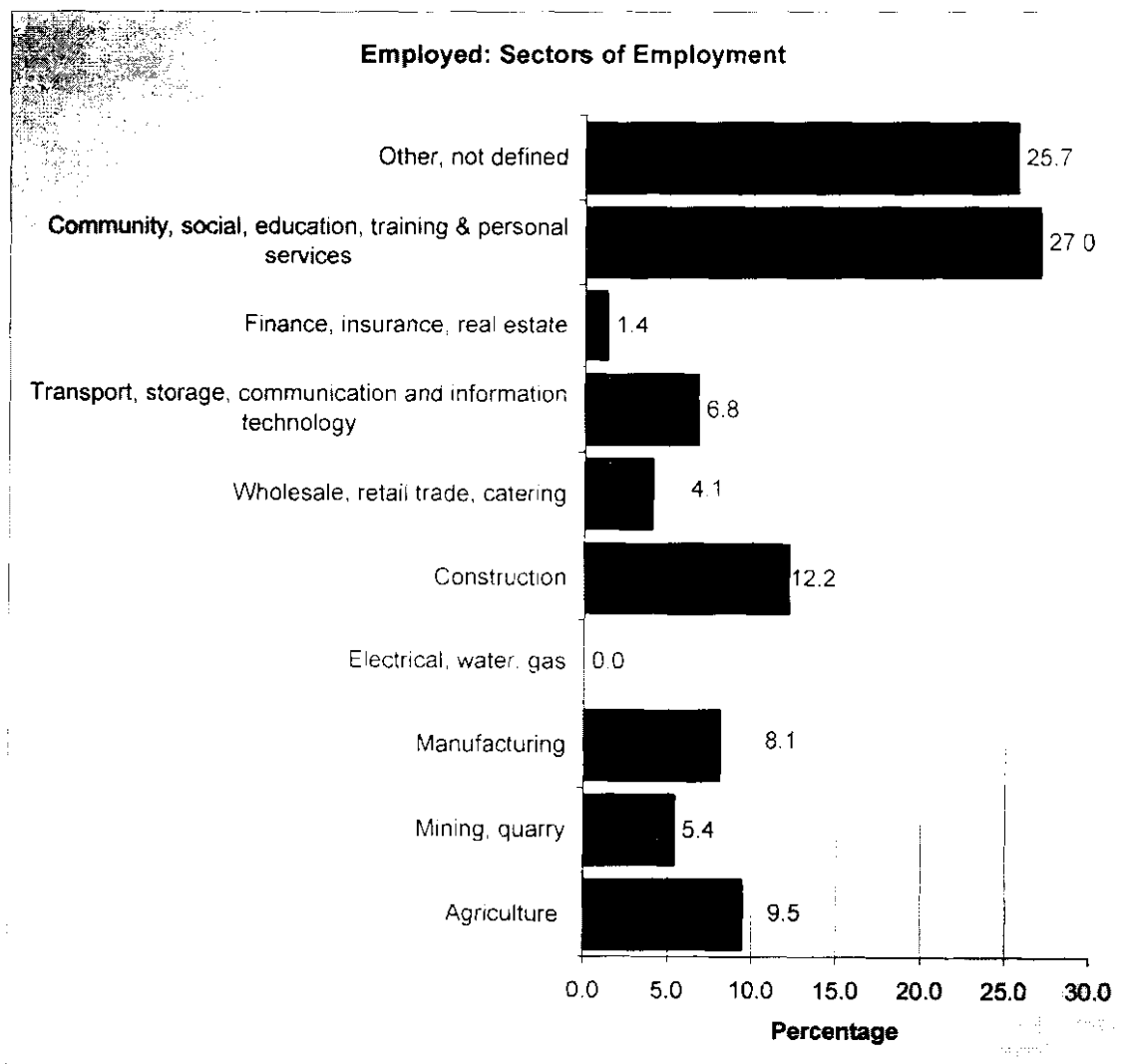
4.2.2.1 Employment and unemployment

This section profiles the employed as well as the unemployed population in Leitrim compared to the employed and unemployed in Rathanda.

The sectors in which the employed population of Leitrim is employed are shown in **Figure 4.6**. This figure shows that the largest percentage of the employed are employed in the community, social, educational, training and personal services sector. From the community survey, it was found that the majority of people employed in this sector are domestic workers and gardeners. The community, social, educational, training and personal services sector accounts for more than 27 percent of the employed population in Leitrim, while the figure for Rathanda is 36.4 percent.

According to Statistics South Africa (2002:v) the figure for the community, social and personal services sector in South Africa is also quite high at 18.9 percent. It is second in importance to the wholesale and retail trade sector in South Africa. Bhorat (1999:1) states: "Domestics and farm-workers may have jobs, but they are still living in poverty. While less than four percent of labourers in the mining and manufacturing sectors live in poverty, 38 percent of domestics are poor and 27 percent of farm-workers earn below the poverty line". A total of 52.7 percent of workers employed in the services sector and other sectors may therefore imply high levels of poverty in Leitrim.

Figure 4.6 Sectors of employment for the employed -2004



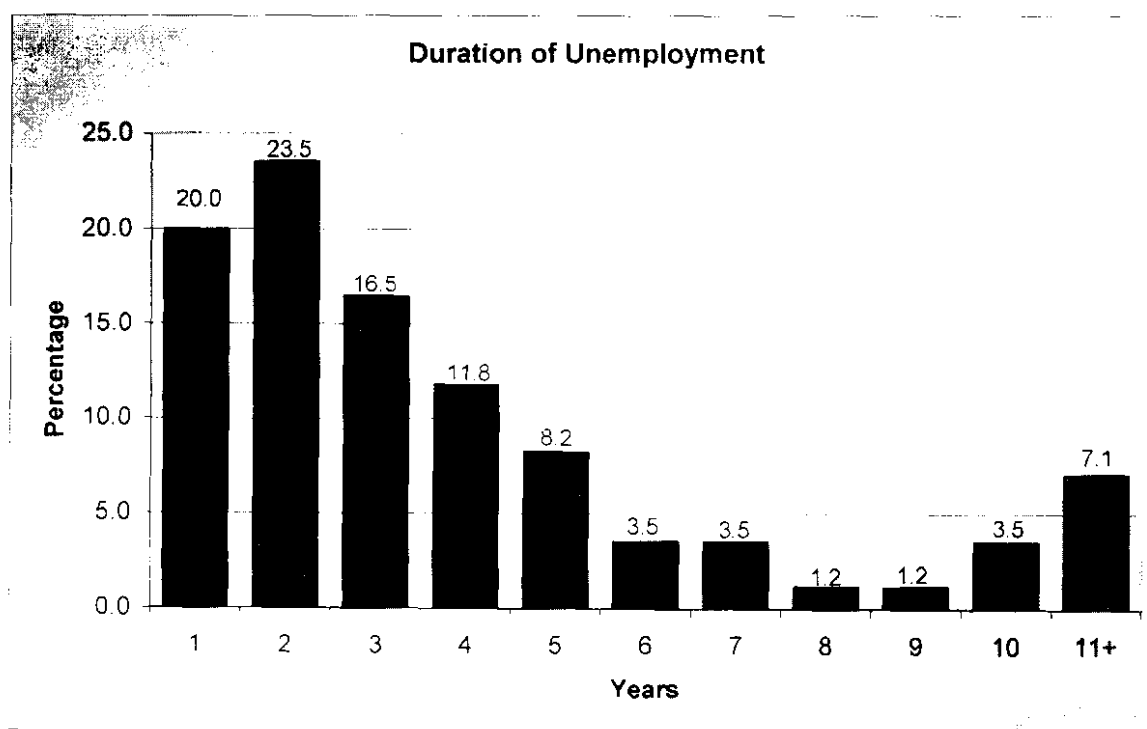
Source: Survey (2004).

In Leitrim unemployment rate is depicted at 53 percent, while Rathanda unemployment rate is 46.3 percent. Many unemployed persons have been unemployed for a number of years, as shown in **Figure 4.7**. The figure shows that, on average, most of the unemployed in Leitrim have been

unemployed for more than three years. The percentage of people unemployed for three or more years is 56.5 percent in Leitrim and 69.2 percent in Rathanda.

This implies that more of the unemployed in Rathanda have on average been unemployed for more than three years compared to the number of unemployed in Leitrim. The percentage of people unemployed for three years and less is 60 percent in Leitrim and only 39.9 percent in Rathanda, emphasizing that Rathanda has a higher rate of people unemployed for longer periods. Global Poverty Network (GPN) (2000:5) states that there is a high incidence of 'discouraged job-seekers', with 43 percent of unemployed persons having searched for formal sector jobs for at least three years in South Africa.

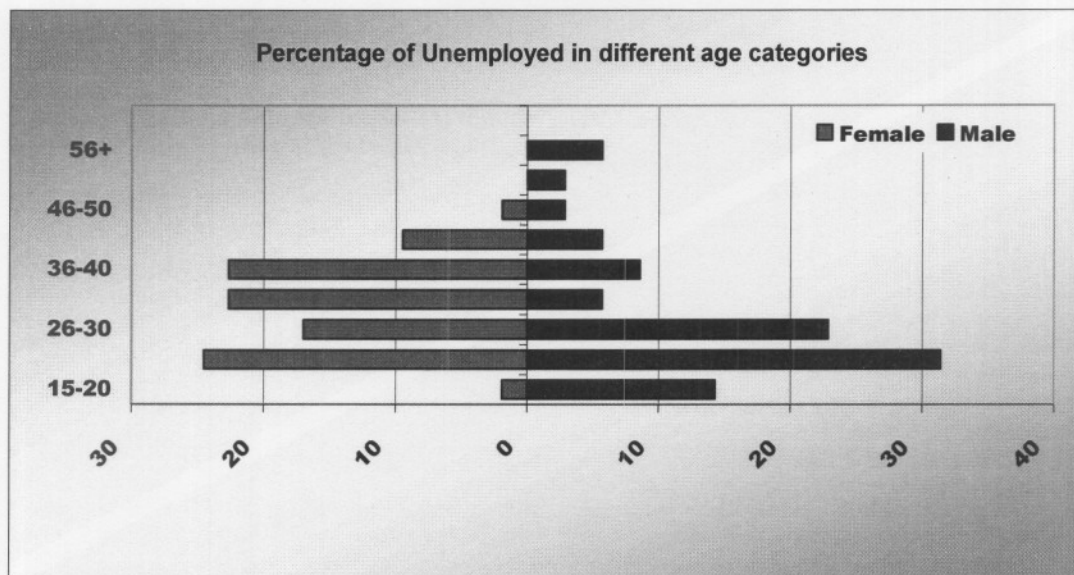
Figure 4.7 Duration of unemployment: Leitrim - 2004



Source: Survey (2004).

Figure 4.8 shows the age distribution of the unemployed. In Leitrim, the main concentration is around the ages of 20 to 40 for female and 20 to 30 for males. This is strikingly similar to the Rathanda distribution. The unemployed are therefore relatively young in both areas. In Leitrim 68.6 percent of the male population is unemployed and they are between the age of 21 and 40 years, while the figure for Rathanda is 62.5 percent. For both areas the figure for unemployed females is higher. In Leitrim the figure is 84.6 percent while the figure for Rathanda is 70.6 percent.

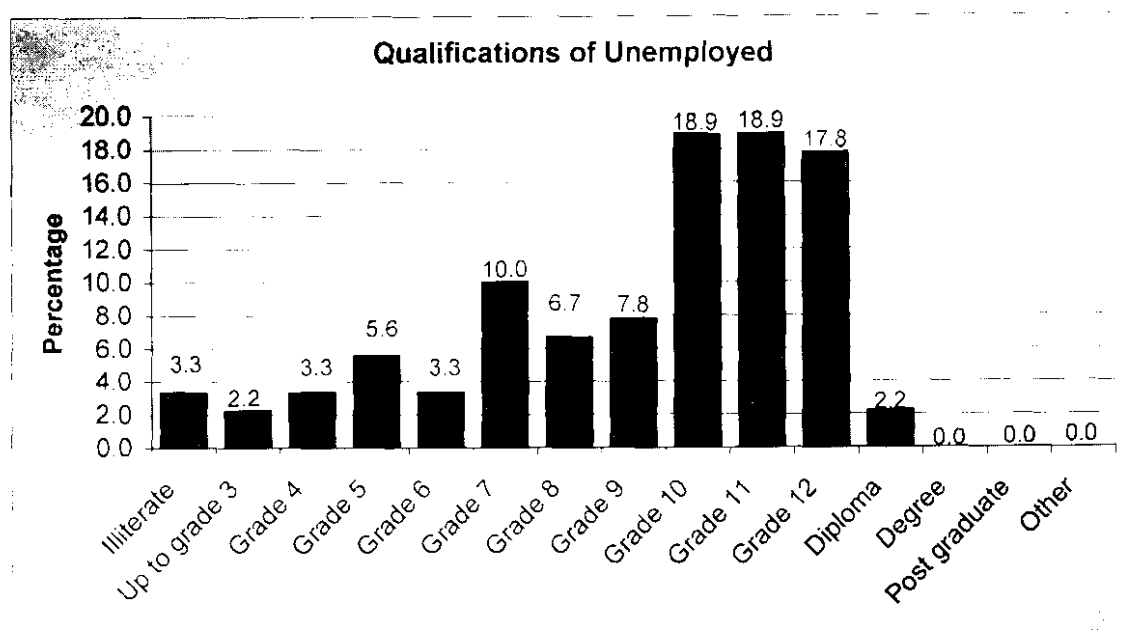
Figure 4.8 Unemployed in different age categories in Leitrim - 2004



Source: Survey (2004).

The education levels of the unemployed are depicted in **Figure 4.9**. This figure shows that 20 percent of the unemployed population in Leitrim has educational attainments of a Grade 12 and higher education, while the figure for Rathanda is 37.3 percent. These figures for Rathanda strongly echo the Gauteng figures (Statistics South Africa, 2003b:4). This might raise the question as to whether education can guarantee a job: it does not necessarily guarantee one. Slabbert (2000:95) points out that in Sub-Saharan Africa; part of the nature of poverty is that the poor have low educational attainment. This appears to be true in the survey population.

Figure 4.9 Qualifications of the unemployed population -2004



Source: Survey (2004).

4.3 Profile of the poor

The purpose in this section is to show the differences between the poor and the total population. This section analyses the section of the population that has been found to be poor, and uses a number of indicators to present the profile of the poor.

The indicators used are the headcount index, the poverty gap ratio, poverty line and dependency ratio. The headcount index is adapted to indicate the fraction of households falling below their individual poverty lines, and is described by means of the equation:

$$H(y; z) = M/N$$

Where: H = the fraction of households below the poverty line;

y = household income;

z = the poverty line of households;

M = the number of households with income less than z ; and

N = the total number of households.

The headcount index for Leitrim is 0.744, while the comparative figure for Rathanda is 0.488. This means that 74.4 percent for the population of Leitrim is below the poverty line and 48.8 percent of the population of Rathanda is below the poverty line.

The poverty gap measures the average shortfall of the income of the poor from the poverty line while the poverty gap ratio measures the extent of the shortfall of income below the poverty line. The poverty gap of an individual household (in monetary terms) can therefore be expressed by the equation:

$$G_i(y, z) = z_i - y_i$$

Where: G_i = the income shortfall of a household;

y_i = the income of the specific household; and

z_i = the poverty line of a specific household.

The poverty gap ratio for Leitrim is 0.5; the comparative figure for Rathanda is also 0.5. The dependency ratio for Leitrim is 3.5 persons, while the comparative figure for Rathanda is 3.2 persons.

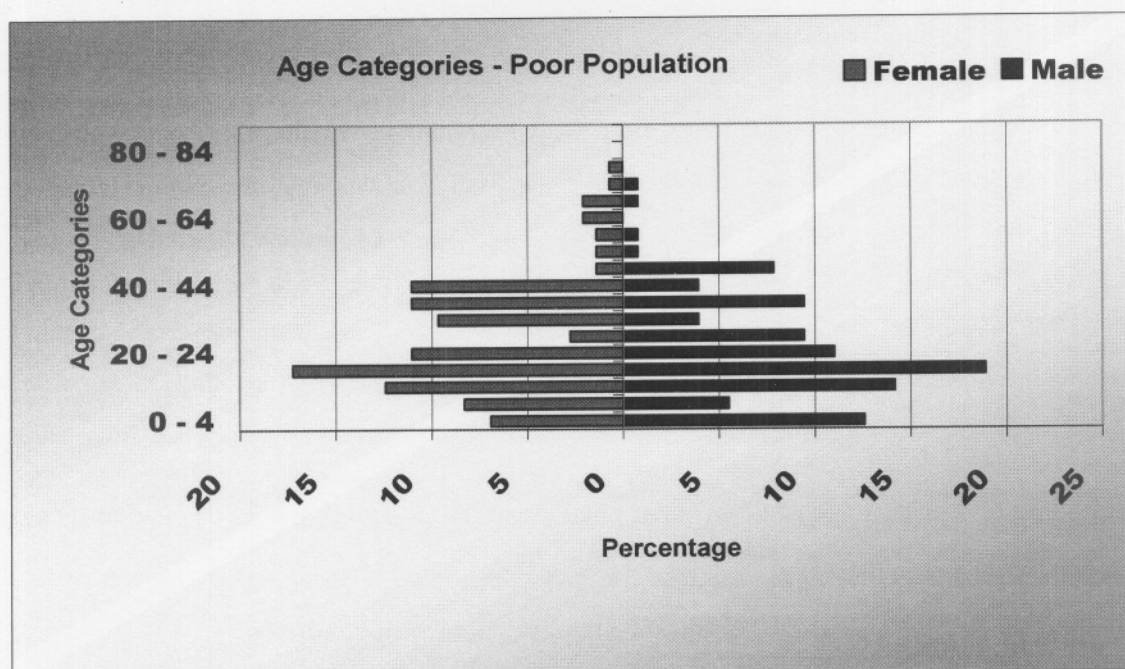
4.3.1 Age analysis

In many respects children are the group most vulnerable to poverty, given their reliance on adults for the provision of basic needs. A child who experiences poverty is exposed to the risk of impaired physical and mental development, and as a consequence can be disadvantaged for life (Whiteford, Posel & Kelatwang, 1995:7). In Gauteng, 24.7 percent of children lived in poverty in year 1999, while the figure for the Free State was higher at 57.1 percent (Whiteford, Posel & Kelatwang, 1995:6-7). May (1998:4) contended that poverty in South Africa had a gender and age dimension, and points out that over 45 percent of the poor in South Africa in year 1998 were children below 16 years of age.

In keeping with the broader population trend of Leitrim, there is a slightly higher percentage of females living in poverty than men. A total of 51.87 percent of women are living in poverty in Leitrim while the comparative figure for Rathanda is 54.5 percent. In Leitrim there is 48.13 percent of male population living in poverty, while the comparative figure for Rathanda is 45.5 percent. **Figure 4.10** shows the age distribution of the poor population. It shows that 46.7 percent of the male population and 42.8 percent of female population lies within the age bracket 0-19 years. This means that just less than half of the poor males and females are children and teenagers. The breakdown for the age group 20-39 is 37.8 percent female and 35.9 percent male.

This shows that while the concentration of the male poor population is in the child and youth bracket, it is more unevenly spread in the case of females. The poor population under 40 years of age accounts for 82.6 percent for males and 80.6 percent for females. In Rathanda the poor population under the age of forty accounts for 74.2 percent male and 69.0 percent female. In Rathanda 45.03 percent of the male population and 36.4 percent of the female population lies within the age bracket 0-19 years. In both townships the large part of the population is composed of the youth.

Figure 4.10 Poor population according to age categories in Leitrim -2004

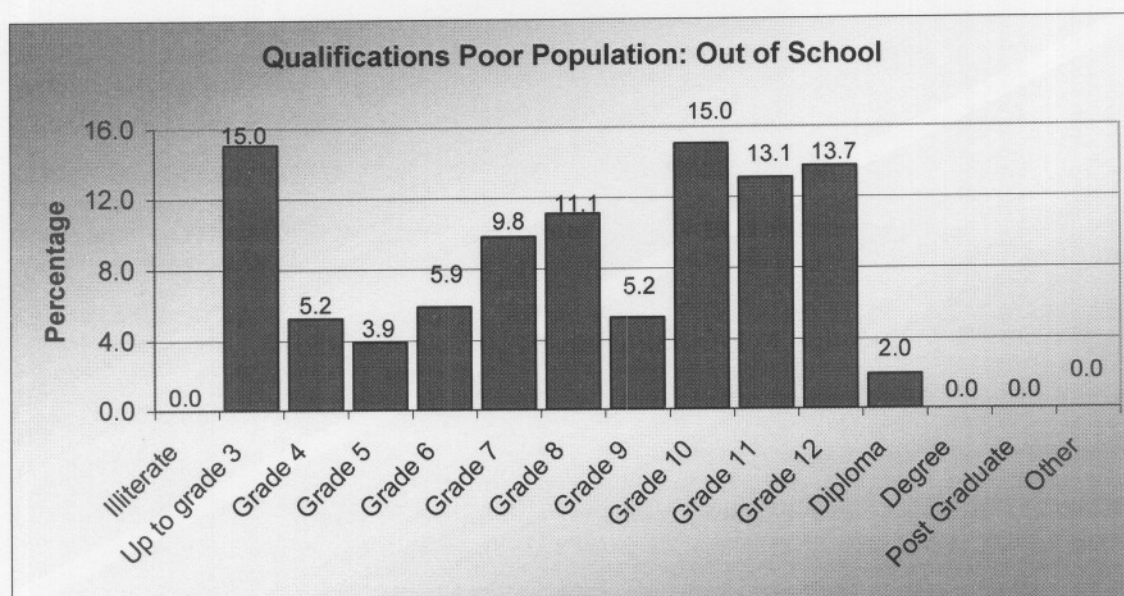


Source: Survey (2004).

4.3.2 Education levels

Households with poorly educated household heads have a far higher incidence of poverty than those with better-educated household heads. This might raise the question as to whether education can guarantee a job: it should be noted that although education increases the chances of finding a job: it does not necessarily guarantee one (Mokoena, 2004:109). The educational levels of the poor population of Leitrim that are out of school are shown in **Figure 4.11**. It shows that about 15.7 percent of the poor post-school population has attained a Grade 12 or higher educational level compared to 20.0 percent for the combined population (poor and non-poor). In Rathanda 37.3 percent attained a Grade 12 education or higher, while 30.0 percent of the combined population has a Grade 12 or higher level of education. This means that in Rathanda a larger number of the unemployed have a Grade12 or higher level of education.

Figure 4.11 Qualifications of the poor out of school - 2004



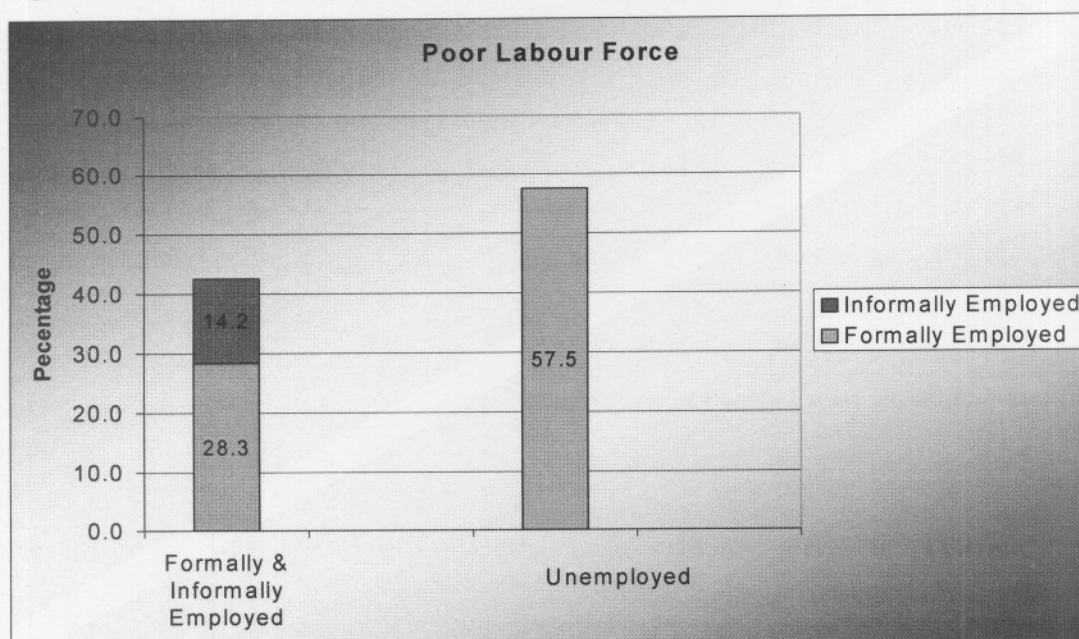
Source: Survey (2004).

The Leitrim poor post-school population with diplomas is zero percent and zero percent possess degrees or post-graduate studies (2.2 percent for the combined population). The figure for Rathanda is 6.4 percent (8.2 percent for the combined population). Slabbert (2003:14) concludes that the difference between the combined population and the poor shows an inverse correlation between especially higher qualification and poverty. This therefore implies that lack of education (especially higher education) may be a contributing factor to poverty.

4.3.3 Employed poor

Figure 4.12 shows the composition of the poor population of Leitrim is based on their employment status. It shows that, on average, the unemployment rate among the poor is 57.5 percent compared to 53.0 percent for the combined population. For Rathanda, the comparative figure for the unemployed poor is 68.6 percent compared to 46.3 percent for the combined population. It seems that in Rathanda there is a higher correlation between unemployment and poverty than in Leitrim.

Figure 4.12 The composition of the poor labour force in Leitrim - 2004

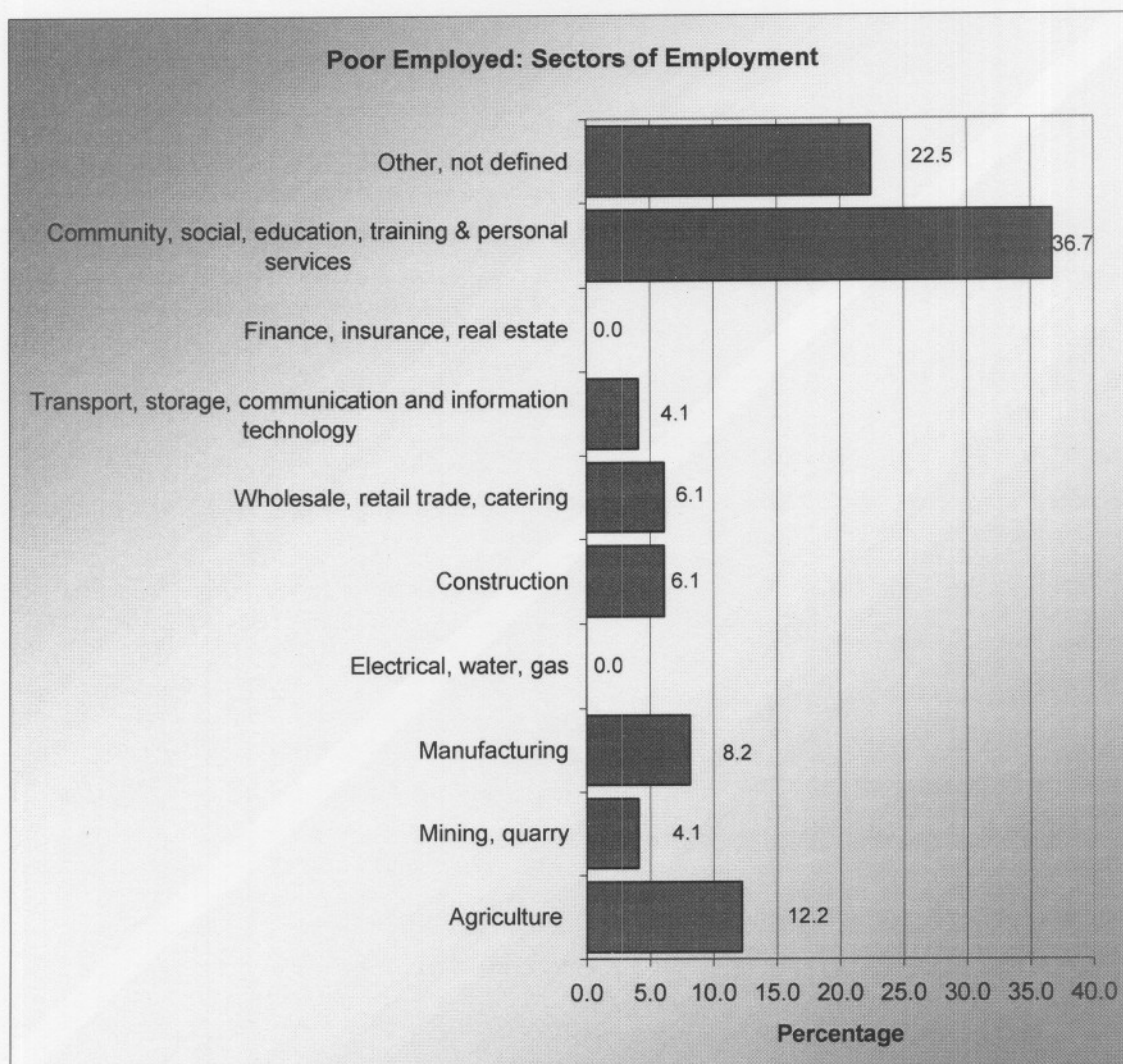


Source: Survey (2004).

The figure further shows that of those poor that are economically active, 14.2 percent are in formal employment while 28.3 percent are in informal employment. The employment figures for Leitrim are slightly higher than those of Rathanda. In the latter 19.9 percent of the poor labour force is employed in the formal sector and 27.1 percent in informal employment for the combined population. In Leitrim 27.1 percent of the total population is formally employed, while 19 percent is employed in informal sector and 53 percent of the total population is unemployed and the figures for Rathanda are as follows, that is, of the 40.8 percent of the total population is formally employed, while 12.9 percent is in the informal sector and 46.3 percent of the total population is unemployed. This shows a larger number of the poor is unemployed than the non-poor, in both Leitrim and Rathanda.

The sectors of employment in which the working poor are engaged are depicted in **Figure 4.13**. The figure shows that in Leitrim 36.7 percent of the poor are employed in the: communication, social and personal services sector, 6.1 percent in the wholesale and retail trade sector, and 12.2 percent in the catering and agriculture sectors. This accounts for 55.0 percent of the employed poor (43.3 percent for the combined population). The same categories account for 49.7 percent of the employed poor in Rathanda. These sectors involve comparatively low wages which easily lead to the perpetuation of poverty, vulnerability to shocks and income risks (Kamanu & Morduch 2002:1-10; and Dercon 2002:25-6).

Figure 4.13 Sectors of employment for the poor -2004



Source: Survey (2004).

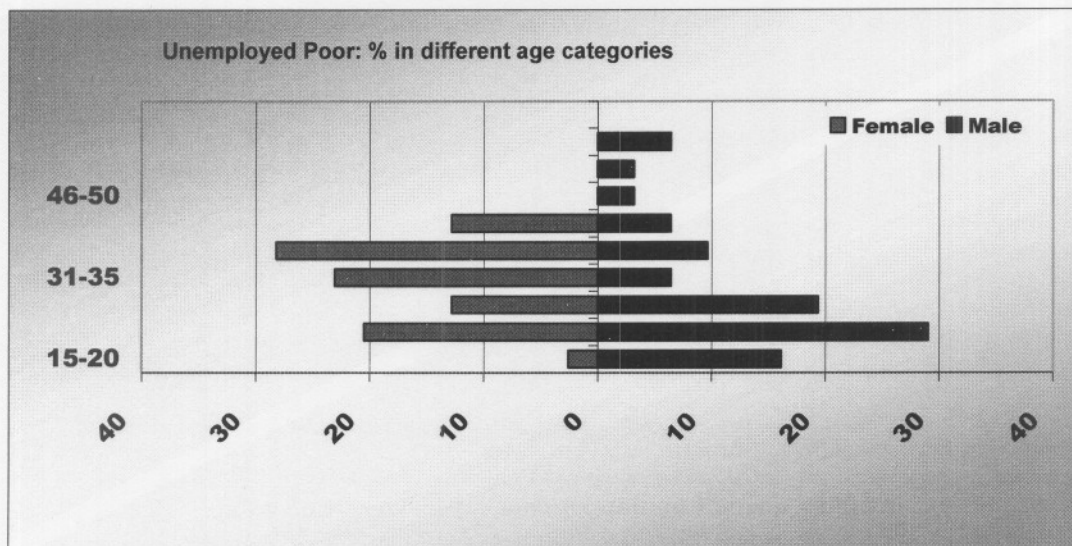
4.4 Profile of the unemployed poor

This section examines the profile of the unemployed poor population in Leitrim compared to that of Rathanda.

The age distribution of the unemployed poor is shown in **Figure 4.14**. The figure shows that the youth are the most affected by unemployment and poverty. A total of 23.9 percent of the unemployed poor are in the age category 20-35 years. Females in this age category are more affected than males. There are 56.4 percent of unemployed poor females in this age category compared to 54.9 percent males. Comparatively, the figure for Rathanda's population in this

category is 26.0 percent. The combined figure for females is 59.4 percent and 47.4 percent for males. The figures for Rathanda are therefore higher than those for Leitrim.

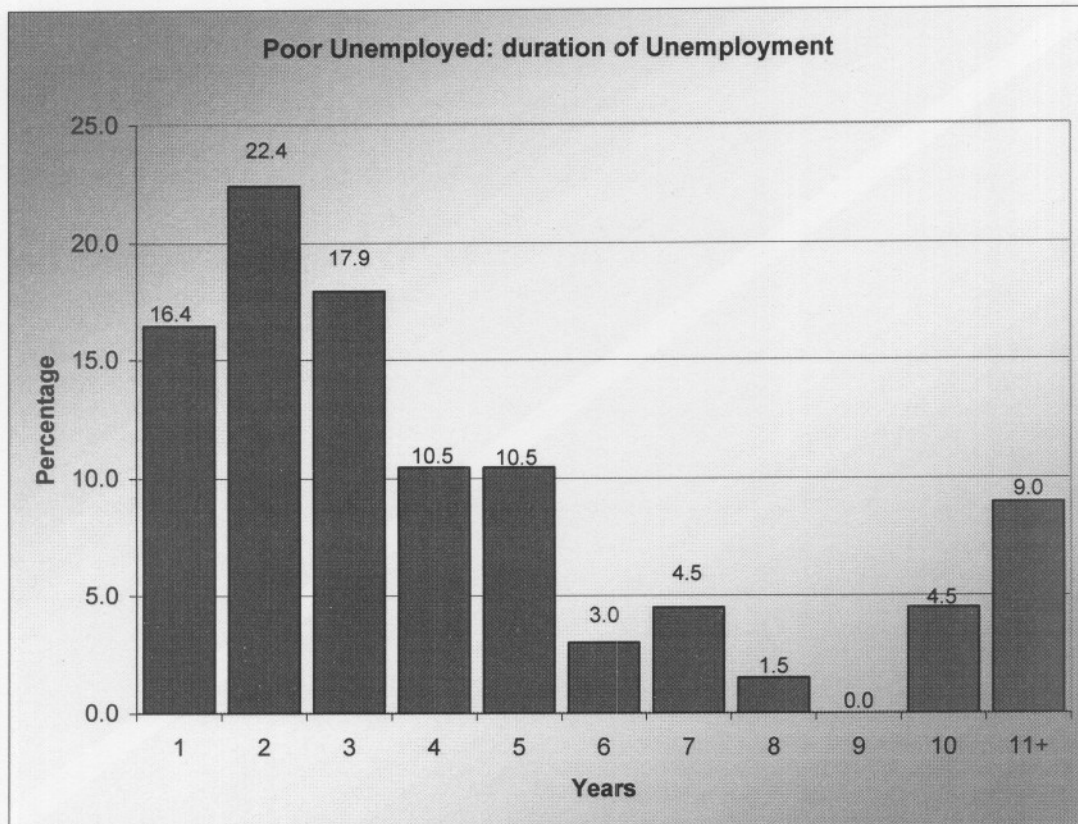
Figure 4.14 Age categories of the poor population in Leitrim - 2004



Source: Survey (2004).

The duration of unemployment for the unemployed poor is shown in **Figure 4.15**. The figure shows that in Leitrim 56.7 percent of the population has been unemployed for up to three years whereas the comparative figure for Rathanda is 42.5 percent. A total of 65.7 percent of the poor unemployed population of Rathanda has been unemployed up to five years, while the comparative figure for Leitrim is 78.7 percent. There is a slightly higher percentage of the poor unemployed for up to 5 years in Leitrim than in Rathanda.

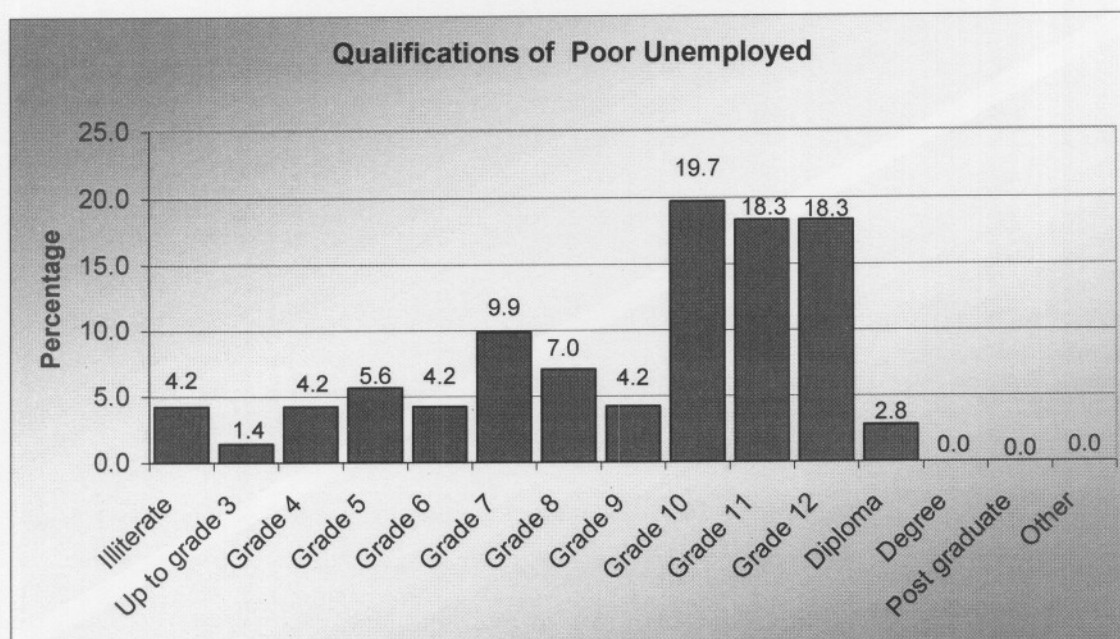
Figure 4.15 Poor unemployed: duration of unemployment -2004



Source: Survey (2004).

Figure 4.16 shows the educational qualifications of the poor unemployed of Leitrim. It shows that the percentage of the unemployed poor with Grade 12 and higher is 21.1 percent, while zero percent possess a degree or higher qualifications. This figure is 37.3 percent for Rathanda. Only 2.8 percent have diplomas in Leitrim, while 5.5 percent of the same population for Rathanda has diplomas and other qualifications. The unemployed poor in Rathanda is therefore better qualified than that of Leitrim. In Leitrim 20 percent of the total population (that is, the combination of the poor and the non poor population) have attained grade 12 and higher level of education, the comparative for Rathanda is 40.4 percent. This shows that the poor have attained less educationally.

Figure 4.16 Qualifications of poor unemployed - 2004



Source: Survey (2004).

4.5 Income and expenditure

This section examines the state of income and expenditure in Leitrim. Although much care was taken to solicit as much information as possible on the different incomes and income sources, the 'phenomenon of expenditure surplus' (Townsend, 1971:101-103) was observed in the survey for many households. This happens when expenditure exceeds income. The reason for this may be due to the fact that some households tend not to declare some income, especially if the source of such income is suspect (for example gained through illegal means), but will more readily declare expenditure.

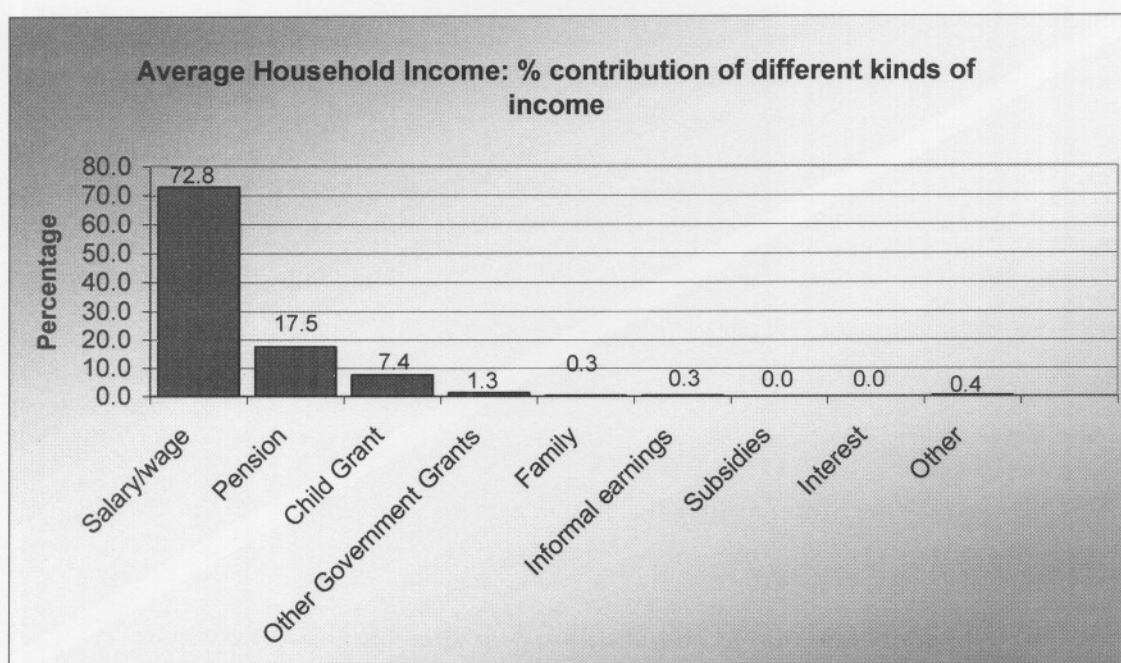
Low incomes compound the problem of poverty. Samson (2003:1) contends that low or non-existent incomes compound poor access to health care, education, housing, and social infrastructure. Most of the poor live in households receiving no social security benefits at all.

The average income per household in Leitrim is approximated at R1142.68 per month (Surveys, 2004). For Rathanda the figure has been calculated at R2377.68. This indicates higher incomes per household in Rathanda. According to **Section 4.3** the headcount index for Leitrim is 0.744, while the comparative figure for Rathanda is 0.488; this means that 74.4 percent for the population of Leitrim is below the poverty line and 48.8 percent of the population of Rathanda is

below the poverty line. The lesser headcount index for Rathanda is supported by the fact that there is a higher level of income when compared to Leitrim.

Figure 4.17 shows the different sources of income and their contribution to the total income. It shows that in Leitrim, 72.8 percent of household income comes from wages and salaries, while the figure for Rathanda is 82.1 percent for wages and salaries. This is therefore by far the primary source of household income, followed by pensions at 17.5 percent (13.0 percent for Rathanda).

Figure 4.17 Average household income in percentages from different sources -2004

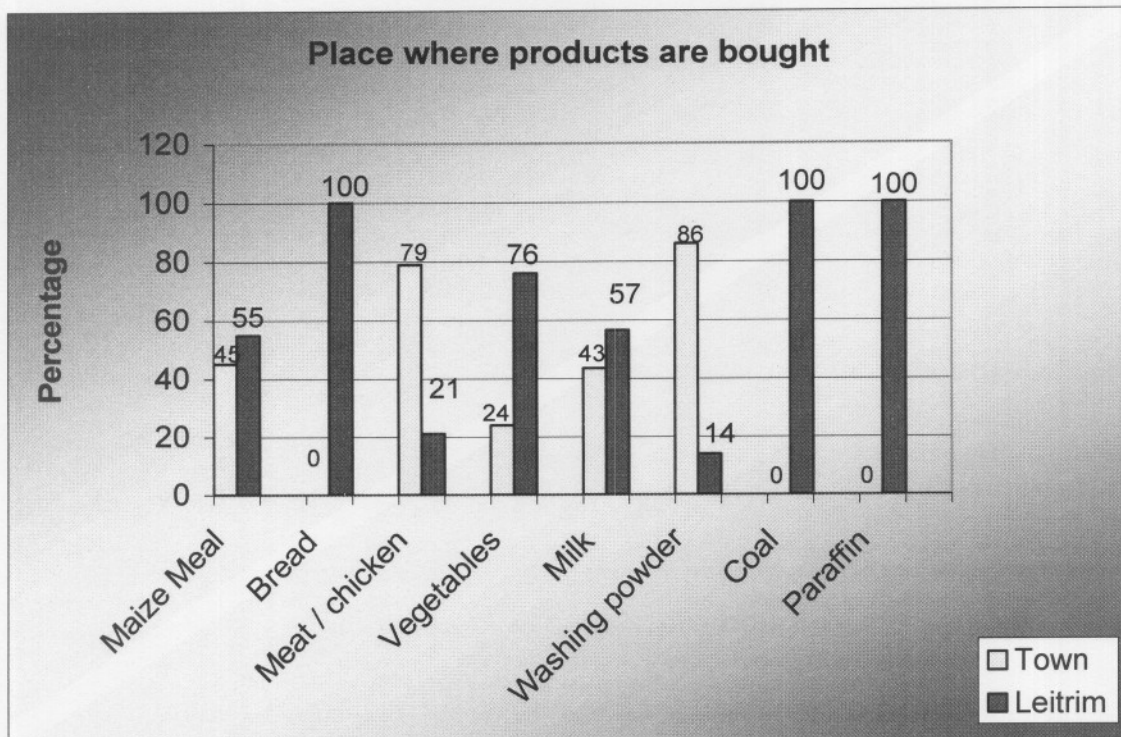


Source: Survey (2004).

Wages and salaries are a greater source of income in Rathanda when compared to Leitrim. The wages and salaries themselves are also much lower in Leitrim than in Rathanda. Informal earnings also contribute more to household income in Rathanda compared to Leitrim.

The total expenditure of Leitrim as projected on to the entire population shows the expenditure patterns on selected items. These items include white and red meat followed by maize-meal and bread. This identifies these items as staple food in the area. The statistics for Bophelong (Slabbert, 2003:21), show a different pattern, where white and red meat is most important, and then followed by bread and then by maize meal. The figures for Rathanda and Leitrim show that item-by-item, the price levels in Leitrim are higher than those in Rathanda. This may be attributed to Leitrim's distance from alternative stores/shops, especially in town. Stores in Leitrim therefore face little competition and the transport costs to suppliers are also factored into prices and passed on to buyers.

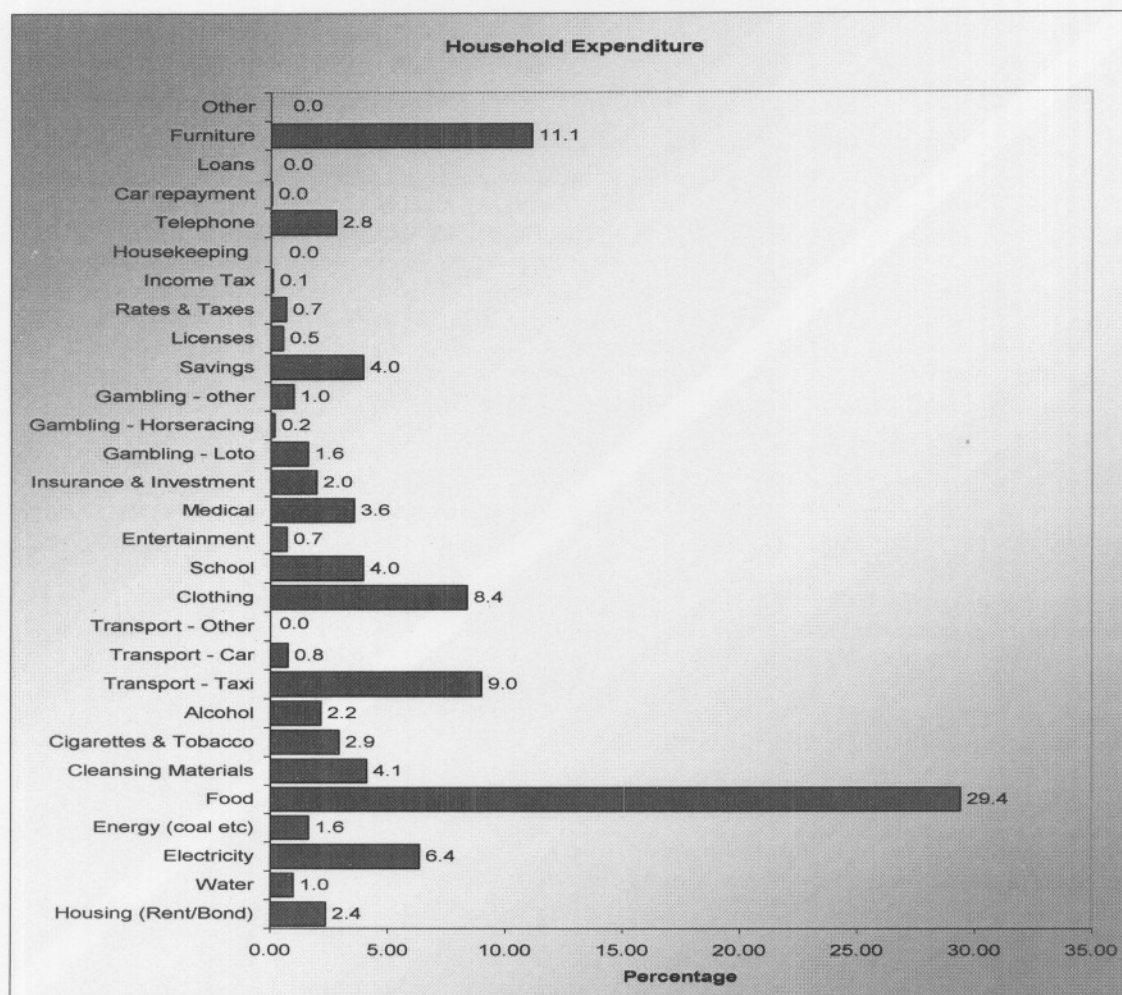
Figure 4.18 Place where products are bought - 2004



Source: Survey (2004).

Figure 4.18 shows where some items of expenditure are bought. It shows that even at the said higher prices, few items are primarily bought from towns (Sasolburg or Heidelberg, namely meat/chicken and washing powder, and a relatively high percentage of other items are bought in the township. Once more, the distance to town (Sasolburg or Heidelberg) proves to be a problem for both residents of Rathanda and Leitrim.

Figure 4.19 Household expenditure - 2004

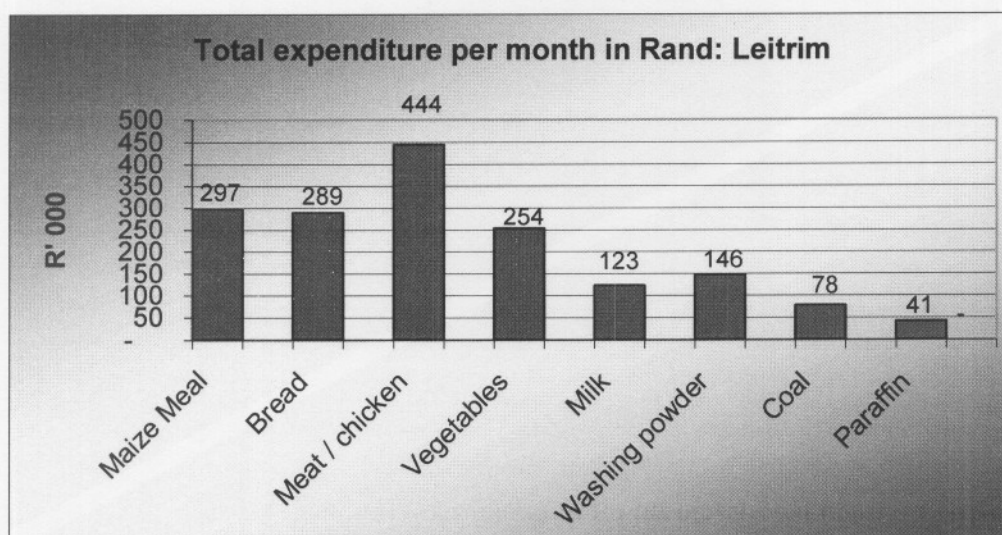


Source: Survey (2004).

Figure 4.19 shows the total household expenditure in Leitrim. For both Rathanda and Leitrim, expenditure on food is by far the highest. It amounts to 29.4 percent of the total expenditure in Leitrim compared to a lower 21.7 percent in Rathanda. Expenditure on clothing, furniture, transport and electricity is also relatively high for both areas. Housing (rent\bond), accounts for 2.4 percent in Leitrim (the houses are 'RDP' low-cost houses supplied free of charge or almost rent-free by the authorities), but is relatively high in Rathanda where it is 9.5 percent of household expenditure.

This high rent might be due to the fact that many people, after receiving the houses from the local municipality, have since left these houses and are renting them out to tenants. The rents these tenants pay, are reflected in the survey.

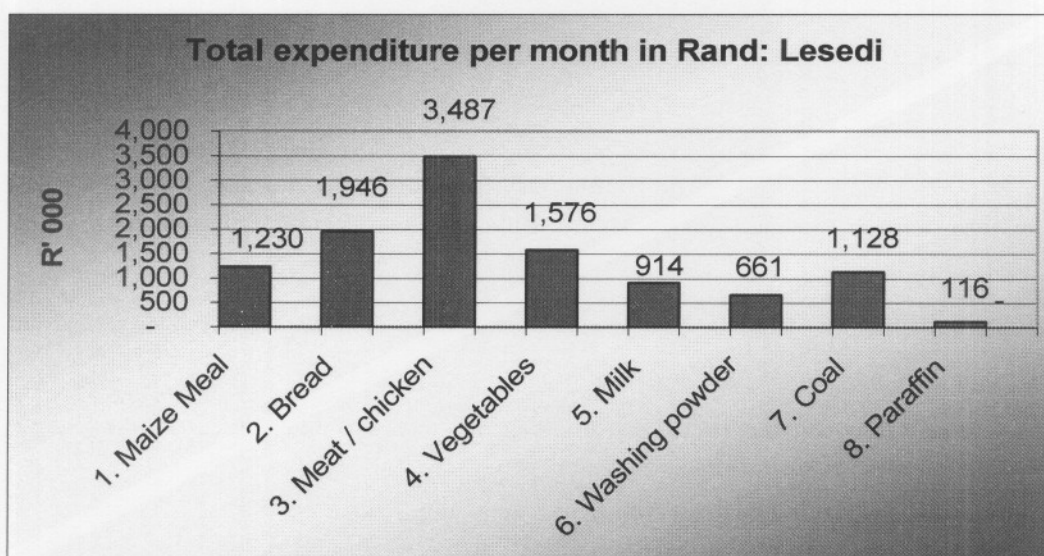
Figure 4.20 Total expenditure per month in Rands on selected items - Leitrim



Source: Survey (2004).

Figure 4.20 shows the household expenditure per month in Rands on selected items in Leitrim. From this figure one can conclude that a large amount of money is spent on red and white meat, followed by maize meal, and then on bread. In comparing Rathanda with Leitrim the difference is small because in Rathanda a large part of their expenses is allocated to red meat and white meat followed by bread, then vegetables and lastly maize meal. This is depicted in **Figure 4.21**.

Figure 4.21 Total expenditure per month in Rands on selected items - Rathanda

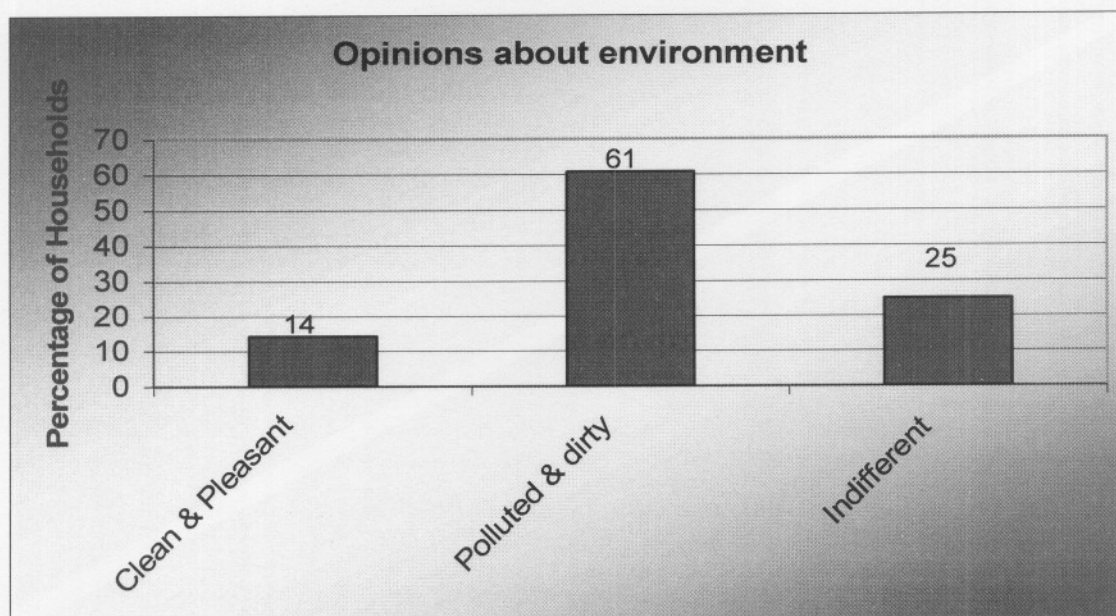


Source: Survey (2004).

4.6 Environmental issues

This section evaluates perceptions about pollution and the cost of pollution in Leitrim compared to the cost in Rathanda as surveyed. This section will focus on three types of pollution, namely littering, noise pollution and air pollution.

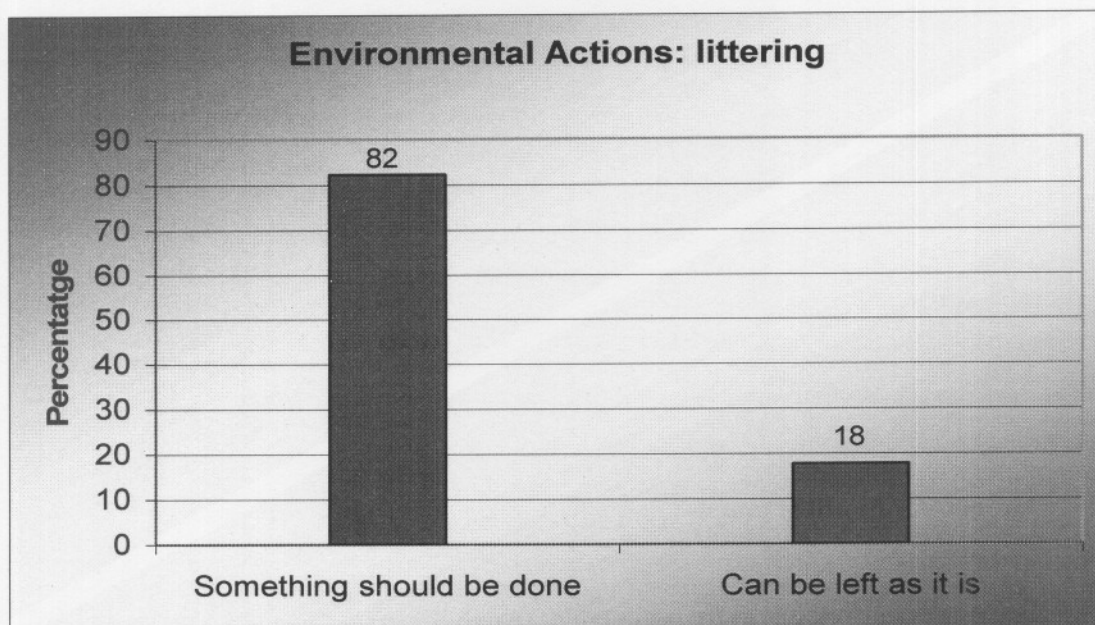
Figure 4.22 Opinions about the environment (littering) -2004



Source: Survey (2004).

Figure 4.22 demonstrates that 61.0 percent of Leitrim's population feels that the environment is polluted and dirty, while only 14.0 percent in Rathanda feels that their environment is polluted and dirty. This probably relates to indiscriminate littering in non-designated areas. Respondents mentioned that in Rathanda there are projects (cleaning and greening campaigns to deal with the problem) that are organised by the municipality.

Figure 4.23 Opinions of the residents of Leitrim in relation to littering -2004

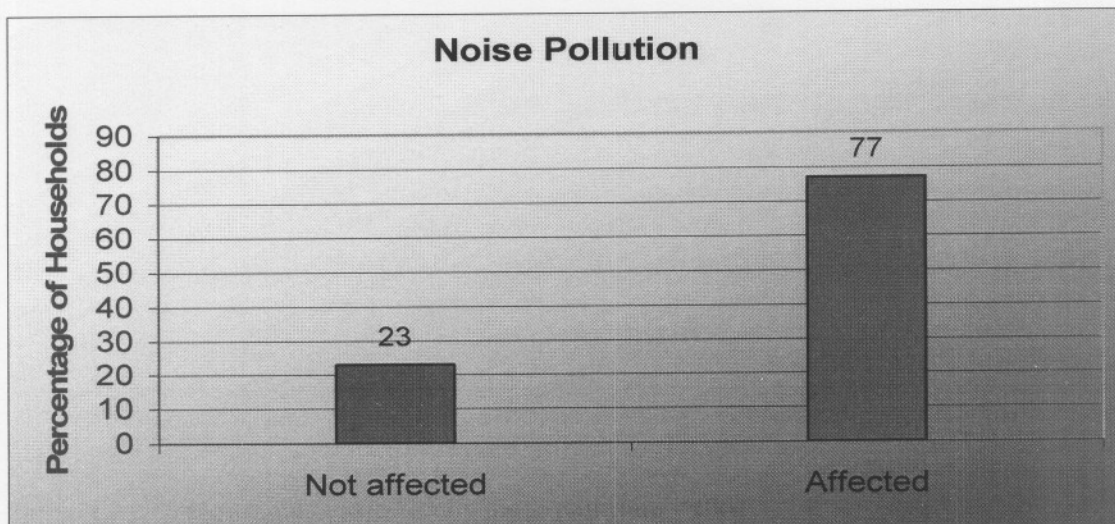


Source: Survey (2004).

Figure 4.23 reflects the views of the residents of Leitrim in relation to action that should be taken in connection to littering. The figure shows that the greater majority of respondents (82 percent) feel that something should be done about cleaning the environment, while the comparative figure for Rathanda is only 35 percent.

Regarding who should take the responsibility for dealing with the unclean environment, 38.0 percent of Leitrim residents feel that the municipality, and 40.0 percent feel that everybody should take responsibility for cleaning the environment. A total of 30.0 percent of Rathanda feel that the municipality should take the responsibility and 59.0 percent feels strongly that each individual should be involved in taking the responsibility for cleaning the environment.

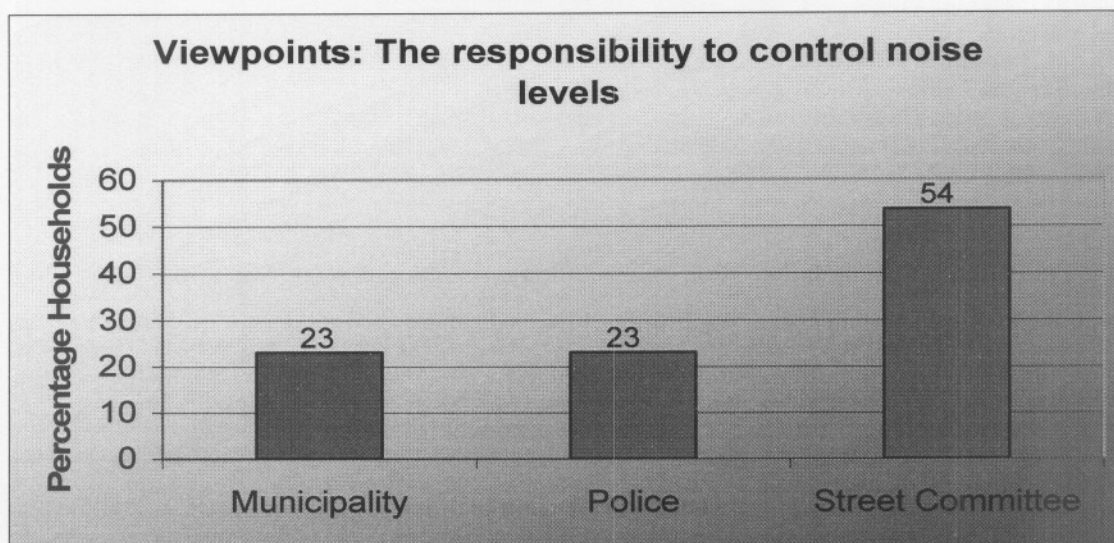
Figure 4.24 Households affected by noise pollution - 2004



Source: Survey (2004).

Figure 4.24 shows how many households are affected by noise pollution. Noise pollution comes mainly from loud music (playing loud music with amplifiers) and vehicles. **Figure 4.24** shows that 77 percent of Leitrim's respondents are affected by noise pollution, while the figure for Rathanda is at a lower rate of 48.0 percent.

Figure 4.25 Responsibility to control noise level - 2004

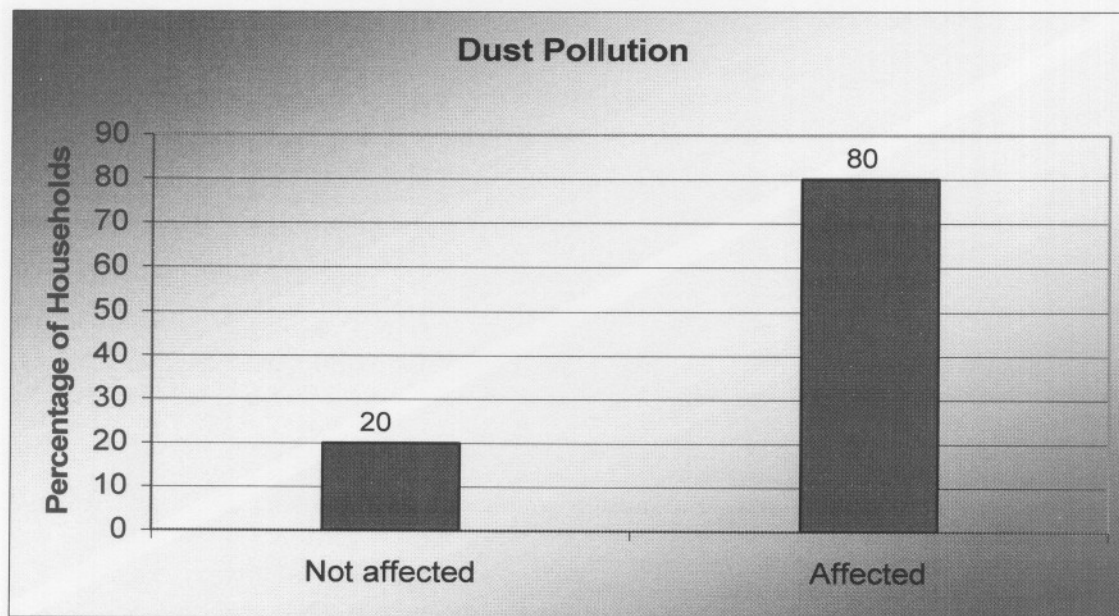


Source: Survey (2004).

In **Figure 4.25** the viewpoints of the sample population of Leitrim are shown with regard to who should take the responsibility of ensuring that the noise level is at the acceptable level and that the community does not play loud music all night without considering the other residents. **Figure**

4.25 shows that 54.0 percent of the community responses were in support of the street committees being in a position to deal with the problem of noise pollution in Leitrim. A total of 30.0 percent of Rathanda residents had the same feeling; 49.0 percent of the respondents think that the municipality should be able to deal with this matter much better. The average monthly Rand value that an average household attaches to a quiet environment is R14.15 for Leitrim and the comparative value for Rathanda is R7.23.

Figure 4.26 Households affected by dust pollution in Leitrim - 2004

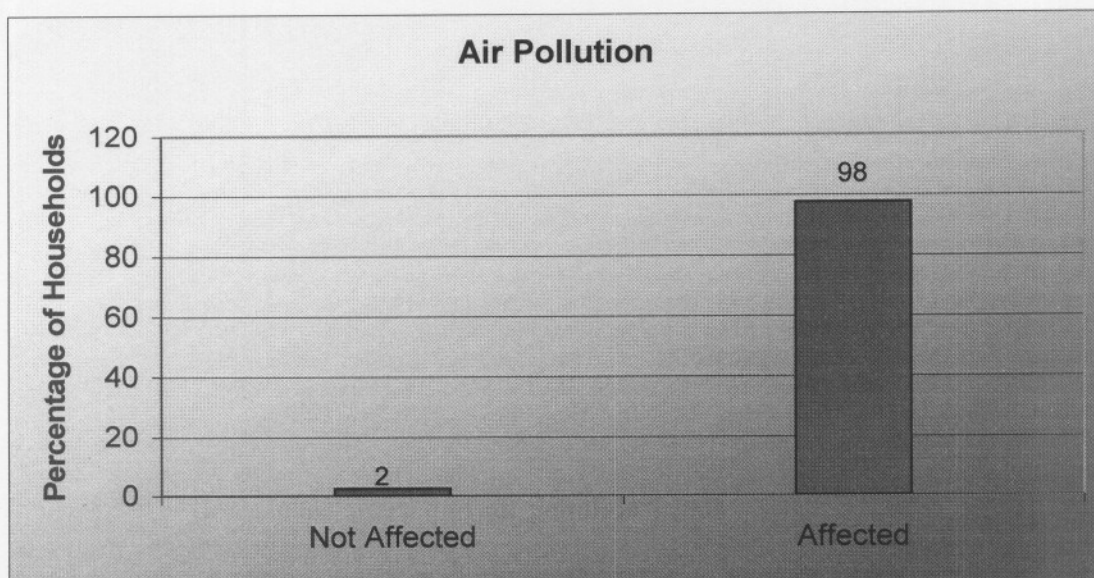


Source: Survey (2004).

Figure 4.26 shows the Leitrim residents that are affected by dust pollution. Dust pollution results from the gravel roads in some places as well as lack of trees and groundcover. Dust pollution is aggravated during the dry autumn and winter months.

Figure 4.26 shows that 80.0 percent of the population in Leitrim is affected by dust pollution, while the figure for Rathanda is 74.0 percent. The average monthly Rand value that an average household attaches to a dust-free environment is R23.96 and the value for Rathanda is R17.20.

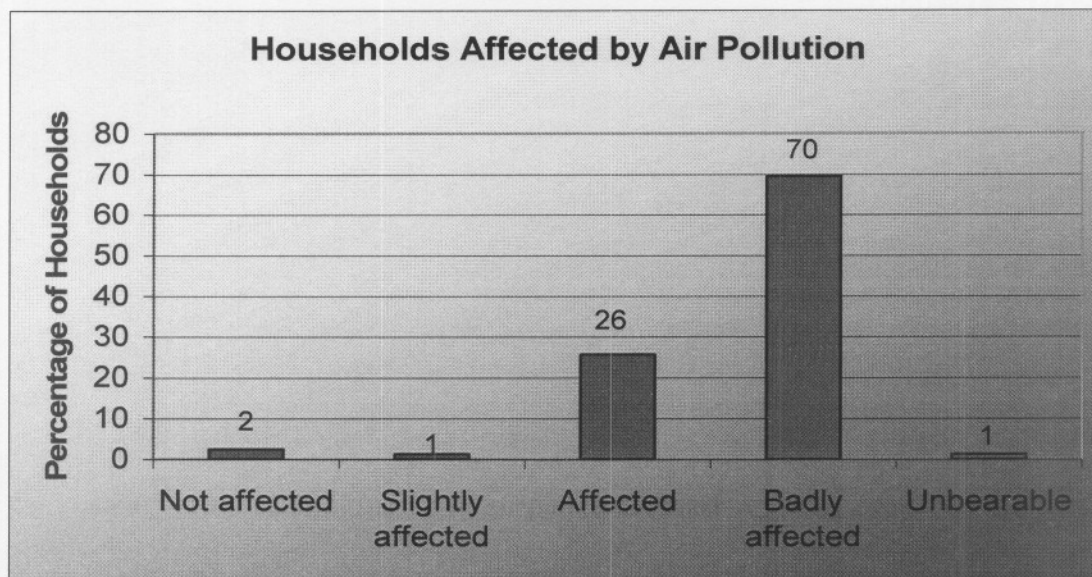
Figure 4.27 Households affected by air pollution – 2004



Source: Survey (2004).

Figure 4.27 shows the percent of households affected by air pollution in Leitrim. This figure gives an indication of how seriously respondents feel affected by air pollution - 98.0 percent are affected by air pollution. Of the total population affected by air pollution, 71.0 percent are badly affected, and this is shown in **Figure 4.28**. The comparative figures for Rathanda are 57.0 percent affected by air pollution, and 36.0 percent of those are (severely or unbearable) badly affected by air pollution. There seems to be a much more serious problem in Leitrim than in Rathanda. The relatively high figure for Leitrim may be accounted for by the fact that townships do not all experience the same level of air pollution. Townships located closer to larger industries such as SASOL and Mittal Steel (formerly ISCOR) experience higher pollution levels than those in outlying areas. In addition, Leitrim is mainly composed of RDP houses and shacks, where coal and paraffin are still widely used; this makes it susceptible to smoke pollution. In Rathanda both paraffin and coal are still used, but the township is electrified.

Figure 4.28 Households affected by air pollution - 2004

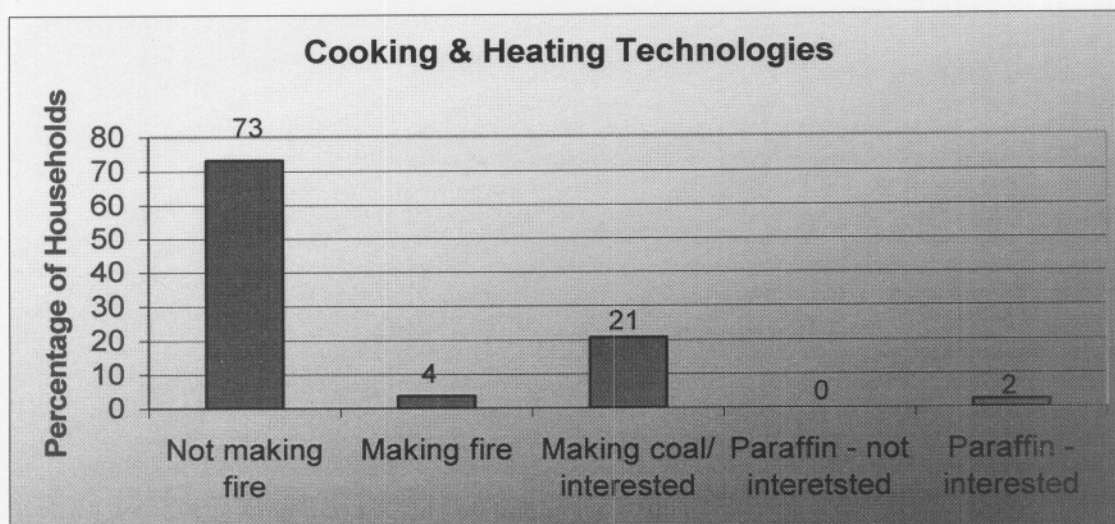


Source: Survey (2004).

The average monthly Rand value that an average household attaches to a smoke-free environment is R38.32 for Leitrim, while the average monthly Rand value for Rathanda is R17.39. This correlates well with the fact that the respondents in Leitrim are more affected by air pollution than those in Rathanda.

Figure 4.29 shows the households that are interested in alternative cooking and heating technologies. This figure illustrates that 73 percent of the sample population in Leitrim is not making fire, while 27 percent is making fire. Of the 27 percent, 77.8 percent are interested in cooking and heating technologies and 7.1 percent are interested in paraffin (they are saying this because of the reasonable price of paraffin). A total of 14.2 percent is making fire and is not interested in cooking and heating technologies. The comparative figures for Rathanda are as follows: the same figure of the population is not making fire (73 percent) while zero percent is using paraffin and 27 percent is making fire. Of this 27 percent, 70.4 percent are interested in cooking and heating technologies and zero percent are interested in paraffin. A total of 29.6 percent of those making fire are not interested in cooking and heating technologies (this part of the population believes that new technology is going to be expensive).

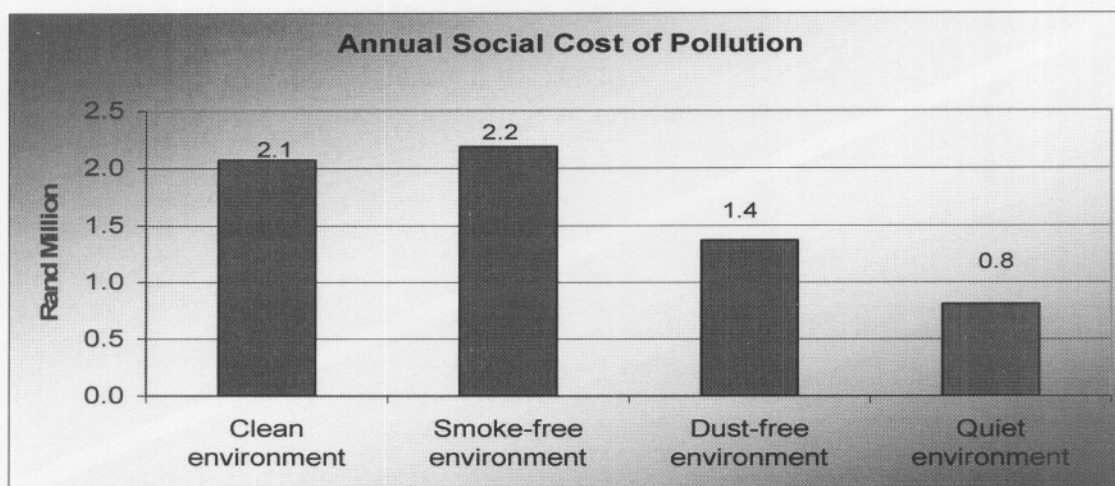
Figure 4.29 Cooking and heating technologies - 2004



Source: Survey (2004).

Figure 4.30 shows the annual social cost of pollution in Leitrim. This shows that Leitrim is willing to spend R2.2-million per annum to have a smoke-free environment, followed by R2.1-million on a clean environment. They are also willing to spend R1.4-million on a dust-free environment and R0.8-million on a quiet environment.

Figure 4.30 Annual social cost of pollution in Leitrim - 2004



Source: Survey (2004).

Table 4.1 reflects the difference between the two townships in terms of their willingness to keep a clean environment. It is clear that Leitrim places more importance on clean air than on the other environmental pollutants. Rathanda places an equal emphasis on both air pollution and dust pollution. The table also shows the total cost derived from averages in the survey data projected

on the entire population – placed on dealing with pollution. These are annualized figures of amounts that the affected population indicated that they are willing to part with living in a clean quiet environment.

Table 4.1 Social cost of pollution – 2004

Pollution	Leitrim	Rathanda
Air pollution	R2.2-million	R3.9-million
Environmental pollution	R2.1-million	R3.6-million
Dust pollution	R1.4-million	R3.9-million
Noise pollution	R0.8-million	R1.6-million
Total	R6.5-million	R12.7-million

Source: Survey (2004).

4.7 Summary and conclusion

This chapter assesses the household level of poverty, welfare and pollution in Leitrim and comparisons are made with Rathanda. The two tables below reflect some of the indicators assessed. Summary Table A reflects both unemployment and poverty in Rathanda and in Leitrim while Summary Table B shows the level of pollution in the two townships and the willingness of the community in making efforts to reduce pollution.

Table 4.2 Summary Table A

	Leitrim	Rathanda
Gender distribution	48.1 % male and 51.9 % females	45.5 % male and 54.5 % female
Youth (0<30 years)	65.3 % male and 59.7 % female.	60.7 % male and 55.7 % female
Qualification of people out of school	15.2 % grade 12 and higher education	30 % grade 12 and higher education
Labour force		
Informal employment	19.9 %	12.9 %
Formal employment	27.1 %.	40.8 %
Unemployment rate	53 %	46.3 %
Sectors where most are employed	Community, social education, training and personal services	Community, social education, training and personal services
Unemployed for five or more years	28.2 %.	48.9 %
Youth unemployment	74.3 percent male, 66 percent female.	70.8 percent male and 74.8 percent of female
Poverty		
Headcount index	0.74	0.488
Poverty gap ratio	0.5	0.5
Dependency ratio	3.5	3.2
The poor		
Gender distribution	46.7 % male, 53.3 % female.	44.7 % male and 55.3 % female
Youth (0 < 35 years) in poverty	75.6 % male, 68.3 % female	
Qualification of out of school population	21.1 % with grade 12 or higher education	40.4 % with grade 12 or higher education
Employed poor		
Informally employed	6.3 %	9.6 %t
Formally employed:	12.6 %.	21.8 %
Sectors of employment	Community, social, education, training and personal services	Community, social, education, training and personal services
Poor unemployed	57.5 %	68.6 %

Unemployed poor		
Youth (16<35 years)	73.1 %t male, 71.1 % female	66.8 % male and 65.8 % female.
Unemployed for 5 years and more	33 %	44.3 %

Table 4.3 Summary Table B

	Leitrim	Rathanda
Other indicators		
Main source of income	72.8 % salary	82.1 % salary
Where products are normally bought	Township	Township
Main expenditure items	Food, clothing, furniture and transport	Food, clothing, furniture and transport
Environmental opinions (Littering)	14.0 % Clean and pleasant; 61.0 % polluted and dirty; 25.0 % indifference	67.0 % Clean and pleasant; 14.0 %t polluted and dirty; 19.0 % indifference
Noise pollution	77.0 % is affected. 54%Street committee, 23% police and 23 % municipality should do something	48 % is affected. 49 % municipality, 21% policy, 30 % street committee should do some thing.
Dust pollution	80 % is affected	72 % is affected
Air pollution:	98.0 %	57 %
Heating and cooking technology	73% is not making fire. 21% interested in technologies, 4% not interested and 2% interested in paraffin technologies	73%t is not making fire. 23% make fire and 19% interested in technologies.

All of the above indicators show a very poor community judged by the household level of indicators presented above.

Based on the following indicators; headcount index, poverty, gap ratio and dependency ratio the town townships are poor, but Rathanda is better off than Leitrim. Whereby the poverty gap ratio for Leitrim is similar to that of Rathanda at 0.5, but there is a higher dependency ratio in

Rathanda that in Leitrim. In Rathanda dependency ratio is 3.2 persons and the figure for Leitrim is 3.5 persons. This shows that more people in Leitrim depend on single income than in Rathanda. The headcount index for Leitrim is 0.74. This means that 74 percent of the total households fall below their individual poverty line. In Rathanda the headcount index is 0.448 therefore 48.8 percent of the households fall below their individual households poverty lines. This means that there are 29.2 percent more households in Leitrim than in Rathanda that fall below their poverty lines.

The level of unemployment is also high in the two townships. This problem of unemployment is mainly concentrated within the young generation and the female gender. Most of the unemployed population has attained education level that is below grade 12; this reduces their chance of being employed.

The level of pollution in Leitrim is higher than in Rathanda, whereby a large number of the population feel that their environment is polluted (that is, it is littered). Also a large number of the households feel that Leitrim have a high rate of air pollution and dust pollution. This high level of pollution reduces the quality of life of the poor community in the townships.

In **Chapter 5** the focus is on the policies and technologies that may be used to alleviate the problem of pollution in the township of Leitrim and Rathanda.

CHAPTER FIVE

POLICIES AND TECHNOLOGIES THAT MAY BE USED TO REDUCE POLLUTION

5.1 Introduction

This chapter will focus on the policies that may operate pollution as well as on technologies that may be used to reduce pollution in townships.

Attempts to reduce air pollution started in the 1960's but have had limited success despite a number of attempts. During the 1960's, low-smoke fuel (devolatilised coal) was investigated but without much success. The 1970's brought the low-smoke stove, but in spite of good sales, this initiative was largely unsuccessful because users modified the combustion chamber thereby negating the smoke suppression features. Electrification was introduced during the 1980's, but yet again this was unsuccessful in decreasing the concentrations of air pollution. During the 1990's, the low-smoke (fuel) solution was re-visited (Van Niekerk & Swanepoel, 2002: 4).

The Vaal Triangle is notorious for its poor air quality, with industrial and mining emissions having combined with large-scale domestic coal burning emissions to produce a formidable air quality problem in the region. The Vaal Triangle encompasses a mixture of commercial, agricultural, and residential land use activities, all within close proximity to one another. Beyond the borders of the urban areas, the land is considered to be semi-rural and is used for low intensity farming practices. Elevated concentrations of particulates, SO₂, NO₂, CO, O₃, H₂S, methane, benzene and NMHCs have been noted to occur in the Vaal Triangle. Certain metals have also been noted to be of concern in the vicinity of specific sources (e.g. manganese, lead and chromium). Air quality thresholds have been noted to have been exceeded for particulates, SO₂, NO₂, O₃, H₂S, benzene and certain metals. Whereas most of these pollutants are of concern primarily due to their impact on human health (and the environment), the effect of H₂S is of concern due to its odoriferous nature and therefore its potential to impact on human welfare. The most significant sources of emission contributing to widespread exposure to pollutants noted to be above acceptable air quality limits include: various industrial emissions (combustion and non-combustion related), power generation emissions, domestic fuel burning, informal waste combustion and vehicle emissions. Fugitive dust sources such as vehicle entrainment of road dust and wind erosion of open areas also have the potential to contribute significant to suspended particulate concentrations (Anon, 2004)

In this chapter the focus is on the policies and technologies that may be implemented in order to reduce pollution.

5.2 Policies that may be used to reduce pollution

There are various implementation options available for facilitating or forcing intervention, such as regulation, taxation, incentives, tradable permits and education. Environmental taxes should consider the distribution implications. Economic instruments, including taxes and charges appear to show more promise in developing countries than tradable permit systems, although tradable permit systems should not be completely disregarded. Penalties and levies applied in different circumstances were found to be the most appropriate to mitigate air pollution from combustible fuel sources. However, imposing additional net costs on poor households should be avoided.

5.2.1 Managing air pollution

The prevention of air pollution must be effected in line with the provisions of the Atmospheric Pollution Prevention Act of 1965. The prevention of air pollution by local authorities mainly involves the monitoring of smoke emission, dust control and liaison with the National Chief Air Pollution Control on the control of scheduled processes as well as programmes. Town councils are required to establish, in respect of the provisions of the Act, departments or sections that will be responsible for the handling of air pollution related problems.

According to Masindi (2002:60-66), in order for the local authorities to be able to control or to take steps against the atmospheric pollution by smoke, the Act has to specify some level or categories to which the population needs to adhere. These levels range from level one to level three and are outlined as follows:

Level one: this level takes into account the enforcement of sections 15, 16, 17 and 23 of the Atmospheric Pollution Prevention Act of 1965, after the Minister has given the authority for such enforcement in terms of sections 14(1); 15-17; 23. These sections are:

- **section 15:** Requires that new fuel burning appliances must not emit black smoke that is prescribed in the Act and that effective appliances must be installed to limit emissions (these provisions do not apply in respect of a fuel burning appliance installed in a dwelling);
- **section 16:** Charges local authorities to ensure that chimneys and buildings are designed in such a way that smoke nuisance is prevented. It is therefore essential that

local authorities ensure that chimneys have optimum heights and that boiler rooms are properly designed to ensure the proper operation of installed boilers;

- **section 17:** Empowers offices of the local authority to take active steps in cases where problems with smoke nuisance are being experienced; and
- **section 23:** Empowers officers of the local authority to enter premises; and this authorization may be used to ensure that new appliances that do not comply with the requirements are not installed (Masindi, 2002:61).

Level two: The main objective of this level is to control the emission of smoke from premises other than private dwellings. This is done by promulgation regulations in terms of sections 18(1) of the Act. By applying regulations, control is increased over pollution from smoke emanating from boilers and space heating appliances in flats and offices buildings, light industries and dry cleaning factories as well as the burning of refuse (dwelling houses are excluded) (Masindi, 2002:61).

Level three: This level is concerned mainly with the combating of domestic smoke pollution in terms of sections 20, 21, 22, 23 24, and 25. Smoke control zone orders were promulgated from 1975, to cover the total municipal area and smallholdings that excluded the township areas (Masindi, 2002:6).

Section 10 of the Atmospheric Pollution Prevention Act 45 of 1965 provides for the following (Fuggle & Rabie, 1999:578).

Dust control. Orders on dust control zones were promulgated from March 1981 in the areas as the smoke control zones. Dust is controlled by an appointed officer in terms of the Act in industries such as brick making factories and coal mines. Health officers may serve a notice on the owner of a place to take measures to prevent dust pollution such as the use of sprinklers.

Scheduled processes. These processes are listed in terms of the Act as the manufacture of chlorine and steel. Health officers would have to liaise with Chief Air Pollution Control Officer at National Office by reporting problems they have identified for him to take action.

Education programme. The provincial health department has to be assisted by the local health department in developing training programmes for health officials who go out to the community to conduct training in air pollution related problems. This project is called Train-the-Trainer on Pollution issues.

Large number of residents of Leitrim use both coal and electrical appliances for their domestic use. Opperman and Davies (1992:13) explain that the only approach to alleviate the pollution

problem in townships will be to introduce low-cost smoke fuels. They argue that the use of low-smoke fuels such as anthracitic coal or pretreated bituminous coal will help to reduce the volume of smoke, but unfortunately the use of the above-mentioned fuels is more expensive. These types of fuels are different from the ordinary bituminous coal that gives off a great deal of smoke which eventually settles close to the ground.

5.2.2 Managing land pollution

From a human point of view, solid waste could mean the remains of wasted food, rotten vegetables, the peelings of vegetables and stalk leaves. Most commonly, waste comes from obsolete or useless items that are no longer useful to individual users. Waste that is mostly dumped on the outskirts of the residential areas is household waste that comprises plastics, papers and some garden refuse. On windy days, such waste is often blown back into the residential areas (Fuggle & Rabie, 1999: 512).

5.2.3 Managing noise pollution

Noise has been described as any sound that is undesirable to the recipients. Noise could emanate from various phenomena that range from the movement of people to peak sounds of jet engines. The management of noise must actually take place in line with the ways in which noise could be controlled. It must, however, be known that there are places where noise and its effects cannot be controlled. For example, rocks must be blasted in order to obtain gold or to gain access to another area during mining activities (Fuggle & Rabbie, 1999:569).

The management of vehicle noise is apparent because conditions that generate noise in South Africa are different from those prevailing in other countries. For example, the poorer thermal insulation of South African buildings as compared to those of highly developed countries leads to the lack of acoustic insulation (Fuggle & Rabbie, 1999:575).

Noise could emanate from household appliances such as refrigerators, kettles and room air conditioners, and consequently those appliances sold to consumers accordingly must conform to noise reduction tests. Any appliances that do not attain the set standard are deemed not fit to be used by members of the public (Fuggle & Rabbie, 1999:576).

Local authorities are tasked with controlling noise levels within their area of jurisdiction. Notices prohibiting noise around important buildings such as churches, hospitals and hospices are visible in order to request individuals to observe noise control. Local authorities, through bylaws, can specify where and when one can make a noise and up to which level. During the construction or demolition of buildings, too much noise is often caused. For this reason; in major towns and

cities no construction or demolition of buildings can be undertaken after 22h00 (Fuggle & Rabbie, 1999:581).

5.3 Technologies that can be used to reduce air pollution

The following criteria are used for evaluating potential solutions (Van Niekerk & Swanepoel, 2002:4). They are used in selecting the technologies that may be used in the reduction of pollution:

- **Affordability.** The ability and willingness of the end-user to pay for the solution, and if not, for another party to do so. Affordability must be determined both for establishing a solution and for its maintenance over the total life cycle. Cost to end-users as well as cost to outside parties such as authorities must be taken into consideration. Potential savings will be calculated for the individual household and service providers (such as the authorities).
- **Beneficiality.** The extent to which the solution does not merely replace the problem elsewhere or bring about new problems in other areas or spheres of the household or community.
- **Cost-effectiveness.** The effectiveness of the solution compared with the cost involved. Cost effectiveness refers to the ability of a solution to realise the goal of the project, in this case to reduce domestic air pollution in coal burning areas. This goal can, however, be subdivided into two separate goals: to improve the health of residents, and to reduce the emission of greenhouse gasses. Some solutions, such as electrification, can be very effective in improving the health of residents if it is used by a sufficient percentage of the residents. It is not as effective in reducing the emission of greenhouse gasses, because such gasses are emitted during the process of generating electricity. Other goals, apart from the improvement of health and the reduction of greenhouse gas emissions, such as reducing the peak demand for electricity, especially during winter evenings, have not been included in the proposed strategy.
- **Desirability.** The term desirable refers to what people strive for themselves in contrast to the term acceptable. It refers to what people would be willing to accept when offered to them by others, even if the people do not strive for these things of their own accord. There is evidence that end-users spontaneously implement the specific solutions, and continue to do so.

- **Phase of development.** The phase of development in which a potential solution is or how far it is from being available for full-scale implementation.
- **Sustainability.** The possibility that the solution will be sustained by the end-users (see: desirability); and will also be affordable in future (see: affordability and availability), and has no detrimental impact on the ecology. Sustainability refers to the ability of a solution, product or project to continue to function over an extended period of time. Sustainability is related to social justice. It refers to the responsibility of the *present* generation to *future* generations, while social justice refers to the responsibility of the rich and powerful to the poor and needy of today. In both cases it is a responsibility towards those who are not in a position to fully protect their own interests (Van Niekerk & Swanepoel, 2002:17).

According to Van Niekerk and Swanepoel (2002) the burning of coal in townships causes indoor pollution levels amounting to 2-3 times acceptable levels in summer and 6-7 times acceptable levels in winter. Several efforts were made over time to reduce this pollution, and are discussed in the following sections.

5.3.1 Devolatilized coal

In the 1960's devolatilized coal was investigated as a method to reduce air pollution. Not much is known about this effort, but one can conclude that it was not a success, because it was followed by the low-smoke stove initiative (Lokkers & Swanepoel, 2003:5).

5.3.2 Low-smoke stoves

The Air Pollution Prevention Act of 1973 and 1981 prescribed certain requirements for new stoves with regard to durability and performance. In most cases this led to manufacturers adapting the standard cast iron stoves by inserting a dividing brick or plate into the combustion chamber to create a secondary combustion chamber where unborn volatiles are burned (Hoets, 1997: 39).

The initiative was largely unsuccessful. Discussions with people in eMbalenhle revealed that the perceived reason for the lack of success was that the users were to blame because they modified the combustion chamber (by removing the dividing brick or plate), thereby negating the smoke suppression features. This was not necessarily correct. It came as somewhat of a surprise to find stoves with the bricks still intact, and to be given the assurance that people only took out the bricks because they cracked after a few months or years. Some people were even looking for

bricks to replace damaged ones. It appears that the problem is more likely to be with the design of the solution, not with the behaviour of the end-users (Van Niekerk & Swanepoel, 2002).

5.3.3 Electrification

The National Electrification Drive (NED) was announced in 1991 by ESKOM, the South African Electricity Utility Company, with the aim being to electrify 3-million houses in five years. However, after electrification there is often a switch back to coal and even paraffin, because electricity does not satisfy all needs. Electricity is often used for lights, TV, and other appliances, and not so much for space and water heating. Existing coal- and wood-based methods are still used for space heating. The result is that pollution levels have not decreased significantly (Van Niekerk & Swanepoel, 2002:5)

5.3.4 Low-smoke fuels

In the 1990s the (then) Department of Mineral and Energy Affairs (DME) initiated an investigation into low-smoke fuels (LSF), which were regarded as transitional fuels “until electricity becomes the preferred energy source”. The DME conducted several social acceptability studies, first on a smaller scale, and in the end culminating in an extensive study. The Macro-Scale Experiment was conducted during the winter of 1997. The results were analysed in two reports. At the end of the study it was concluded: “No single fuel is currently identifiable as comprising all of the attributes necessary to present a viable alternative to the use of bituminous coal within the household energy sector”. The required attributes were: low emissions, potential for health benefits, social acceptability, technical feasibility and economic viability. Social and technical requirements were: suitable heat production and retention, speed of cooking, and ease of ignition. Coal merchants also reacted negatively to low smoke fuel, a product that they could perceive as a threat to their market (Hoets, 1997:26).

The Net Present Value (cost in present day terms) of implementing LSF is estimated to be R36,000-million while the Benefit/Cost ratio (ratio of monetary benefit in terms of savings in anticipated health costs as result of reduced air pollution levels attributable to effective implementation, to the cost of implementation) is estimated to be 0.4. This means that the anticipated benefit is less than the cost of implementation (Van Niekerk & Swanepoel, 2002:12).

An issue that is also important is the relation between the fuel and the stove. The smoke emission is influenced by the interaction between the two factors so that a low-smoke fuel cannot be called such in isolation from the stove in which it is burned (Van Niekerk & Swanepoel, 2002:13).

5.3.5 Paraffin, LP Gas, ethanol/methanol, and renewables

These sources of energy cannot compete with coal at present because of the space-heating requirement. They are expected to become desirable once the impacts of insulation on energy need patterns become known (Van Niekerk & Swanepoel, 2002:14).

5.4 Potential solutions to reduce the need for space heating

Insulating existing low cost houses. The value of insulation to reduce energy loss during space heating has been well known for a long time, but no affordable and safe insulation material that also complies with the other criteria is available. The exact impact of insulation upon energy consumption patterns in low cost houses is not known, but it can be assumed that the increased use of coal in winter is for the purpose of space heating. In Leitrim, coal consumption doubles from two bags per month in summer to four bags per month in winter. Technically, insulation could reduce this additional need in winter by 50 percent, resulting in savings of about four bags of coal or R100 per household per annum. If an insulation material can be developed that costs R4/m² the cost of installing insulation could be paid for from the savings within one year. Insulation also has major social benefits in terms of enhancing human dignity, but it poses a potential safety risk if ventilation is impaired. The social benefits of insulation are very important and need further investigation (Van Niekerk & Swanepoel, 2002:12).

Energy efficient building methods. These are not considered to form part of the current study since it is considered to be a long-term solution that should be managed by the Department of Housing (Van Niekerk & Swanepoel, 2002:14).

5.5 Potential solutions to replace undesirable energy carriers with more desirable (less polluting) energy carriers

Low smoke fuels. Although laboratory results indicate potentially high efficiency, the condition of the combustion appliance has a major impact upon the actual emission of pollutants. Consequently the results in actual use have been less positive because of the poor condition of most stoves.

Electricity. This is not considered to form part of the study, because it already forms part of the Integrated National Electrification Programme.

Paraffin, LP Gas, ethanol/methanol, renewables, etc.: These sources of energy cannot compete with coal at present because of the space-heating requirement. They are expected to

become desirable once the impacts of insulation on energy need patterns become known (Van Niekerk & Swanepoel, 2002b:12).

5.6 Potential solutions to refine existing methods and appliances for more efficient energy conversion

This section provides potential solutions to refine existing methods and appliances for more efficient energy conversion.

- **Chimneys.** Initially this seemed to be an attractive solution. Investigation however revealed that the condition of most stoves is so poor that airflow cannot be regulated. The result is that when a stove is equipped with the correct length of chimney it overheats. The solution has consequently been disregarded (Van Niekerk & Swanepoel, 2002:14).
- **Basa Magogo.** This is an adaptation of the top-down method of fire ignition, where wood and paper are placed on top of the coal to start a fire. The Basa Magogo method adds an additional handful of coal after the wood and paper is burning. It is currently estimated that Basa Magogo reduces air pollution by approximately 50 percent. It is estimated that the implementation cost will be between R25- and R50-million if it is assumed that approximately one million households use coal. This compares favourably with a potential saving of R250-million in annual health cost to government and a further potential saving of an estimated R150-million in energy costs to families (Van Niekerk & Swanepoel, 2002:12).

This product matches the identified criteria, as will be indicated below.

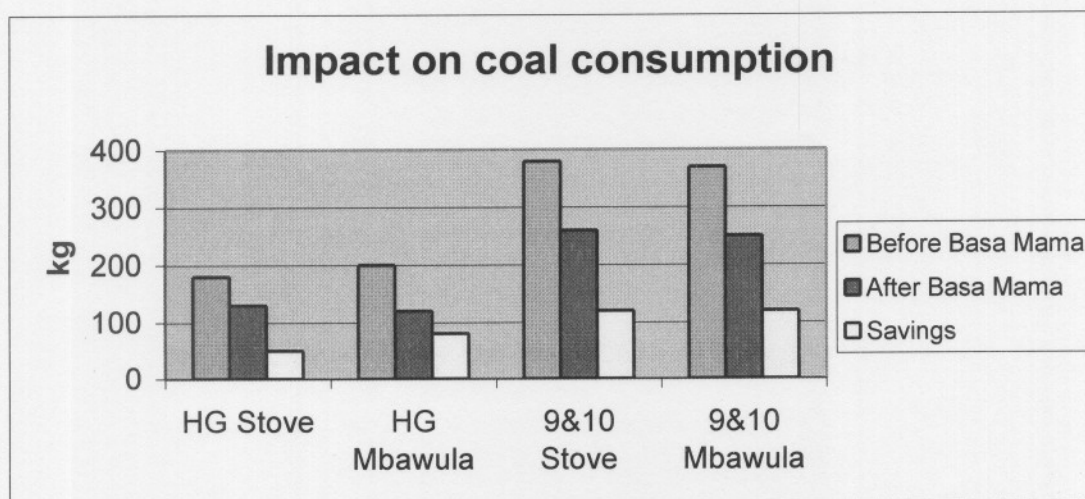
- **Affordability.** Basa Magogo saves end-users up to 50 percent in coal expenses (on average, 25 percent or R150 per household per annum); it requires a small investment (about R50 per household) to market in the community, and almost no cost from authorities to ensure continuous usage. The cost of marketing on a national scale is estimated at R50-million for an estimated one million households (Lokkers & Swinepoel, 2003: 13).
- **Beneficiality.** The benefits of coal use, such as bringing the family together, are retained. The way in which savings will be used, will have to be monitored.
- **Cost-effectiveness.** The actual reduction of air pollution in the mbawula (mbawula is a self-made stove which is uses coal and hood for cooking and space heating) and self-made stove has not yet been measured, but it is estimated to be about 80 percent

for a given quantity of coal, compared with the traditional method of ignition. A further reduction of pollution is achieved because of the estimated average reduction of 25 percent of the quantity of coal used (Van Niekerk & Swanepoel, 2002a:12). If the effectiveness described above is compared with the fact that continuous use of Basa Magogo after marketing costs almost nothing, but saves the end-user significant costs, it is obvious that this solution is extremely cost-effective.

- **Desirability.** The ultimate state of desirability is when a given solution spreads on its own because end-users are excited and drive implementation themselves. Basa Magogo is not yet as successful as that: it needs marketing down to the street and household levels. However, in eMbalenhle it has become community driven; there is talk of making it compulsory through public pressure and mass meetings. It may develop further momentum if it is properly marketed (Van Niekerk & Swanepoel, 2002a:12).
- **Phase of development.** Basa Magogo requires no changes in production, distribution or marketing in the existing coal merchant network, which is a major advantage. It improves the availability of coal by reducing the quantity of coal used for the same amount of energy. It would need a well-planned and properly executed marketing strategy to reach all beneficiaries. For Basa Magogo the marketing strategy is in the validation phase, but for Basa Magogo the marketing is still in the research and development phase.

Sustainability. Social and economic sustainability are discussed under affordability and phase of development; the ecological sustainability of Basa Magogo is not ideal, because coal is a limited resource, but it is better than present practices because of a reduction in the amount of coal used.

Figure 5.1 Impacts on coal consumption (quantity) - 2003

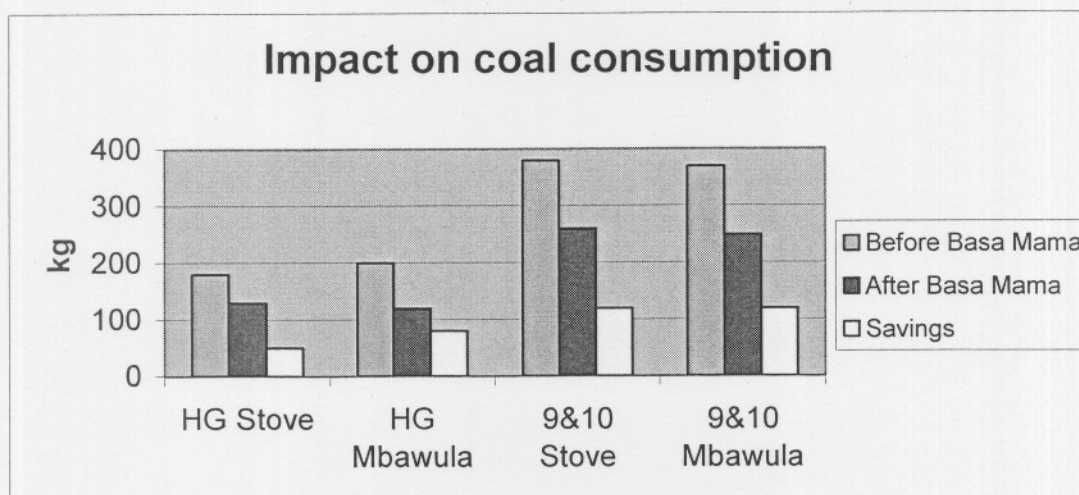


Source: Lokkers & Swinepoel (2003: 8).

Figure 5.1 shows the household consumption of coal in kilogrammes during the winter months of 2003. The figure shows the quantity of coal consumption before and after Basa Magogo when households are using coal stoves and mbawula. Households that used a stove before Basa Magogo consumed 180kg of coal per month, while after using Basa Magogo they only consumed 130kg, making a saving of 50kg. Households that used mbawula used to consume 200kg and now they are consuming only 120kg, making a saving of 80kg of coal per month.

Figure 5.2 shows the monthly financial impact on coal consumption. This demonstrates that households which were using a coal stove for cooking and space heating is now spending less on coal per month after using Basa magogo. They used to spend R75 and now spending R55 giving them a financial saving of R20 per month. While households that were using mbawula for space heating and cooking are now making a financial saving of R35 per month by consuming less coal per month.

Figure 5.1 Impacts on coal consumption (quantity) - 2003

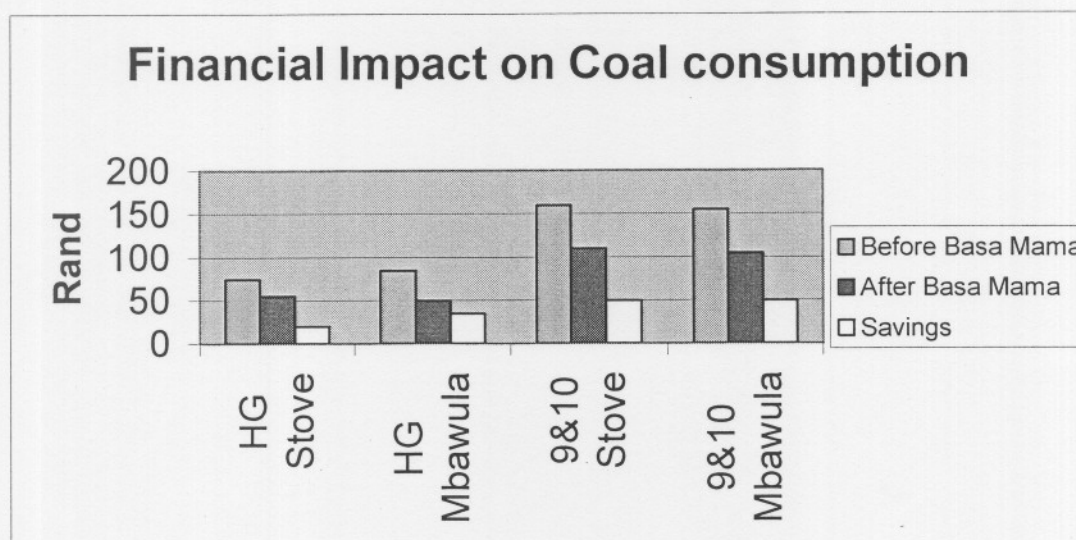


Source: Lokkers & Swinepoel (2003: 8).

Figure 5.1 shows the household consumption of coal in kilogrammes during the winter months of 2003. The figure shows the quantity of coal consumption before and after Basa Magogo when households are using coal stoves and mbawula. Households that used a stove before Basa Magogo consumed 180kg of coal per month, while after using Basa Magogo they only consumed 130kg, making a saving of 50kg. Households that used mbawula used to consume 200kg and now they are consuming only 120kg, making a saving of 80kg of coal per month.

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Figure 5.2 Monthly financial impact on coal consumption - 2003



Source: Lokkers & Swanepoel (2003: 8).

Lokkers and Swanepoel (2003:7-9) reveal that because heat is available sooner, households could delay the time that they ignite a stove or mbawula with between half an hour and two hours, and this is especially convenient for working mothers.

5.7 Policies and technologies that may reduce pollution in Leitrim

Of the total population, 82 percent feel that the environment is polluted and dirty. The study shows that 78 percent of the population feels that the municipality and every person (the community members) should be involved in cleaning-up the environment. The population of Leitrim places an average Rand value on the reducing of pollution of R38.32 per month from every household.

Most commonly, waste comes from obsolete or useless items that are no longer useful to individual users. Waste that is mostly dumped on the outskirts of the residential areas is household waste that comprises plastics, papers and some garden refuse. On windy days, such waste is often blown back into the residential areas. The municipality should intervene by cleaning the environment (remove garbage) and they also should encourage the community members to recycle most of the waste material (recycling projects such as collect-till paper recycling and many more). This will reduce the social cost of littering that this poor community is incurring. The recycling projects will also generate income for the households that are involved in the recycling projects and this could help to reduce the poverty levels in the area.

A total of 77 percent of the population in Leitrim is affected by noise pollution mainly from music played by other members of the community using equipment such as amplifiers. Of the total population, 54 percent feel that the street committee should be give more power to make arrangements about the manner in which loud music should be played.

Local authorities are tasked with controlling noise levels within their area of jurisdiction. Notices prohibiting noise around important buildings such as churches, hospitals and hospices are visible in order to request individuals to observe noise control. Local authorities, through bylaws, can specify where and when one can make a noise and up to which level. During the festive season, the community often makes too much noise, and tavern owners and the local authorities have the power to prohibit this form of pollution. In major towns and cities loud music cannot be played after 22h00. The community feels that if the local authority operates jointly with the street committee, the level of noise in the townships will be reduced significantly, and laws such as the one that prohibits the community to play loud music after 22h00 will be maintained.

Of the total population, 98 percent feel that there is high level of air pollution in the area, and 71 percent of the population is badly affected by air pollution. The population of Leitrim places an average Rand value on pollution reduction of R23.96 per month from every household.

In this study, there has been a focus on indoor smoke pollution that is smoke from coal burning. This occurs because the community needs to warm their space and to cook. In this study, certain technologies that are available for the community to reduce air pollution have been identified, like BM, electrification and low smoke stove. Most of these technologies are expensive for poor communities, and others are not suitable for the environment. We have managed to identify Basa Magogo (BM) as the most appropriate technology that can be used by poor communities in order to reduce air pollution. BM satisfies the following conditions, which makes it the most recommended technology for the poor communities:

Affordability, the ability and willingness of the end-user to pay for the solution, and if not, for another party to do so. Beneficiality, the extent to which the solution does not merely replace the problem elsewhere, or bring about new problems in other areas or spheres of the household or community. The effectiveness of the solution compared with the cost involved. In this case it is to reduce domestic air pollution in coal burning areas. This goal can, however, be subdivided into two separate goals: to improve the health of residents, and to reduce the emission of greenhouse gasses. Desirability refers to what people strive for themselves. Evidence reveals that end-users spontaneously implement the specific solutions and continue to do so. Sustainability refers to the possibility that the solution will be sustained by the end-users and will also be affordable in future and has no detrimental impact on the ecology.

BM will reduce the level of air pollution by more than 50 percent if it is implemented at full scale. It will also reduce the monthly cost of the households by more than R20 per month (currently average monthly spending on coal is R75 and BM will reduce this cost to R55 per month), which will be saved when purchasing coal and this will contribute to poverty reduction for the poor community. In this study if the population of Leirim is compensated for the negative externalities (i.e. the cost that the community incurs for cleaning air, dust free environment, cleaning waste material) the poverty rate will be reduced from 74.4 percent to 69.5 percent. This means that the poverty rate will fall by 4.5 percent.

5.8 Summary and conclusion

This chapter focused on policies and technologies that may be used to reduce pollution. There are varied implementation options available for facilitating or forcing intervention, such as regulation, taxation, incentives, tradable permits and education. Environmental taxes should consider the distribution implications. Economic instruments, including taxes and charges, appear to show more promise in developing countries than tradable permit systems, although tradable permit systems should not be completely disregarded. Penalties and levies applied in different circumstances were found to be the most appropriate to mitigate air pollution from combustible fuel sources; however, imposing additional net costs on poor households should be avoided.

The prevention of air pollution must be effected in line with the provisions of the Atmospheric Pollution Prevention Act of 1965. The prevention of air pollution by local authorities mainly involves the monitoring of smoke emission, dust control and liaison with the National Chief Air Pollution Control on the control of scheduled processes as well as programmes. Town councils are required to establish, in respect of the provisions of the Act, departments or sections that will be responsible for the handling of air pollution related problems.

Waste, which is on the increase due to the increase in population, could become a nuisance to the removers and can be seen as a source of income to the waste reclaimers. All over the country people are being encouraged to recycle certain recyclable material for a price. Be it aluminum, papers and oil, waste reclaimers have the chance to earn a better living, this will add to the reduction in poverty.

The following became clear: it is not always necessary to provide huge amounts of money to implement and sustain a solution. Adapting the BM will actually reduce the fuel cost of households and also the medical costs (to government) because of lower levels of upper respiratory infections. There is a considerable need in South Africa to educate the poor (providing regular educational programmes on how important a clean environment is will

improve their quality of life) about ways of reducing pollution in their environment. There is need for affordable technologies that the poor will use - technologies that will reduce pollution such as BM.

There is a need for the municipality to work jointly with the community in decision-making processes on problems such as noise pollution. The community needs to be educated on procedures to follow when they are going to play music.

To reduce dust pollution in poor communities the municipality needs to encourage the community to plant ('go green' project) trees and green grass in the township, as this will reduce the level of dust pollution in this area.

CHAPTER SIX

SUMMARY AND CONCLUSION

6.1 Introduction

The main objective of this study is to determine the levels of unemployment and poverty in Leitrim (a township that is located close to the industrial area) as well as to investigate the extent of pollution as experienced by households. The results are compared with Rathanda (a township that is not in the industrial area). This chapter provides a summary of the main points of the dissertation and draws some conclusions and recommendations.

6.2 Summary of the dissertation

This dissertation focused on states of poverty, unemployment and pollution reduction in the townships of Metsimaholo. In Leitrim the number of households is estimated at 4,758, while the average household size is 4.27 persons per house and the population estimated at 20,310.

Unemployment and poverty are increasingly seen as multi-dimensional concepts, resulting in a range of capabilities, such as education, health and human and civil rights. Factors such as the absence of adequate economic growth which led to stagnation in the labour market, inability of the formal sector to create sufficient employment opportunities for a growing population, general low level of skills in the labour force and general uncertainty regarding the future economic prospects of South Africa, are regarded as some of the underlying causes of unemployment in this country. In South Africa, unemployment is more concentrated among African people, and women, especially Black women, and the youth. This and other factors make the problem of unemployment complex. The unemployment rate in Leitrim is 57.5 percent while in Rathanda the figure is 46.3 percent. In Leitrim 80.7 percent of the male population under the age of 40 years are unemployed, while the figure for female population that is below 40 years of age is 87.2 percent. In Rathanda the figure for unemployed male population that is below the age of 40 years is 70.8 percent, the figure for female population in the same age category is 74.8 percent.

To reduce or to define poverty is not an easy task. It was shown that poverty should not be simply about the level of income obtained by households or individuals; nor is it only about the lack of access to social services. Factors such as inability to participate in society are also important, and economic, social, cultural and political factors also play a part. Poverty is indeed all this and more; it will always be dependent on whoever is studying poverty and why they are studying it.

Poverty calculations are usually based on representative sample data of income or consumption gathered from the target area, and related to a poverty line. This, in turn, is established with reference to minimum consumption as in the case of absolute poverty. Other measures of poverty are more qualitative and /or more location specific, and cannot so easily be aggregated. When poverty is multi-dimensional, problems arise with the weighting of different components.

A poverty line is a quantitative approach, and this was used to measure poverty in this study. A poverty line is a line, which shows the level of income necessary to offer a minimum subsistence level. Poverty lines are income and price elastic, they are adjusted for changes in the median or mean income or consumption of the general population as well as for change in the general price level.

Other measures used to measure poverty are headcount index, the poverty gap ratio, and the dependency ratio. For the purposes of this study, the headcount index was adapted to indicate the fraction of the households that fall below their individual poverty lines. For the purpose of this study, the HSL (write out in full) is used. The poverty gap measures the average shortfall of the extent of the incomes of the poor from the poverty line, while the poverty gap index measures the extent of the shortfall of incomes below the poverty line. The dependency ratio refers to the ratio of the number of non-income earners that depend on income earners. The headcount index of Leitrim is 0.74 while the headcount index in Rathanda is 0.4875.

Different types of pollutants are discussed and the four main types of pollution are air pollution, land pollution (littering), noise pollution, and dust pollution.

Under air pollution sources of air pollution were identified and it was defined as the contamination of air in an environment where people and animals live. Air pollution emanates from those everyday activities, which are an integral part of modern and technologically advanced societies. Exposure to indoor air pollution (smoke) from cooking and heating sources ranks close to urban air pollution as a concern. Some 400-million people worldwide are exposed to unsafe levels of indoor smoke, as against 700-million for outdoor air pollutants, but exposure to indoor pollution is typically more intense. Smoke inhalation contributes to about 4-million deaths per year among infants and children.

Land pollution (littering) is waste that has been misplaced; it must be recovered and brought into the formal waste stream where it can be managed with the resources that are available for the task. Land pollution (hazardous solid wastes) was referred to as any unwanted materials or refuse capable of posing a substantial threat to health or the environment (ecology).

Noise pollution is defined as any undesirable sound. In the case of townships this type of sound is produced when people play loud music using equipment such as amplifier. Factors were also stated that influence the degree of undesirability of sound.

Table 6.1 Summary Table A

	Leitrim	Rathanda
Gender distribution	48.1 percent male and 51.9 percent females	45.5 percent male and 54.5 percent female
Youth (0<30 years)	65.3 percent male and 59.7 percent female.	60.7 percent male and 55.7 percent female
Qualification of people out of school	15.2 percent grade 12 and higher education	30.0 percent grade 12 and higher education
Labour force		
Informal employment	19.9 percent	12.9 percent
Formal employment	27.1 percent.	40.8 percent
Unemployment rate	53 percent	46.3 percent
Sectors where most are employed	Community, social education, training and personal serves	Community, social education, training and personal serves
Unemployed for five years or more years	28.2 percent.	46.1 percent
Youth unemployment	74.3 percent male, 66 percent female.	70.8 percent male and 74.8 percent of female
Poverty:		
Headcount index	74.0 percent.	48.8 percent
Poverty gap ratio	50.0n percent (0.5).	50 percent
Dependency ratio	3.5	3.2
The poor		
Gender distribution	46.7 percent male, 53.3 percent female.	44.7 percent male and 55.3 percent female
Youth (0 < 35 years) in poverty	75.6 percent male, 68.3 percent female	66.9 percent male, 65.8 percent female
Qualification of out of school population	21.1 percent with grade 12 or higher education	25.6 percent with grade 12 or higher education
Employed poor		
Informally employed	6.3 percent.	9.6 percent

Formally employed:	12.6 percent.	21.8 percent
Sectors of employment	Community, social, education, training and personal serves	Community, social, education, training and personal serves
Poor unemployed	57.5 percent	68.6 percent
Unemployed poor		
Youth (16<35 years)	73.1 percent male, 71.1 percent female	58 percent male and 63.7 percent female.
Unemployed for 5 years and more	33.0 percent	44.3 percent

Table 6.2 Summary Table B

	Leitrim	Rathanda
Other indicators:		
Main source of income	72.8 % salary	45.6 % salary
Goods are normally bought	Townships	Townships
Main expenditure items	Food, clothing, furniture and transport	Food, clothing, Renting and transport
Environmental opinions	14 % Clean and pleasant; 61 % polluted and dirty; 25 % indifference	67 % Clean and pleasant; 14 % polluted and dirty; 19 % indifference
Littering	82%Polluted and dirty, something should be done about it (municipality and every person	35%Polluted and dirty, something should be done about it (municipality and every person
Noise pollution	77 % is affected. 54%Street committee, 23%police and 23%municipality should do something	48 % is affected. 49%Municipality, 30%street committee and 21%police and should do something
Dust pollution	80 % is affected and 64 % badly affected	20 % is affected and 7 %t badly affected
Air pollution:	98 % is affected, while 71 percent is badly affected	98 % is affected, while 71 % is badly affected
Heating and cooking technology	73 % of the population is not making fire	73 % of the population is not making fire

Technologies that may be used to reduce air pollution are discussed. Methods for selecting technologies that will be advantageous for the poor communities were listed - and which are sustainable, desirable, affordable, and cost effective. The technology, which seems to be the most suitable Basa Magogo technology, is recommended, as this technology is more suitable for a poor community, and it also adheres to the requirements for the desired technology.

6.3 Conclusion

The hypothesis of the study states that poverty, unemployment and pollution reduce the quality of life. The impact of pollution on the Metsimaholo townships has immense cost implications. Due to the fact that the cost of pollution and the cost of preventing pollution are not known to the authorities and the fact that poor communities lack the funds to improve their environment, they are not taking any measures to reduce pollution in order to improve the quality of life in the township area.

Unemployment and poverty are increasingly seen as multi- dimensional concepts, resulting in a much wider range of factors being considered regarding poverty including the deprivation in a range of capabilities, such as education, health and human and civil rights.

The major problem of unemployment in South Africa is that it does not have obvious causes - which make it more complex. The absence of factors such as adequate economic growth which led to stagnation in the labour market, inability of the formal sector to create sufficient employment opportunities for a growing population, general low level of skill in the labour force and uncertainty regarding the future economic prospects of South Africa are regarded as some of the underlying causes of unemployment in the country. In South Africa unemployment is concentrated mainly among African people, and women, mainly Black women, and the youth.

Poverty has many complex roots and causes. The creation of conditions for its reduction therefore requires concerted action in a number of functional spheres of government and civil society. Poverty knows no boundaries of race, creed, gender or citizenship. The alarming march of unemployment and poverty in South Africa, and indeed in the entire Southern African region, is testimony to the socio-economically inefficient application of the resources of the continent. Particularly through the instability it engenders, poverty is one of the most significant and enduring threats to the fabric of society on the continent.

Poverty is a highly contested term, which makes it difficult to define. Many works on the subject become so technical that it is very difficult to draw conclusions from them or to employ them in policy-making activities. How poverty is defined and measured tends to determine the types and

direction of policies aimed at reducing it. The important factor with the definition of poverty is that definitions drive policies.

Urban poverty differs from rural poverty in a number of ways. One of these ways is the fact that the poverty line and consumption patterns of the rural poor differ markedly from those of the urban poor in most developing countries. A single poverty line for both urban and rural poverty is specifically considered due to the nature of the area being studied. In respect to urban poverty the physical manifestations thereof are evident in all cities of developing countries in the form of slums and squatters. In this respect South Africa is no different, and the same applies to the area of this study.

The following are the examples of poverty lines used in South Africa: PDL, MLL, SLL, HSL and HEL. The HSL was used in this study. It is defined as an estimate of theoretical income needs by an individual household to maintain a defined minimum level of health and decency in the short-term and is calculated at the lowest retail cost of a 'basket' of necessities of adequate quality. The basket includes food, clothing, fuel and lighting, and washing and cleaning material for each individual in a household as well as the cost of rent and transport.

Other measures used to measure poverty are the headcount index, the poverty gap ratio, and the dependency ratio. For the purpose of this study, the headcount index was adapted to indicate the fraction of households that fall below their individual poverty lines - below their HSL. The poverty gap measures that average shortfall of the income of the poor from the poverty line while the poverty gap index measures the extent of the shortfall of incomes below the poverty line. The dependency ratio refers to the number of non-income earners that depend on income earners.

Land pollution refers to (hazardous solid wastes) any unwanted materials or refuses capable of posing a substantial threat to health or the environment (ecology). The following are the types of hazardous substances. Land-based pollution is mainly due the disposal of human refuse and contamination by agricultural chemicals. Dumped refuse in landfill sites is a problem because it destroys natural habitats, is a breeding ground for disease and releases methane (a greenhouse gas) as the refuse decomposes.

Noise pollution is a particular category of sound. It may be defined as undesirable sound. In this study the undesirable types of sound that were addressed were the loud music played by the community members and tavern owners. This loud music is often played the whole night long without considering other members of the community.

Of the total population, 82 percent feel that the environment is polluted and dirty. The study shows that 78 percent of the population feels that the municipality and every person (the community members) should be involved in cleaning up the environment.

Waste that is mostly dumped on the outskirts of the residential areas is household waste that comprises plastics, papers and some garden refuse. On windy days, such waste is often blown back into the residential areas. The municipality should intervene by cleaning the environment (remove garbage and this will reduce the social cost of littering that this poor community is incurring) and they also should encourage the community members to recycle most of the waste material (recycling projects such as collect-till paper recycling and many more). The recycling projects will also generate income for the households that are involved and this could also reduce the poverty levels in the area.

Local authorities are tasked with controlling noise levels within their area of jurisdiction. Notices prohibiting noise around important buildings such as churches, hospitals and hospices are visible in order to request individuals to observe noise control. Local authorities, through bylaws, can specify where and when one can make a noise and up to which level. During the festive season, the community often makes too much noise and tavern owners and the local authorities have the power to prohibit this form of pollution. In major towns and cities loud music cannot be played after 22h00. The community feels that if the local authority operates jointly with the street committee the level of noise in the townships will be reduced significantly, and laws such as the one that prohibits the community to play loud music after 22h00 will be maintained.

Of the total population, 98 percent feel that there is high level of air pollution in the area, and 71 percent of the population is badly affected by air pollution. The population of Leitrim places an average Rand value on reducing pollution of R23.96 per month from every household. For poor people many environmental problems are associated with poverty. Exposure to indoor air pollution (smoke) from cooking and heating sources ranks close to urban air pollution as a concern.

In this study there has been a focus on indoor smoke pollution, that is smoke from coal burning. This occurs because the community needs to warm their space and to cook. In this study some technologies are identified that are available for the community to reduce air pollution. Most of these technologies are expensive for poor communities, and others are not suitable for the environment. Basa Magogo (BM) is identified as one of the most appropriate technologies that can be used by poor communities in order to reduce air pollution.

BM will reduce the level of air pollution by more than 50 percent if it is implemented at full scale. It will also reduce the monthly cost of the households by more than R20 per month (currently average monthly spending on coal is R75 and BM will reduce this cost to R55 per month), which will be saved when purchasing coal and this will contribute to poverty reduction for the poor community.

It is not always necessary to provide huge amounts of money to implement and sustain a solution. Adapting BM adapted to could actually reduce the fuel cost of households and also the medical costs (to government) because of lower levels of upper respiratory infections.

Because of the interaction between complex factors, the process of attempting to solve problems by technological means is not predictable and cannot be implemented mechanistically. For instance, the electrification of households did not reduce the use of coal. On the contrary, in some instances it even increased the use of coal. (This unpredictability is probably also true for attempts to solve problems by economic or political or any other means).

BM will reduce the level of air pollution by more than 50 percent if it is implemented at full scale. It will also reduce the monthly cost of the households by more than R20 per month (currently average monthly spending on coal is R75 and BM will reduce this cost to R55 per month), which will be saved when purchasing coal and this will contribute to poverty reduction for the poor community. If the population of Leitrim is compensated for the negative externalities (i.e. the cost that the community incurs for cleaning air, dust free environment, cleaning waste material) the poverty rate will be reduced from 74.4 percent to 69.5 percent, this means that the poverty rate will fall by 4.5 percent.

6.4 Recommendations

It is recommended that the development of a dumping site at a convenient point for all residents - and that is linked to the recycling initiatives - should be considered.

It is recommended that a culture of small urban agriculture should be inculcated in residents. This will ensure that as many yards as possible in the area are used for vegetable growing. This will assist residents with food harvested from their own backyards.

The municipality should intervene by cleaning the environment (remove garbage and this will reduce the social cost of littering that this poor community is incurring) and they also should encourage the community members to recycle most of the waste material (recycling projects such as collect-till paper recycling and many more). The recycling projects will also generate income

for the households that are involved in the recycling projects and this will also reduce the poverty levels in the area.

A large part of the population feel that the street committee should be give more power to control the manner in which loud music should be played.

The community feels that if the local authority operates jointly with the street committee the level on noise in the townships will be reduced significantly, and laws such as the one that prohibits the community to play loud music after 22h00 will be maintained.

BM has been identified in this study as the most appropriate technology that can be used by poor community in order to reduce air pollution.

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ANNEXURE A

SURVEY DESIGN APPLICATION

One questionnaire was employed in soliciting data from both households of Rathanda and Leitrim. The household questionnaire was carefully constructed to utilize specific indicators. It was compiled from a number of other questionnaires used in the field such as by Slabbert (2003).

Maps of both Rathanda and Leitrim were obtained from the respective municipalities. These maps were used to stratify the areas and to allocate questionnaires evenly throughout. Households' questionnaires were completed on site. Details with regard to the site were listed, but no names were recorded with regard to head of the household or other persons living at site. This was done ensure anonymity, thereby encouraging honest and reliable information.

Two researchers interviewed a total of 242 households. All the households approached were willing to take part in the survey and 242 questionnaires were completed in August 2004.

ANNEXURE B

HOUSEHOLD QUESTIONNAIRE JUNE 2004

Township	Section: Old / RDP / shack	Date:	Questionnaire no:
Street:	House number:	Interviewer:	

N.B.: The information in this questionnaire will be treated in strict confidence. (9 June 2004)

Please note that the Head of the Household should preferably answer this questionnaire.

A: BACKGROUND INFORMATION

What is the position of the respondent in the Household? Cross ✕

Head of household	Spouse or child	Extended family member	Boarder
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How many housing units are on the site?

How many people stay permanently on the site?

How long have you (respondent) stayed in the Vaal Triangle (years)?

B: ENVIRONMENTAL

How do you feel about the environment in which you stay? (Mark 2 options) ✕

1. It is clean and pleasant	2. It is littered, untidy and dirty	3. Indifferent – No opinion	4. Something should be done to clean it	5. It can be left as it is
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If you feel it should be cleaned up, who should take the initiative and responsibility? (✕ More)

1. The municipality	2. A street committee	3. Everyone should be made responsible	4. A campaign should be organised	5. Other: explain
---------------------	-----------------------	--	-----------------------------------	-------------------

If you would have the money, what would you be prepared to pay monthly to have your environment cleaned up?

How do you experience, especially in winter, the smoke levels (air pollution) in your area? *

1. Not affected	2. Slightly affected	3. Affected	4. Badly affected	5. Unbearable (Severely Affected)
-----------------	----------------------	-------------	-------------------	-----------------------------------

If you are making fire for cooking & heating purposes, would you like to be introduced to technologies that will reduce the smoke levels at your house? *

1. Not making fire: using electricity for cooking & heating	2. Making coal / wood fire: but not interested	3. Making coal / wood fire: And interested	4. Using paraffin: Not interested	5. Using paraffin: Interested
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What would you be prepared to pay monthly to have your environment smoke-free?

a) What % of the smoke pollution do you think comes from industry? and coal fires?

b) Number of persons in your household whose health is affected by air pollution?

c) What are most of them suffering from?

How do you experience, especially in winter, the dust levels in your area? *

1. Not affected	2. Slightly affected	3. Affected	4. Badly affected	5. Unbearable (Severely Affected)
-----------------	----------------------	-------------	-------------------	-----------------------------------

What would you be prepared to pay monthly to have your environment dust free?

Especially in the spring & summer some people are using amplifiers to make loud music. How are you affected by this in your area? *

1. Not affected (quiet in the area).	2. I hear it but I don't care (accepting it)	3. I hear it and it is affecting me (don't like it)	4. I hear it and I am badly affected	5. I hear it and it is unbearable (severely affected)
--------------------------------------	--	---	--------------------------------------	---

If you feel that something should be done in your area to reduce the noise levels, who should be responsible and what should be done? (Mark * more than one option)

1. The municipality should control & restrict people to play loud music.	2. The police should control & restrict people to play loud music.	3. A street committee should control & restrict people to play loud music.	4. People who disturb the neighbourhood with noise should be fined / punished	5. The instruments of those who disturb the neighbourhood should be confiscated
--	--	--	---	---

If you would have the money, what would you be prepared to pay monthly to have your environment quiet?

Has any person in your household been a victim of crime in the last 12 months?

What kind of crime? (Can mark * more than one option)

1. Assault	2. Robbery	3. Rape	4. Murder	5. Abduction	6. Other
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C: CONSUMPTION

How much of the following items does your household buy per week/per month & about how much does your household spend on these items per week/per month?

Product	Kilograms / litres per week	Kilograms / litres per month	Rand per week	Rand per month	Town ✓	Town-ship✓
1. Maize Meal						
2. Bread						
3. Meat / chicken						
4. Vegetables						
5. Milk						
6. Washing powder						
7. Coal						
8. Paraffin						

How does your household spend their income monthly?

Item	Rand per month	Name of shop	Town	T/ship	
Housing (Rent/Bond)					1
Water					2
Electricity					3
Other energy (coal, paraffin etc)					4
Food					5
Cleaning materials					6
Cigarettes & Tobacco					7
Beer, wine & spirits					8
Transport: Taxi..... Car..... Other.....		Total			9
Clothing					10
School					11
Entertainment					12
Medical Expenses					13
Insurance					14
GAMBLING:					15
Lotto.....					16
Horseracing.....					17
Other (casino etc)..					
Savings					18
Licenses (e.g. TV, Vehicle)					19
Rates and taxes					20
Housekeeping Services (e.g. Garden)					21
Telephone.....					22
Cell.....					23
Car Repayment					24
Loan repayments					25
Furniture					26
Other: Specify					27

D: EMPLOYMENT & EDUCATION STATUS

How does your household spend their income monthly?

Number of people in the household	1	2	3	4	5	6	7	8
Composition of members (Code list 2)								
Age of each member in years								
Sex (Male = 1; female = 2)								
Marital Status (code list 5)								
Qualifications (still at school) (Code list 6)								
Qualifications (not at school) (Code list 7)								
Employment Status (Code list 8)								
Sector of employment (Code list 9)								
Has your salary increased as a result of minimum wages? (10)								
Can employer afford increases because of minimum wages?								
Working hours been reduced because of minimum wages?								
(10 - 17 for <u>unemployed</u> only) Skills of the unemployed								
Duration of unemployment in years								
Dismissed because employer could not afford minimum wage								
Willingness & type of Skills Training required (code list 13)								
What is the Unemployed doing presently								
Do you have matric exemption?								
If persons would like to study further: preferences								
Preferences to start self-sustaining activities								
Minimum wage required to take a job								
Income: Wages/salaries per month (Take home pay)								

Pension/Remittance								
Child Grant from Government								
Other Grants from Government								
Help (family/relatives/etc) Also help in kind								
Informal activities (e.g. SMME)								
Subsidies (e.g. Housing)								
Interest/dividends								
Other (Specify)								

Does someone in your household have a vegetable garden?

Yes	No
-----	----

Would someone in your household be interested in receiving assistance to start a food garden in your yard?

Yes	No
-----	----

Would someone in your household like to be involved in a community food garden project?

Would someone in your household be interested in farming?

Yes	No
-----	----

Do you know small farmers in the area? If so, give the address:

Yes	No
-----	----

Yes	No
-----	----

Does someone in your household own a sewing machine?

Do you know a clothing manufacturing business in your township?

Yes	No
-----	----

If so, give the address:

Do you know any small scale welding / metal work firm in the township?

Yes	No
-----	----

If so, give the address: _____

Has any member of your household operated a SMME / still operating one? If so, what kind of SMME? _____

Yes	No
-----	----

Taking into account your skills (or that of your household members), would you or someone in your household (unemployed persons) be interested in starting your own business or rather work together with others in a cooperative?

What kind of business would you like to start?

Own business

Cooperative

If you would like to start your own business, what kind of support do you think you will need?

Do you know somebody with a catering business in your township? If so, give the address:

Yes

No

Do you think you will get a job if you are better trained?

Yes

No

THANK YOU FOR YOUR COOPERATION!

Source: Adapted from questionnaires of Slabbert, T.J.C.

ANNEXURE C

METHODOLOGY FOR MEASURING OF UNEMPLOYMENT

Different methods are used to measure unemployment. The following are more or less standards method:

Census methods

This method is used for measuring the economic status of the entire population. It takes place periodically and when it does, only a limited number of questions pertaining to employment can be included. This method was not used in this study for that reason.

Registration method

This method provides for the unemployed to register at the Department of Manpower. Because of the fact that the figure published by the Department of Labour in South Africa do not reflects the level of unemployment accurately, particularly for Blacks, this method was also not employed for this study.

Sample survey

Surveys are undertaken on a sample basis to obtain the data required for calculating unemployment rate for the specific groups of people. This method was used for this study to determine the unemployment rate in both Leitrim and Rathanda.

Definition of unemployment

Statistics South Africa (Statistics South Africa) used the following definition of unemployment as its official definition:

The unemployed are those people within the economically active population who:

- a) did not work during the seven days prior to the interview;
- b) want to work and are available to start within a week of the interview; and
- c) have taken active steps to look for work or to start some form of self employment in four weeks prior to the interview.

These general criteria are translated into statically meaning criteria, namely:

- the population of potential work age (i.e. 15 years and older);
- the economically non-active (i.e. those who prefer not to or who cannot work for instance housewives, person 65 years and older, the disabled, etc);
- the economically active population (all those who are fit to work, wish to work, have no employment and are ready for and actively looking for work, plus the employed and self-employed).

The unemployment rate (U_r) then, is calculated according to the standard equation:

$$\frac{\text{Number of unemployed}}{\text{Economically Active Population (EAP)}} \times \frac{100}{1} = U_r$$

In developed countries, the definition is relatively simple to apply. The criteria for measuring unemployment are straight and defined, i.e. an person is out of work, and is actively looking for a job by means of a listing at a placement or other government office. However, in developing countries circumstances are very different, and it is not always clear whether or not a person is seeking employment. In South Africa some unemployed persons become discouraged and therefore refrain from taking active steps to seek employment.

In the survey for this section, only one criterion was used as an indication of seeking work, namely if a person “has the desire to work and to take up employment or self-employment”. The question asked was simply: “Do you want to work/” when the standard Statistics South Africa definition is used, but its strict criteria are relaxed as was done in this survey it is referred to as expanded definition of unemployment. The expanded definition includes (a) and (b) but not (c) (Statistics South Africa, 2000:xv).

Statistics South Africa’s definition for employment which define ‘employed; as those performed work for pay, profit of family gain in the seven days prior to the household survey interview, or who were absent from work during these seven days, but had some form of paid work to which they can return (Statistics South Africa, 2000) was also simplified. The question was simply asked: “do you work for a business, for yourself or for your family?” Working for a business was regarded as formal employment. Self-employment and family employment were taken as working in the informal sector.

Source: Slabbert and Slabbert. 2002:17.

ANNEXURE D

METHODOLOGY FOR THE MEASURING OF POVERTY

Following the guidelines of the World Bank, a poor household is defined as household of which the combined income of all members is less than the HSL as determined for the specific household. If the combined income for a household is described by y_i and the poverty line (HSL) of the same household is described by z_i , the extent of poverty, P_i , of this household is described by $P_i(y_i; z_i)$.

The headcount index is defined as the fraction of the population below the poverty line. In this study, the headcount index is adapted to indicate the fraction of household that fall below their individual poverty lines, and is described by means of the equation:

$$H(y; z) = M/N$$

Where: H = the fraction of households below the poverty line;

y = household income;

z = the poverty line of households;

M = the number of households with income less than z ;

N = the total number of households.

The poverty gap usually measure the average shortfall of the income of the poor from the poverty line while the poverty gap index measure the extent of the shortfall of incomes below the poverty line. In this report the poverty gap index is adapted to be a measure of a specific household, described by equation:

$$R_i(y; z) = (z_i - y_i)/z_i$$

Where: R_i = the shortfall that a household expressed as a proportion of the household's poverty line;

y = the income of a specific household; and

z_i = the poverty line of a specific household.

The poverty gap of an individual household (in monetary terms) can therefore be expressed by the equation:

$$G_i(y, z) = z_i - y_i$$

Where: G_i = the income shortfall of a household;

y_i = the income of the specific household; and

z_i = the poverty line of a specific household.

From the equations above, it is clear that, the poverty gap can only be reduced by an increase in the household income (Slabbert, 1997:47).