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CAPRICORN DISTRICT MUNICIPALITY

INTEGRATED WASTE MANAGEMENT PLAN

AGANANG LOCAL MUNICIPALITY
STATUS QUO REPORT
Volume 1

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CAPRICORN DISTRICT MUNICIPALITY

INTEGRATED WASTE MANAGEMENT PLAN
AGANANG LOCAL MUNICIPALITY – STATUS QUO REPORT

PROJECT NAME	:	Capricorn District Municipality Integrated Waste Management Plan
REPORT TITLE	:	Aganang Local Municipality Status Quo Report
AUTHOR	:	Zwingli Visser
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CAPRICORN DISTRICT MUNICIPALITY

INTEGRATED WASTE MANAGEMENT PLAN
AGANANG LOCAL MUNICIPALITY – STATUS QUO REPORT

ABBREVIATIONS AND ACRONYMS

l/c/d	:	litre per capita per day
AIDS	:	Acquired Immuno-Deficiency Syndrome
ALM	:	Aganang Local Municipality
ANC	:	Antenatal Clinic
ANCs	:	Antenatal Clinic Survey
ASSA	:	Actuarial Society of South Africa
BID	:	Background Information Document
BLM	:	Blouberg Local Municipality
BVi	:	BVi Consulting Engineers (Pty) Ltd
CADRE	:	Centre for AIDS Development Research and Evaluation
CBO	:	Community Based Organisation
CDM	:	Capricorn District Municipality
CEA	:	Cumulative Environmental Assessment
CEIA	:	Cumulative Environmental Impact Assessment
CEIMP	:	Consolidated Environmental Implementation and Management Plan
CoM	:	Chamber of Mines
DBSA	:	Development Bank of Southern Africa
DE	:	Department of Education
DEAT	:	Department of Environmental Affairs and Tourism
DFEATE	:	Department of Finance, Economic Affairs, Tourism and Environment Limpopo Province
DLA	:	Department of Land Affairs
DME	:	Department of Minerals and Energy
DoA	:	Department of Agriculture
DoH	:	Department of Health (National)
DoHous	:	Department of Housing
DoHW	:	Department of Health and Welfare (Provincial)
DoLG	:	Department of Local Government
DoT	:	Department of Transport
DPW	:	Department of Public Works
DSE	:	German Foundation for International Development
DTI	:	Department of Trade and Industry
DWAF	:	Department of Water Affairs and Forestry
ECA	:	Environmental Conservation Act (Act No. 73 of 1989)
EIA	:	Environmental Impact Assessment

EIAR	:	Environmental Impact Assessment Regulations
EMP	:	Environmental Management Plan
EPA	:	Environmental Protection Agency (USA)
H	:	Hazardous Waste or Landfill for Hazardous Waste
H:h	:	Hazardous Waste Landfill that can receive domestic waste as well as hazardous waste with a hazard rating of 3 and 4
H:H	:	Hazardous Waste Landfill that can receive hazardous wastes with a hazard rating of 1 and 2
ha	:	Hectare
HIV	:	Human Immuno-deficiency Virus
HRD	:	Human Resources Development
HSRC	:	Human Sciences Research Council
IAP	:	Interested and Affected Party
ICDP	:	Integrated Compensation and Development Plan
IDP	:	Integrated Development Plan
IEM	:	Integrated Environmental Management
IFR	:	Instream Flow Requirement
IMR	:	Infant Mortality Rate
IWMP	:	Integrated waste management plan
km^2	:	Square kilometres
LNLM	:	Lepelle-Nkumpi Local Municipality
m	:	Metre
m^3	:	Cubic metres
m^3/a	:	Cubic metres per annum
MAP	:	Mean Annual Precipitation
MAR	:	Mean Annual Runoff
masl	:	Metres above sea level
mg	:	Milligrams
MIIU	:	Municipal Infrastructure Investment Unit
MLM	:	Molemole Local Municipality
MRC	:	Medical Research Council
MRD	:	Maximum Rate of Disposal
MSA	:	Municipal Systems Act (Act No. 32 of 2000)
NAP	:	National Agriculture Policy (1995)
NDS	:	National Development Strategy
NEMA	:	National Environmental Management Act (Act No. 107 of 1998)
NGO	:	Non Governmental Organization
NWA	:	National Water Act (Act No. 36 of 1998)
NWMS	:	National Waste Management Strategy
O & M	:	Operations and Maintenance
OHSACT	:	Occupational Health and Safety ACt
PIP	:	Public Involvement Programme
PLM	:	Polokwane Local Municipality
PMC	:	Project Management Committee

PP	:	Public Participation
PPP	:	Public Participation Process
REA	:	Regional Environmental Assessment
RQO	:	Resource Quality Objectives
RSA	:	Republic of South Africa
SABS	:	South African Bureau of Standards
SADC	:	Southern African Development Community
SAHRA	:	The National Heritage Resources Act, 1999 (Act No. 25 of 1999)
SAM	:	Strategic Adaptive Management
sat	:	Saturation
SDI	:	Spatial Development Initiative
SEA	:	Strategic Environmental Assessment
SMMEs	:	Small, medium and micro enterprises
SOE	:	State of Environment
STI	:	Sexually Transmitted Infections
ToR	:	Terms of Reference
U5MR	:	Under-5 mortality rate
WMP	:	Waste Management Plan
WTW	:	Water Treatment Works
WUA	:	Water User Association

CAPRICORN DISTRICT MUNICIPALITY

INTEGRATED WASTE MANAGEMENT PLAN
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DEFINITIONS

Note: Where applicable the definition of terms is based on those given as by the Capricorn District Municipality in the Terms of Reference (ToR) for this appointment (Ref. 8).

Aquifer	Is a water bearing formation capable of supplying sufficient yield for a community based potable water source.
Build-Operate-Transfer (BOT)	A form of concession, with an emphasis on construction of new, stand-alone systems. The Municipality may or may not receive a fee or share of profits. Typical duration: 15+ years.
Cell	Is a volume of waste generally placed during one working day and covered on all horizontal surfaces by cover fill.
Communal landfill	Is the smallest landfill classification with a capacity of less than 25 tonnes per day.
Concession	A private firm handles operations and maintenance and finances investments (fixed assets) in addition to working capital. Assets can be owned by the firm for the Municipality for the period of the concession and where owned by the firm are transferred back to the Municipality at the end of this period. The project is designed to generate sufficient revenues to cover the private firm's investment and operating costs, plus an acceptable rate of return. The Municipality exercises a regulatory and oversight role and receives a concession fee for this arrangement, which typically focuses on operating and financing the expansion of existing system components. Typical duration: 15+ years.
Confidence interval	"The term "95% confidence interval (CI)" is often used in HIV prevalence and behavioural surveys. Confidence intervals show how precise an estimate is. For example, the HIV prevalence of 15-19 year olds might be estimated to be 13% - but we need to know how precise that estimate is.

	What the 95% CI shows is the level of confidence that is influenced by the number of observations of HIV infection – so for example, the sample size might have been too small to make a very accurate estimate, and what is then given is the likely range of the estimate. In the case of the example, the researchers would say that they believe that the rate is 13%, but because of the limitations of their sample, this might range from 10% to 16%, with a 95% likelihood that it is 13. Narrower CI ranges indicate a higher level of sampling efficiency – so a CI range of 12%-14% is better than a range of 10%-16%, in the case of our example." (Ref. 26)
Confirmation of site feasibility	Is the initial step in the DWAF permitting process, which establishes the basic site features and general feasibility for a fully permitted landfill.
Controlled landfill	Is a solid waste management facility used for the disposal of non-hazardous domestic waste and non-infectious medical waste, which employs compaction of wastes, covering of waste with soil cover material, and the management of leachate and gaseous materials produced by the organic decomposition of the landfilled waste, all in such a manner as not to harm human health and minimize negative impacts to the environment.
Corporatisation	A Municipality forms a separate legal corporate entity to manage municipal service provision. The Municipality continues to own the enterprise; but it operates with more freedom and flexibility generally associated with a private sector business. A "Section 21 Company" is one of a variety of possible forms of corporatisation.
Corrosive	Substances that can eat away at metals or living things (Ref. 21).
Daily cover	Is a daily application and compaction of approximately 15 centimetres of soil intended to control blowing litter, odours, flies, rats and fires, intended for an exposure of less than one week.
Design drawings	Are drawings prepared by the landfill designer and include dimensions, specifications and other technical data regarding the construction of the landfill.

Disposal site	A site used for the accumulation of waste with the purpose of disposing or treatment of waste (Ref. 20).
Dispose of	Get rid of something in an acceptable way (Ref. 21).
Domestic solid waste (General Waste)	Is solid waste generated by single or multifamily residential dwellings, and solid waste of a non-hazardous nature, generated by wholesale, retail, institutional or service establishments such as office buildings, stores, markets, restaurants, theatres, hotels, warehouses, industrial operations and manufacturing processes.
Environment	Where we live. This includes our social environment and the natural world around us (Ref. 21).
Environmental Impact Study (EIS)	An investigation to find out what damage to the environment might occur through any development e.g. a landfill site (Ref. 21).
External service delivery mechanism	Meaning given in the Municipal Systems Act, Chapter 8, paragraph 76(b).
Final cover	Is an application and compaction of soil on the landfill after it has reached its designed elevation. The final cover soil shall be relatively impermeable and have a thickness of approximately 50 centimetres.
General waste	Waste that is not dangerous unless it is badly managed (Ref. 21). All urban waste that is produced within the jurisdiction of local authorities. It comprises rubble, garden, domestic, commercial and general industrial waste. It may also contain small quantities of hazardous substances dispersed within it such as batteries, insecticides and weed-killers discarded on domestic and commercial premises. General waste may be disposed of in a permitted landfill and may be equated to what is commonly referred to as domestic solid waste (DSW) and municipal solid waste (MSW) i.e. that which is normally managed by a local authority. (Ref. 20)
Generator	Any person or industry that produces waste. The generator is responsible for his / her waste and for any damage that it may cause (Ref. 21).

Groundwater	Is all the water flowing or existing under the ground surface.
Hazardous waste	Waste that is dangerous, poisonous, infectious, explosive, corrosive or flammable (Ref. 21). Waste which, even in low concentrations, has the potential to have a significant adverse effect on or cause danger to public health and/or the environment, whether alone or in combination with other wastes. This would be on account of its inherent chemical and physical characteristics such as chemical reactivity, toxic, explosive, ignitable, corrosive, carcinogenic or other properties (Ref. 20). Hazardous waste is categorized in four hazard ratings with 1 being the most hazardous and 4 being the least hazardous.
HIV incidence	"Is the number of new infections occurring over a given time period among previously uninfected people. This is usually expressed as a number of a particular population – for example, it is estimated that there are 600 new infections occurring per day. Measuring new infections is a complex process and is usually estimated rather than being measured directly. Estimates are usually derived from antenatal prevalence surveys, by estimating incidence using prevalence rates amongst young people (e.g. 15-19 year olds) as it is more likely that any infections in this group will have occurred quite recently. Although there are limitations to this approach, changes in HIV prevalence amongst younger age groups may reflect important new trends in the epidemic (Ref. 34)". (Ref. 25, Ref. 26)
HIV prevalence	"Is the estimated percentage of the adult population living with HIV at a specific time (Ref. 34). Prevalence is always expressed as a percentage. It describes the HIV trends in terms of time, place (province) and age. National level prevalence surveys are usually conducted using pregnant women attending antenatal clinics as the sample population (Ref. 12). However, they can be conducted amongst a sample of the general population (for example, as was done in the

	Nelson Mandela/HSRC Survey), but also in workplaces, in specific communities, or amongst particular populations (for example sex workers, or truck drivers).” (Ref. 26)
Hydrogeological investigation	A study that uses boreholes to find out about the rocks, soils and groundwater underneath and around a proposed landfill site (Ref. 21).
Incineration	Is the controlled combustion of solid waste employing closed combustion chambers, controlled combustion air, temperature monitoring and control to insure complete combustion of organic matter with a minimum of undesirable air emissions and wastewater discharges.
Intermediate cover	Is an application and compaction of cover having the same functions as daily cover but applied at a thickness of 30 centimetres, intended to be exposed for a period of one week to one year.
Internal service delivery mechanism	Meaning given in the Municipal Systems Act, Chapter 8, paragraph 76(a).
Landfill (Sanitary landfill)	A waste disposal site where waste is compacted and covered. Unlike a dump, a landfill is properly designed so that pollution will not occur (Ref. 21).
Landfill classification	Is a system under DWAF Minimum Requirements for classifying landfill according to the type and size (TPD) of the landfill, and its potential for significant leachate generation.
Landfill gas	Is the gaseous by-product of organic decomposition of landfilled waste. Landfill gas contains significant concentrations of methane gas, which is explosive at concentrations exceeding 5 percent.
Leachate	Is the liquid by-product of organic decomposition of landfilled waste or any liquid, which comes in contact with solid waste in a sanitary landfill. Water that gets polluted when it seeps through waste (Ref. 21).
Lease contract	A private firm rents facilities from a Municipality and assumes responsibility for operation and maintenance. The lessee finances working capital and replacement of capital components with limited economic life, but not fixed assets, which remain the responsibility of the Municipality. Typical duration 10 years.

Lift	Is a series of one or more landfill cells forming a section of landfilled waste that extends horizontally across the landfill.
Liners	Layers of plastic or clay placed beneath a landfill to catch leachate that is formed (Ref. 21).
Local authorities	the sphere of government including local councils, metropoles and transitional authorities responsible for local government (Ref. 20)
Management contract	A municipality pays a fee to a private firm to assume overall responsibility for operation and maintenance of a service delivery system, with the freedom to make day-to-day management decisions. Typical duration: 5 years.
Manifest system	A system of documents requiring signatures, that ensures that a hazardous waste is controlled from when it is generated to when it is disposed of (Ref. 21).
Medical waste	Is any waste generated by hospitals, clinics, nursing homes, doctor's offices, medical laboratories, research facilities and veterinarians, which is infectious or potentially infectious.
Mortality rate	Mortality rates are the measure of number of deaths per number of persons in a given area and time. (Ref. 25)
Municipal debt issuance	The Municipality issues bonds to raise capital directly from private investors to finance the capital costs of building or expanding an infrastructure system. The Municipality maintains total control of the project, and bears all associated risks. The issuance process is usually facilitated by underwriting firms (usually public or private banks) and may also involve financial advisory service providers. Typical maturity of debt: 10-20 years.
Municipal Systems Act	Means local Government Municipal Systems Act 2000, (Act No. 32 of 2000).
Operating plan	Consists of drawings, descriptions and other documents regarding the operation of the landfill, placement of waste, building daily cells and lifts, leachate management, landfill gas management and all other functions related to the operation of the landfill.
Operator	Is the person or organization responsible for the operation of the landfill. The operator may be the owner, another public agency or private contractor.

Owner	Is the person or organization that owns the property and/or facilities that constitute the landfill.
Perimeter drains	Are open ditches surrounding the landfill installed to prevent surface water from entering the landfill.
Public-public partnership	A municipality enters into an agreement with another public entity for municipal service provision.
Raw material	Natural substances that are used to make something (Ref. 21).
Recycling	Is the sorting, processing, and transportation of solid waste materials, products or containers for the purpose of remanufacture or reuse.
Rehabilitation	Shaping and covering a landfill to make it environmentally acceptable (Ref. 21).
Scavenging	Is the unauthorised separation of solid waste for recyclable materials and food for human consumption.
Sector	A group of activities or industries producing like products, using like processes and producing like wastes (Ref. 20)
Service authority	Means the power of a municipality to regulate the provision of a municipal service Act, Chapter 3, paragraph 11(2).
Service contract:	A Municipality pays a fee to a private firm to provide specific operational services such as meter reading, billing and collection, or operating facilities. Typical duration: 1 to 3 years.
Service delivery agreement	Means an agreement between a municipality and an institution or person mentioned in Section 76(b) of the Municipal Systems Act, in terms of which a municipal service is provided by that institution or person either for its own account or on behalf of the municipality.
Service provider	Means a person or institution thereof which provides a municipal service.
Solid waste management facility	Is any facility used for the transportation, processing or disposal of solid waste, and includes transfer stations, recycling facilities, composting facilities, waste incinerators, and sanitary landfills.
Solid waste	Waste of a solid nature generated by a person, business or industry.
Sorting	Is the authorized separation of solid waste materials for the purpose of recycling or disposal, either at the source of generation or at a solid waste management facility.

Special waste	Is a non-hazardous waste, which due to its nature requires special or separate handling at a sanitary landfill. Special wastes include but are not limited to tires, asbestos, demolition waste, industrial sludges of a non-hazardous nature, paper mill sludge, olive oil waste, abattoir wastes and petroleum waste oil.
Surface water	Is all waters in or coming from a water source, which is found on the surface of the ground, excluding water under the surface of the ground and seawater.
Toxic	A substance that is harmful or poisonous to plant, animals or humans (Ref. 21).
Transfer station	Is a facility that receives solid waste from collection vehicles and reloads that waste into larger vehicles for transfer to a disposal or processing facility.
Vectors	Are birds, insects and rodents capable of carrying disease-causing bacteria, viruses or fungi from one host to another.
Waste	The unwanted leftovers of any process (Ref. 21). Any matter, whether gaseous, liquid or solid or any combination thereof, originating from any residential, commercial or industrial or agricultural area identified by the Minister of Environmental Affairs and Tourism as an undesirable or superfluous by-product, emission, residue or remainder of any process or activity. Non-hazardous industrial waste, which is produced inside or outside the jurisdiction of a local authority and which is disposed of on site, is not included within this definition (Ref. 20)
Waste generation level	those areas that generate like volumes of general waste within a region. (Ref. 20)
Water balance	Is a method for determining the potential for significant leachate generation, which includes climatic conditions (rainfall and evaporation) and site condition.
Working area	Is the area of the landfill where waste is unloaded, compacted and covered. It generally includes adequate space for several trucks to unload at the same time, for waste compaction and storage of cover soil.

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PRINCIPLES FOR THE CONTROL OF WASTE

Cradle-to-grave	A policy of controlling waste from its creation (cradle) to its final disposal (grave) (Ref. 21).
Duty of care principle	The individual or organisation that produces the waste (generator) is, under all circumstances, responsible for the waste from cradle-to-grave (Ref. 21).
Integrated Waste Management	An internationally accepted four-step approach used to manage waste (Ref. 21).
Polluter pays principle	The person who causes pollution must pay for its cleanup and for any damages caused (Ref. 21).
Precautionary principle	Unknown waste must be treated as extremely hazardous until it is identified and classified (Ref. 21).

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1 INTRODUCTION

1.1 BACKGROUND

As outlined in the Terms of Reference for this appointment, the MSA requires municipalities to develop and adopt and Integrated Development Plan (IDP). The IDP is to be used as the principal strategic planning instrument for local government, and as such it must outline development priorities, objectives and operational strategies. Sections 77 and 78 of the MSA require municipalities to assess whether the implementation of the IDP can be carried out by existing internal mechanisms. Based on this assessment, the municipalities are required to review the IDP and decide on appropriate mechanisms for service delivery.

By definition, an Integrated Waste Management Plan (IWMP) will outline solid waste management priorities and strategies, which will meet the requirements of the IDP. The IWMP thus provides the basis for the review of mechanisms for solid waste management as required under Section 78 of the MSA.

To fulfil the requirements of Section 78, the CDM proposed that a study be conducted that would review the internal mechanisms currently in place for solid waste management. Capricorn District Municipality (CDM) therefore invited proposals (March 2003) for the provision of consulting services for the investigation of Solid Waste Management, as required by the Municipal Systems Act (MSA) (Act 32 of 2000).

BVi Consulting Engineers (BVi) were appointed by the CDM for the completion of the above mentioned study, and the development of an Integrated Waste Management Plan (IWMP) for each of the four local Municipalities: Aganang, Blouberg, Lepelle-Nkumpi, and Molemole, which fall within the Capricorn District. As part of the commission an IWMP for the entire Capricorn District is also to be developed.

The appointment was received on December 04, 2003 from the Municipal Manager Ms S.T. Malatji. This project is funded by a grant from the Municipal Infrastructure Investment Unit.

1.2 PROJECT STEERING COMMITTEE (PSC)

A Project Steering Committee (PSC) was established for the management of this project. This committee comprises members from the Capricorn District Municipality, the four affected local Municipalities, as well as representatives from various relevant provincial departments. A full list of the members of the PSC is given in Table 1.1 below. PSC meetings are normally held on a monthly basis to discuss progress on the project.

Table 1.1 Project Steering Committee (PSC)

Name	Organisation	Address	Tel.
Mr Percy Mahoda	Capricorn District Municipality (CDM)	41 Biccard Street P.O. Box 4100 Polokwane, 0700	(015) 295-8169
Mr Theo van Rooyen	Capricorn District Municipality (CDM)	41 Biccard Street Polokwane	(015) 295-8169
Mr Marius G. Schutte	Capricorn District Municipality (CDM)	41 Biccard Street Polokwane	
Mr Anton van Wetten	Department of Finance, Economic Affairs, Tourism and Environment (DFEATE) : Environmental Affairs	90 Bok Street Polokwane	(015) 297-4149
Mr Henry Mmako	Department of Health and Welfare (DoHW)	Private Bag 9530 Polokwane	(015) 297-0157
Mr Phineas Tjikane	Polokwane Local Municipality (PLM)	Polokwane	(015) 290-2335
Mr Ofentse Nthutang	Aganang Local Municipality (ALM)	Cornelia	(015) 295-1407
Mr Ernest Mabonyane	Aganang Local Municipality (ALM)	Cornelia	(015) 295-1400
Mr E.M. Masenya	Blouberg Local Municipality (BLM)	Senwabarwana / Bochum	(015) 505-0295
Mr S. Sehlapelo	Lepelle-Nkumpi Local Municipality (LNLM)	P.O. Box 1366 Chuniespoort	(015) 633-5287
Mr William Sepota	Molemole Local Municipality (MLM)	303 Church Street P.O. Box 44 Dendron, 0715	(015) 501-0243/4
Mr L.L. Maraka	Molemole Local Municipality (MLM)	P.O. Box 22 Dendron	(015) 501-0243/4
Mr Zwingli Visser	Bvi Consulting Engineers	15 Rhodesdrift Street Bendor, Polokwane	(015) 296-0852
Mr Guillo Marapyane	Bvi Consulting Engineers	15 Rhodesdrift Street Bendor, Polokwane	(015) 296-0852

1.3 STUDY AREA

The study area comprises the entire area of jurisdiction of the Capricorn District Municipality. The study covers the four local Municipalities: Blouberg, Lepelle-Nkumpi, Aganang, and Molemole. These local municipalities are located in the area surrounding the town of Polokwane. As part of the study detailed investigations have been carried out in each of these municipalities in order to determine the status quo regarding waste management in these areas. A Waste Management Plan will be produced for each of these local municipalities.

The District Master IWMP is to cover the entire Capricorn District, including the local municipality of Polokwane. Detailed investigations are not, however, required in Polokwane, as these have previously been completed under a separate study implemented by Kutu Waste Management Services (Pty) Ltd. Based on the findings of this study, presented in the *Polokwane Waste Assessment Report* (Ref. 22), the Polokwane Local Municipality has already developed a draft IWMP (Ref. 30). The requirements, strategies etc. of this IWMP will be borne in mind and integrated in the development of the Capricorn District IWMP.

1.4 GEOGRAPHIC AREA – AGANANG LOCAL MUNICIPALITY

The area of jurisdiction of the Aganang Local Municipality lies to the North West of Polokwane. The area measures some 1 852 km^2.

The communities comprise mainly rural villages and scattered rural dwellings. The area is divided into eighteen wards. The existing communities are largely concentrated in Wards 9, 13 and 16, in the central part of the municipal area.

The main municipal offices are located next to Ga-Setshaba. The Gilead-Seshego (R567) main road passes through the Aganang area of jurisdiction.

1.5 FOCUS AND OBJECTIVES

The main focus and objectives of this assignment are well defined by the major stages of the environmental planning process, which are all incorporated in the integrated waste management planning process. These stages are (Ref. 11):

- Reviewing the existing baseline situation and legal environment;
- Making projections of future requirements;
- Setting objectives;
- Identifying system components;
- Identifying and evaluating alternative methods/approaches for meeting requirements;

- Developing and implementing an integrated waste management plan;
- Evaluating and reviewing the plan to ensure the respective objectives are being met.

With the exception of the actual implementation of the IWMP, and of the last stage, all of the above processes will be implemented as part of this assignment. The monitoring, evaluation and review process will be built into the Integrated Waste Management Plans, and will be ongoing throughout the implementation of the plan

In addition to the implementation of these processes, specific project goals and objectives have been set, and the strategic goals of the Capricorn District Municipality (CDM) must be met. These are discussed in detail in the following sections.

1.5.1 Project goals and objectives

As defined in the Terms of Reference (ToR) (Ref. 8), the two main outcomes of the study shall be:

- A Phase 1 Feasibility Study
- The Integrated Waste Management Plan

In order to arrive at these outcomes, the scope of work for the project includes, but is not limited to:

- Public participation to obtain inputs from all stakeholders. To date the public participation process (PPP) has included a process of consultation with stakeholders through interviews, questionnaires, and meetings held at Municipal and Ward Council level. Further consultation will include workshops, which will be held with the relevant stakeholders and IAPs.
- Existing waste strategies and practices must be identified and evaluated, and those that are effective should be incorporated in the WMPs.
- Waste quantities and characteristics must be defined. Waste volumes generated in terms of class, sector, and geographic region must be identified and quantified.
- Future waste generation rates must be predicted.
- The status quo regarding aspects such as recycling, waste minimisation and waste treatment and management must be defined.
- Current needs relating to waste management must be identified and prioritised.
- Existing organisational structures must be evaluated, specifically considering whether these structures meet the needs of stakeholders.
- Legislative instruments must be assessed as to their efficacy. This includes the municipal bylaws.

- Economic instruments must also be assessed, and financing options for the implementation of the Plan must be identified.
- Hazardous waste streams must be identified.
- Existing data that is available is to be augmented through the collection of data in the field.
- Risk assessment.
- The development of Waste Management Plans with SWOT ('Strengths, Weaknesses, Opportunities and Threats') Analysis.
- The development of a Master Plan for Integrated Waste Management in the Capricorn District.
- A refuse collection policy, together with tariffs and outlines for applicable by-laws must be developed for the municipality.
- Mechanisms for the control of illegal dumping must be investigated and described.
- Procedures for the closure and rehabilitation of illegal waste disposal sites must be described in detail.
- A landfill site operation and management strategy must be developed for each municipality.
- A landfill site policy, together with tariffs and applicable by-laws must be developed for each municipality.

1.5.2 CDM strategic objectives

Throughout the implementation of the study, and the development of the IWMP, the main strategic goals of the CDM with regard to solid waste management must be considered. These have been defined by the CDM as follows (Ref. 8):
"*..to institute a process of waste management aimed at pollution prevention and minimisation at source, managing the impact of pollution and waste on the receiving environments. Waste management…..must therefore be planned and implemented in a holistic and integrated manner that extends over the entire waste cycle…..*

The main goal is to optimise waste management by maximising efficiency, and minimising associated environmental impacts and financial costs."

1.5.3 Aspects to be considered / included in the study

Various important aspects regarding the project objectives should be noted. These include:

- The IWMPs developed must link to the Capricorn District Integrated Development Plan (IDP) (Ref. 7), as well as to the IDPs of the various local

municipalities (Ref. 3, Ref. 6, Ref. 24, Ref. 36), and the Waste Management Plan already developed by the Polokwane Local Municipality (Ref. 30). As Polokwane is centrally located and the economic hub of the district, it is imperative that the waste management facilities etc. located in Polokwane be considered when developing an IWMP for the entire District. The information available in the above mentioned reports will therefore be used when completing a comprehensive situation analysis and needs assessment for the District Master IWMP. It is believed that both strategically and economically it will be beneficial to the Polokwane Local Municipality to work co-operatively with the entire Capricorn District, facilitating the development of an Integrated Waste Management Plan that will meet the needs of, and be mutually beneficial to, all five Local Municipalities in the District.

- All legislative requirements regarding waste management must be met and integrated into the WMPs and the District IWMP. As noted in the ToR, a strong focus on the environment has resulted in a number of waste-specific new regulations, policy and strategy papers and related legislation, which place an onerous obligation on municipalities.
- The strategic objectives, as defined at a national level for waste management, must be met, as well as those established by the CDM and at a provincial level.
- Aspects such as “marketing” of waste management systems must be incorporated in the Plan.
- Partnerships e.g. public-private partnerships, must be considered as means of implementing and financing the Plan.
- Public information systems and awareness programmes must be built into the Plan.
- Monitoring and review systems must be built into the implementation programme for the Plan.
- The study is to highlight deficiencies with respect to waste management within the Local Municipalities of Aganang, Blouberg, Lepelle-Nkumpi, and Molemole.
- Recommendations are to be made for the improvement of services, or where no services exist, for the establishment of systems for the collection, transportation, treatment and / or disposal of solid waste.
- Solutions should focus on job creation and options and / or examples of successful community projects should be investigated. Plans to ensure the socio-economic development of the district must be included in the action plans.
- The objectives and action plans must cover each component of the waste cycle, viz.

- Waste prevention
- Waste minimization
- Waste collection
- Waste transportation
- Waste treatment
- Waste disposal or discharge

- The WMPs and strategic objectives must be designed to reduce the generation of waste and the environmental impact of waste. The long term outcome must be that uncontrolled and uncoordinated waste management no longer adversely affects the health of the people and the quality of the environmental resources.
- Plans must be developed so that waste management services of an acceptable standard will be delivered to all members of the community.
- Attention must be given to raising public awareness on waste management issues and on promoting and delivering environmental education.

1.5.4 New approach

It is specifically noted in the ToR that a "New Approach" to waste management will be required to solve the unique problems faced by the CDM and Local Municipalities in the District with regard to waste management.

The area of jurisdiction of the CDM is rural and underdeveloped in nature. With respect to waste management, and the provision of other basic services, there are a number of problems that occur in areas in South Africa that are at this level of economic development, particularly after the reforms that were instituted following the attainment of democracy in the country. These problems include:

- There are now many new customers, and a strong demand and need for services.
- New municipalities are faced with inexperience amongst personnel and councillors.
- Municipalities are burdened with severe financial constraints, in conjunction with large financial responsibilities.
- There is a culture of non-payment. High levels of poverty and unemployment exacerbate this.
- Lack of basic education in the communities regarding environmental and waste management issues. This, accompanied with a long-standing lack of services, results in "bad waste practices" within the communities e.g. littering.

As noted in the ToR, in order to solve problems of this nature a new, imaginative and innovative approach is required when developing the WMPs

for the District. It has been noted that this approach should, *inter-alia*, aim to achieve the following:

- Include the development of small, medium and micro enterprises (SMME's).
- Make use of unsophisticated collection vehicles.
- Move disposal sites further away from developed areas.
- Reduce the outlay on collection vehicles.
- Provide cost-effective services.
- Involving private sector capital. This could possibly be achieved through public-private partnerships.
- Develop Municipal Service Partnerships (MSP's).

2 WASTE MANAGEMENT INDICATORS

In order to evaluate and assess the current, or future, situation regarding waste management, it is necessary that a common set of indicators be established and used. Indicators provide a means of assessing the performance of economic, social and environmental aspects, with the advantage of being able to summarize, focus and condense information about complex systems, and highlight trends or phenomenon, which are not immediately detectable through basic data collection (Ref. 4).

As the findings of this assignment will form the basis for assessment of development and progress in the waste management sector in the Capricorn District, it was deemed important that, where possible, data be collected to allow for the establishment of a set of indicators for the sector. In the long term, it is also considered ideal for the indicators used by the CDM to coincide with those used on a national basis. For this reason a general, previously established set of indicators was sought that could be applied to the waste management sector in the CDM.

The need for indicators is further highlighted in the *White Paper on Integrated Pollution and Waste Management (IP&WM)* (DEAT, 2000), which identifies *"the development of effective and efficient information systems, including the development of appropriate pollution indicators to ensure informed decision making, to measure progress in policy implementation and to enable public participation in the governance of integrated pollution and waste management"* as a key issue.

The South African Department of Environmental Affairs and Tourism embarked on a programme in 2001, to develop a core set of environmental indicators for *National State of Environment Reporting* in South Africa. The programme, referred to as the *National Environmental Indicators Programme*, is in partial fulfilment of the South African Government's international and national obligations to report on environmental conditions and trends, and the implementation of sustainable development in the country (Ref. 4).

It was realised that the development of such indicators would require accurate, spatially complete, long-term data to allow reporting on environmental conditions and progress made towards sustainable development goals. An issues based approach was used to identify environmental sectors of concern and develop indicators within this programme. The DPSIR (Driver-Pressure-State-Impact-Response) framework was adopted. Waste management was identified as an issue of concern, in particular, the increase in the amount of general and hazardous waste produced, and the apparent lack of waste reduction activities (Ref. 4).

This section is drawn from the paper by Arendse, L and Godfrey, L on the development of waste management indicators for national state of environment reporting (Ref. 4).

Through stakeholder involvement, the following indicators, which aim to address the goals and objectives of South Africa's *National Waste Management Strategy*, were selected to report on the state of waste management within South Africa:

- General waste produced per income group per year
- General waste produced per capita per year
- Hazardous waste produced per sector per year
- Waste recycling
- Value of waste recycled
- General waste correctly disposed through landfill
- Hazardous waste correctly disposed
- Available landfill lifespan
- Provincial expenditure on waste management
- Provincial waste collection capacity

2.1 INDICATORS (Ref. 4)

The Organisation for Economic Cooperation and Development (OECD) defines an indicator as:
"a parameter, or a value derived from parameters, which provides information about a phenomenon. The indicator has significance that extends beyond the properties directly associated with the parameter value" (OECD, 1994).

Historically the term 'indicator' has progressed from a broad definition to more pertinent definitions as the need for this strategic tool became more apparent. This is reflected in the following definitions for indicators:

- An indicator is defined as a *"statistic or measure which facilitates interpretation to a standard or goal"* (EPA, 1972).
- Indicators measure progress toward goals, milestones and objectives. They provide information on environmental and ecosystem quality or give reliable evidence of trends in quality (EPA, 1996).
- Indicators can present information on status or trends in the state of the environment, can measure pressures or stressors that degrade environmental quality, and can evaluate society's responses aimed at improving environmental conditions (EPA, 1996).
- Indicators are a valuable tool that can be used to measure the progress made in achieving sustainability (Tencer & Peck, 2000).
- Indicators are 'executive summaries' addressed to non-experts who want to get a quick impression of basic trends without the need for further interpretation (Jesinghaus, 2000),

2.2 ISSUES OF CONCERN (Ref. 4)

The generation of waste by society may be viewed as a manifestation of the inefficient use of resources, and the root cause of pollution and the associated environmental degradation. Increased waste generation is an inevitable consequence of development and must be systematically managed in order to conserve resources and protect the environment (DEAT & DWAF, 1999). An expanding economy, increased production of goods together with an expanding population are seen as the main drivers for waste generation.

According to the *IP&WM White Paper*, South Africa is emerging from a period of unsustainable and inequitable development. One outcome of these unsustainable and inequitable development policies is environmental degradation, which has significant economic and social impacts. Part of effecting a transformation to sustainable development is to redefine the way in which pollution and waste is managed in South Africa (DEAT, 2000).

International concern around increasing pollution has escalated over the past 20 years, resulting in the development of many international protocols and conventions around environmental and waste management (e.g. Basel Convention, which addresses trans-boundary movement of hazardous waste). Many reports have also been written and conferences held as a result of concern about global environmental degradation. One of the most important of these conferences was the United Nations Conference on Environment and Development (UNCED), which was held in Rio De Janeiro in 1992. At this conference, 178 countries agreed on Agenda 21 as a blueprint for sustainable development. The *White Paper on IP&WM* is part of the South African Government's efforts to meet the goals of Agenda 21 (DEAT, 2000).

Certain international agreements (e.g. UN Framework Convention on Climate Change, which deals with greenhouse gases, and the Basel Convention) impose specific requirements on South Africa. These requirements are also being addressed as part of the process of formulating South Africa's policy on IP&WM (DEAT, 2000).

The indicators that are proposed here aim to address the goals and objectives of South Africa's *National Waste Management Strategy*, the implementation strategy to the *White Paper on IP&WM* (DEAT and DWAF, 1999). The indicators are grouped according to the main issues surrounding waste management in South Africa. The main issues are grouped under categories of waste generation and waste reduction. The waste reduction category as used here is broad and includes correct disposal and collection and expenditure indicators.

2.2.1 Waste Generation

According to the 1999 *State of the Environment Report for South Africa* (DEAT, 1999), the country generates over 42 million m^3 of solid waste every year. This

is about 0.7 kg per person per day, which is more typical of developed countries than a developing country (by comparison the figure in the UK is 0.73 kg, 0.87 kg in Singapore and 0.3 kg in Nepal). In addition, 5 million m^3 of hazardous waste is generated every year (DEAT, 1999).

South Africa's capacity to treat, store and dispose of high volumes of waste are limited, and it is predicted that five of the nine provinces will have landfill shortages within the next decade (DEAT, 1999). Further cause for concern is the low percentage of hazardous waste that is properly disposed of, i.e. at permitted, environmentally acceptable landfill sites, or treatment facilities. According to the State of Environment Report for South Africa, it was estimated that only 5% of the 5 million m^3 produced every year was disposed of at designated sites (DEAT, 1999).

2.2.2 Waste Reduction

Until recently, the focus in South Africa has been on waste disposal and impact controls or "end of the pipe" treatment. Inadequacies of this focus (DEAT, 2000) include:

- Lack of waste avoidance, minimization and cleaner production technology initiatives;
- Lack of regulatory initiatives to manage waste minimization;
- Few incentives for reducing waste;
- Industries not required to submit plans for waste disposal when applying to establish new enterprises;
- Inadequate resource recovery and a general lack of commitment to recycling – no legislation, policy or waste management culture that promotes resource recovery or makes it financially viable; and
- Lack of a variety of appropriate waste treatment methods.

Some of the consequences of previous waste management policies are continued air and land pollution and the pollution of fresh and marine waters, resulting in the disruption of ecosystem processes, habitat destruction and species loss. The amount of waste produced also places increasing pressure on the country's landfills. Increasing amounts of land set aside for landfills could lead to habitat destruction and species loss. Lack of appropriate waste management strategies and treatment technologies associated with these policies also have a negative effect on human health.

Appropriate measures to reduce and manage the amount of general and hazardous waste produced in South Africa need to be put in place. The approach to integrated pollution and waste management spelled out in the White Paper (DEAT, 2000) requires a shift from control to prevention.

2.3 WASTE MANAGEMENT INDICATORS (Ref. 4)

The following ten indicators have been identified as core indicators for National State of Environment Reporting. Each indicator is discussed in more detail below together with possible reporting examples.

- ***Waste Generation:***
  - General waste produced per income group per year *(state indicator)*.
  - General waste produced per capita per year *(state indicator)*
  - Hazardous waste produced per sector per year *(state indicator)*
- ***Waste Reduction:***
  - Waste recycling *(response indicator)*
  - Value of waste recycled *(response indicator)*
  - General waste correctly disposed through landfill *(state indicator)*
  - Hazardous waste correctly disposed *(state indicator)*
  - Available landfill lifespan *(pressure/state indicator)*
  - Provincial expenditure on waste management *(response indicator)*
  - Provincial waste collection capacity *(response indicator)*

2.3.1 WM01: General waste produced per income group per year

Tonnages of general waste produced throughout South Africa increases annually due to population growth, economic growth and unsustainable lifestyles. Waste that is not disposed of properly has the potential to impact adversely on ecosystem functioning and human health. In South Africa disparities in the volumes of waste generation between higher income groups and lower income groups exist. In general, the higher income groups generate more waste per capita (2.7 m^3 / capita / a) than the lower income groups (0.2 m^3 / capita / a) (DWAF 1997, 1998a).

Indicator WM01, highlights both the spatial and temporal differences in the amount of waste generated per income group. This indicator is identified as a Level 2 indicator (i.e. the indicator is presently feasible, but cannot be provided without additional investment in the data collection process). Although limited data resides with some local metropolitan municipalities, nationally, data is limited.

The aim of indicator WM01 is to monitor and assess:

- Trends in development, i.e. increasing waste generation in low income groups;
- Trends in general waste production;
- The effectiveness of policy and programme implementation, such as waste minimization and recycling initiatives, i.e. reduction in waste generation in high income groups;

- Allow for the medium to long-term planning of landfill sites and treatment facilities.

2.3.2 WM02: General waste produced per capita per year

As discussed in the previous indicator, waste production increases annually due to population growth, economic growth, inadequate services and unsustainable lifestyles. The South African Government has, through its *White Paper on IP&WM*, highlighted the need to minimise the amount of general waste generated. This indicator is identified as a Level 2 indicator (i.e. the indicator is presently feasible, but cannot be provided without additional investment in the data collection process). Although limited data resides with some local metropolitan municipalities, nationally, data is limited.

Indicator WM02 may be used to monitor and assess:

- Trends in general waste production;
- The effectiveness of policy and programme implementation, such as waste minimisation and recycling initiatives;
- Allow for the medium to long-term planning of landfill sites and treatment facilities.

2.3.3 WM03: Hazardous waste produced per sector per year

This indicator describes the annual amount of hazardous waste produced per sector (industry, mining, agriculture). Hazardous waste is defined in the National Waste Management Strategy (NWMS) as *'waste that has potential even in low concentrations, to have a significant adverse effect on the public health or the environment*'.

This indicator is identified as a Level 2 indicator (i.e. the indicator is presently feasible, but cannot be provided without additional investment in the data collection process).

As with indicator WM02, indicator WM03 provides and overview of:

- Trends in hazardous waste production;
- The effectiveness of policy and programme implementation, such as waste minimisation, cleaner production and recycling initiatives;
- Allow for the medium to long-term planning of hazardous waste landfill sites and treatment facilities.

2.3.4 WM04: Waste recycling

The *White Paper on IP&WM* and the *NWMS* promote the concept of waste minimization, reuse and recycling, as an alternative to disposing of waste in landfills. The associated reduction in volumes of waste disposed of to landfill

reduces the pressures on available landfill airspace, the need for new landfills, which may lead to the disruption in ecosystem functioning and habitat and species loss. Recycling is also a means of job creation and generation of income, especially among low-income groups.

This indicator may be reported on as the total annual amount of waste recycled per material type, either at a provincial or national level. The indicator is identified as a Level 2 indicator, however limited recycling data is available, for example, from the Packaging Council of South Africa (PACSA, 2002) annual publication of industry estimates of recycling activities within the packaging and related industries.

The aim of indicator WM04 is to monitor and assess:

- Trends towards sustainability, by increasing recycling;
- The effectiveness of policy and programme implementation, in recycling initiatives.

2.3.5 WM05: Value of waste recycled

Indicator WM05, measures the value of recycled waste in the country. As the value of recycled materials increases it will become more lucrative for individuals to begin recycling their own waste. Individuals who may previously have not recycled waste materials because they did not benefit in any way may show a change in behaviour.

The indicator is identified as a Level 2 indicator. Data on the volumes and types of wastes recycled in each of the provinces needs to be collected, along with the data on local and international prices of recycled waste. The value of recycled waste is calculated by multiplying the volume of waste by the respective price, on an annual basis, in order to determine the value of recycled waste.

$$Value\ of\ recycled\ waste = quantity_{type}\ x\ price_{type}$$

For this indicator, the assumption is made that suitable domestic markets for recycled waste are provided by means of a favourable economic environment, through for example incentives.

2.3.6 WM06: General waste correctly disposed through landfill

The illegal disposal of waste within South Africa results in pollution of the natural environment and places humans at risk through contact with the waste. Indicator WM06 addresses the total annual amount of general waste disposed of at landfill sites. A comparison with waste generation figures allows for an

assessment to be made of illegal waste disposal, waste disposal to non-permitted landfill sites, and the effectiveness of enforcement of legislation.

2.3.7 WM07: Hazardous waste correctly disposed

Hazardous waste that is not disposed of and/or treated properly may pollute land resources, inland water resources and the marine and coastal environment. This may lead to habitat fragmentation and the disruption of ecosystem functioning, which in turn may lead to species loss and the decreased ability of ecosystems to support human livelihoods and commercial activities. Exposure to certain hazardous wastes may also lead to disease in humans and animals. An assessment of waste disposal activities during the 1998 baseline studies indicated that significant volumes of hazardous waste are sent to general waste disposal sites, for final disposal.

Indicator WM07 may be used to monitor and assess:

- The movement of hazardous waste within the country from the point of generation to final disposal/treatment;
- Volumes of hazardous waste disposed of illegally, or to general landfill sites;
- The effectiveness of enforcement of legislation.

2.3.8 WM08: Available landfill lifespan

It is estimated that more than 700 landfill sites exist within South Africa (DWAF, 1997), however only a small percentage of these landfills are environmentally acceptable and comply with the Minimum Requirements as set out by DWAF (DWAF, 1998b). Each year South Africa's population places increasing pressure on existing landfills through the increasing volumes of waste generated. The closure of non-permitted landfills means that waste must be re-routed to permitted landfills for disposal, shortening the lifespan of existing sites. Monitoring landfill lifespan, is critical in assessing whether available landfills can meet medium to long-term demands. Indicator WM08 is a key indicator for planning and permitting of new landfills at local, provincial and national levels. This indicator is used to show the number of years a landfill site is likely to remain in operation at a certain waste disposal rate. The establishment of a new landfill site is estimated to take 5 to 7 years.

This indicator is identified as a Level 2 indicator. Although limited data resides with some local metropolitan municipalities, nationally, data is limited. This indicator can be reported on as landfill lifespan in years, calculated as available airspace/ incoming volume per annum (m^3 / m^3 per annum).

2.3.9 WM09: Provincial expenditure on waste management

Indicator WM09 addresses the total annual budget spent on waste management (including waste collection, litter collection, waste disposal etc.) at local authority level, i.e. the municipal response to waste management. The assumption here is that higher budgets means better waste services. Further value may be added to this indicator by assessing the annual budget spent on waste management per capita. This in effect gives an indication of the level of waste management services within the local authority or province. This indicator is identified as a Level 2 indicator.

2.3.10 WM10: Provincial waste collection capacity

The indicator shows the number and percentage of households with access to weekly curb-side waste collection services. The indicator measures the number of households within local authorities and thereby provinces that have waste collected. This gives an indication of the number of provinces that are actively involved in waste collection and management. This in turn, gives an indication of where potential shortfalls in waste management could be found, assuming a lack of collection capacity results in excessive waste. Indicator WM10 relates closely to Indicator WM09, in that the more money that is available for waste management, the higher the percentage of curb-side waste collection services.

2.4 CONCLUSIONS (Ref. 4)

It is recognised that a number of additional waste management indicators may also be suitable for reporting on the status of waste management. However, it is felt that the ten indicators presented here represent a suitable core set of indicators to report on the state of waste management within the CDM. There is limited data available on waste management in the CDM. It would therefore be better to establish data for a smaller set of indicators, and set up systems that will allow for adequate comprehensive capture of this data, rather than attempting to capture data for a much larger set of indicators and not do so comprehensively.

Considering this, the data collection and reporting aspects of this assignment have been designed to capture data that can be used as a basis for establishing the information systems for utilizing the waste management indicators as discussed above.

3 SCOPE OF CONSULTING SERVICES

3.1 OVERVIEW

The study is envisaged to consist of ten phases, some of which overlap and will run concurrently. The ten phases of the project are:

- Phase I: Inception
- Phase II: Data collection: Field work
- Phase III: Data collation and analysis
- Phase IV: Writing the Status Quo Reports
- Phase V: Gap identification and collection of additional data
- Phase VI: Situation and strategic analysis, needs assessment and prioritisation
- Phase VII: Identify infrastructure development requirements and strategies
- Phase VIII: Costing and financial procurement strategies
- Phase IX: Development of the WMPs for the local municipalities
- Phase X: Development of the Capricorn District Master Plan for Integrated Waste Management

3.2 PHASE I: INCEPTION

3.2.1 Appointment of local representatives

Phase I of the project included the appointment of a local representative from each Local Municipality: Molemole, Aganang, Blouberg and Lepelle-Nkumpi. The local representatives have been, and are, responsible for conducting surveys within the Local Municipalities to identify and quantify waste related facilities, practices and issues. When appointing these representatives, it was believed to be important that these representatives live in the jurisdiction of the Local Municipality in which they were to work, as they would thus be better able to understand the specific local problems etc. that occur.

The process followed by BVi in appointing the four local representatives for each Local Municipality was as follows:

- The four Local Municipalities were contacted by BVi in order to obtain the names of candidates for the positions.
- Each Local Municipality provided BVi with the names of 2/3 possible candidates and interviews were scheduled with the candidates.
- One successful candidate for each Local Municipality was identified and appointed.
- Four local representatives were appointed.

Mr Richard Teffo was appointed to act as the representative within the Aganang Local Municipality (ALM).

3.2.2 Workshop and training of representatives

During January and the beginning of February 2004, a waste survey was designed, and a survey manual was developed for use by the four local representatives. Following the appointment of the representatives the use manual and completion of the survey was workshopped with them. The representatives were also given some basic education regarding waste management.

3.2.3 Desk top study

During January 2004 a desk top study was conducted by BVi to determine what information and data was available on the CDM. It as found that with the exception of information contained in the Integrated Development Plans (IDP's) for each local municipality and the CDM, and the demographic data arising from the 1996 and 2001 censuses, very little information is available about the area of jurisdiction of the CDM. Virtually no information exists regarding aspects such as waste generation rates, waste management practices etc.

Data, at ward level in the Local Municipalities, was obtained from the 1996 and 2001 census. This included data on:

- Population figures
- Household income
- Travel modes
- Dwelling types
- Household size
- Information regarding refuse, etc

Although this data is useful, it must be noted that ward boundaries have been changed since both censuses were conducted, and it is therefore very difficult to compare current ward populations with those determined by these censuses.

3.3 PHASE II: DATA COLLECTION: FIELD WORK

A critical step in compiling an Integrated Waste Management Plan (IWMP) is the collection of reliable data and relevant information about the communities for which the plan is to be developed. This is necessary in order to create a realistic and quantitative basis for the development of the IWMP.

Data has been collected from various different sources, including the nominated waste management official at the Local Municipality, various provincial government departments, Statistics South Africa, the Local Environmental Health Practitioners, as well as directly from the local communities.

3.3.1 Nominated waste management officials

Where available, information obtained from the nominated waste management official at the Local Municipality included information about:

- The structure of the local Municipality's Waste Management Section (positions of the officials, their names, their contact numbers, their HDI status, their years experience, annual budget for the waste management section.)
- Waste management strategies, practices and system.
- Waste prevention and minimisation strategies, practices and systems.
- Names, addresses and contact details of refuse removal entities and an inventory of transport vehicles.
- Population figures.

3.3.2 Surveys

- ***Waste survey 1***

  Extensive surveys were conducted in each village / town that falls within the study area. An initial survey was conducted during March, April and May of 2004. Local community representatives were identified and consulted, and each village was visited by the data collection team. Ward councillors also gave invaluable assistance during this process, as well as during the second survey that was conducted.

  Information collected as part of the initial survey included:

  - *Geographic:* Maps of all the four Local Municipalities were obtained in order to establish what geographical areas fall within the jurisdiction of each Local Municipality.
  - *Stakeholders:* Key community representatives were identified in each village or town.
  - *Environmental:* The local representatives indicated the general location of all rivers, dams, sewage treatment plants, mines, etc. in the vicinity of each village on sketch maps of the given village during their site visits.
  - *Socio-economic:* The population distribution (high income, low income etc.) and socio-economic condition are indicated by obtaining information regarding the residents' perceived ability to afford and pay for a refuse removal service. This information was obtained from the local community representatives.

- ***Waste survey 2***

  After completion of the initial survey, it was found that the information obtained directly from the communities did not meet the needs of the study, nor provide sufficient information for establishing the basis for use of the waste management indicators as previously discussed. A further, second

survey, was therefore designed for additional data collection in order to augment the initial data collection. The second survey was designed to collect detailed and general information about waste management practices, community waste management etc. and information on the waste management indicators selected. General information regarding the following aspects was requested from the villages through the second survey:

- Businesses
- Hawkers
- Composting of waste in villages.
- Street cleaning activities in villages.
- The disposal and possible reuse of builders' rubble.

Detailed information regarding the following aspects was also requested:

- Schools.
- Nursery or pre-schools and crèches.
- Police stations and prisons.
- Communal gardens/ agricultural plots.
- Community based organisations (CBOs) (health, environmental, educational programmes, etc.).
- Non-governmental organisations (NGOs) (health, environmental, educational programmes, etc.).
- Recycling facilities (how many, where, what materials, cost for purchase and product, collection contractors, external collection, staff, etc.).
- Waste treatment facilities (how many, where, what materials, staff, costs, procedures, etc.).
- Landfill sites (how many, positions, capacity, operational methods, machinery and equipment available, operating costs, staff, charges, etc.).
- Medical waste treatment facilities (how many, where, what materials, staff, costs, procedures, etc.).
- Waste collection (equipment, facilities, vehicles, capacity, private contractors, staff, costs, etc.).
- The current and planned development in the area – socio-economic, commercial and agricultural. This has also been gleaned from the ALM, NGO's, agencies, reports and through public participation.

In order to complete the second survey, BVi contacted all the IAPs previously identified.

The second survey was facilitated by the participation of the Ward Councillors, who assisted in collecting data in their communities. Their assistance with this was greatly appreciated by the study team.

To evaluate the social and economic context of the Project Area, it is required that regional data, for factors that have an impact on the present and future demand for waste management services, be gathered. This information was collected during both surveys, and includes:

- demography,
- social development (employment, education, health, law, justice, security, gender equality, social welfare, culture and sports),
- economic development (agriculture, mining, tourism, trade and industry),
- infrastructure development (water supply, power generation and distribution and other transport infrastructure), and
- institutional development as well as nature conservation and environmental issues.

Details of the number of surveys questionnaires distributed in each ward, the number of questionnaires returned and gaps in the information obtained through the surveys are included in ***Appendix F***. In summary, a total of 106 survey questionnaires, for both Survey 1 and Survey 2, were distributed. For the first Survey sixteen questionnaires were not returned, while for Survey 2, four questionnaires fifty six were not completed. There are also minor information gaps in a further 13 of the questionnaires returned. These information gaps are not, however significant, and can be filled in time as required.

3.3.3 Key stakeholder identification

The details of all persons from whom the local representative obtained information for the waste survey have been recorded. This information has been incorporated in the database (spreadsheet based) developed for the capture of the information collected through the surveys. A list of key stakeholders identified in Aganang is included in ***Appendix B***. Key stakeholders identified in the Capricorn District are listed in ***Appendix A***.

3.3.4 Problems experienced

While conducting the field survey, the local representatives experienced some difficulties. These include:

- *Payment:* In some areas visited, people ask to be remunerated for the supply of information.
- *Resignations*: In some of the Local Municipalities the nominated waste management official resigned. There were therefore no persons at the municipality familiar with, or responsible for, local waste management practices and associated issues, with whom the study team could liase.

- *Crime:* A local representative was advised by police not to enter a specific area as it was considered unsafe. This situation was linked to a robbery in the area.
- *Rain:* Continuous rain and resultant poor road conditions restricted access to some villages.

Although these problems have not been of major significance, they are noted here for reference purposes for persons who may conduct similar surveys in the future.

The main factor related to the completion of the surveys that has affected the progress of the project is the long period of time it has taken to gather the data. It is extremely important to note, particularly for the purposes of any future work of this nature that may be conducted, that the collection of data and information in semi-rural to rural communities is a slow lengthy process. This is necessarily so as the purpose of the survey must be explained to each community member with whom the data collection team has dealings. It is also extremely important that while the purpose of the survey is explained to the community members, that false hopes of sudden improvement in conditions are not created in the communities. The relevance of certain types of information may also not be clear to community representatives, and until they understand why said information is required, they may not be willing to be of assistance.

3.4 PHASE III: DATA COLLATION AND ANALYSIS

A database has been developed for the compilation of all data collected, both through the waste surveys and the desktop study. This database is spreadsheet based, developed in Microsoft Excel. Microsoft Excel has been used, as it offers the advantage that many computer users are familiar with spreadsheets, yet data can readily be transferred for use from Excel into the database software Microsoft Access.

The trends in waste management practices, or lack thereof, shown in the surveys have been analysed and assessed. Current waste generation rates, potential income from the collection of levies for waste collection etc. has also been calculated based on the data collected through the surveys.

3.5 PHASE IV: STATUS QUO REPORTS

The Status Quo Report has been written to incorporate all data collected. The findings of the data analyses are also be incorporated in the report.

The first draft of the Status Quo Report will be presented to the Client, as well as to stakeholders / IAPs for comment. It is important that stakeholder comment be

obtained at this time, as it is always possible that the study team may inadvertently have overlooked some crucial information. Stakeholders can identify such gaps, and the necessary information incorporated in the report prior to proceeding with any decision-making processes, which may be based on the findings included in the Status Quo Report.

3.6 PHASE V: GAP IDENTIFICATION AND COLLECTION OF ADDITIONAL DATA

Phase V, gap identification and collection of additional data, will commence during the implementation of Phases III and IV, and will be ongoing through the implementation of Phases VI to VIII.

During Phases III and IV, the data collation and analysis, and the writing and reviewing of the Status Quo Reports, it is inevitable that gaps will be identified in the data collected and analysed. The gaps in the data will be indexed, and the collection of additional data to fill these gaps will be prioritised. As stated above, this process of collecting data to fill important gaps will be ongoing as the study proceeds into Phase VI and beyond.

It is important to note that, as there is currently minimal information available with respect to waste and waste management in the Capricorn District, not all gaps in the data can be filled as part of this study. Data collection must be an ongoing process that will, in itself, form part of the Waste Management Plans.

3.7 PHASE VI: SITUATION AND STRATEGIC ANALYSIS, NEEDS ASSESSMENT AND PRIORITISATION

Following the completion of the Status Quo Reports, and the acceptance of these by the relevant stakeholders as a true representation of the status quo regarding waste, a situation analysis and needs assessment will be conducted.

Based on the findings of the previous phases, the needs of the ALM (and other local municipalities) with regard to waste management will be identified and prioritised. This will link with the strategic goals as outlined in the Aganang IDP. A strategic analysis will also be conducted.

A first draft report outlining the needs identified, prioritisation of needs and strategic goals will be prepared for Client and stakeholder review. Again it is believed that it is essential that stakeholder comment be obtained at this time, as it is necessary that confirmation be obtained that the needs identified and prioritised are, in fact, those of the stakeholders.

3.8 PHASE VII: IDENTIFY INFRASTRUCTURE DEVELOPMENT REQUIREMENTS AND STRATEGIES

Following identification and prioritisation of the needs and strategies of the CDM, the infrastructure, institutional and other development requirements to meet these needs will be identified. Where possible, various options will be considered, to allow for the best solution to be selected.

3.9 PHASE VIII: COSTING AND FINANCIAL PROCUREMENT STRATEGIES

The cost and financial viability of existing waste practices, and of proposed waste collection, transportation, disposal and recycling systems, will be investigated and projected over a period of 10 years.

3.9.1 Cost establishment of proposed waste management systems

As required by the ToR, the projected annual investment and operating costs for collection, transport, treatment and disposal of waste over a period of 5 years will be established. This will include costs for:

- personnel
- transport
- operating
- maintenance
- administration
- environmental impact abatement and penalties
- interest and depreciation

3.9.2 Establishment of charges to be levied

The financing of waste management systems and practices will include:

- Funding mechanism for collection, treatment and disposal, e.g. subsidies from National or Provincial Government, user charges, loans, income from the sale of recoverable / recyclable materials.
- Affordable user charges to tax and / rate payers for collection, treatment and disposal of waste.
- Processes for the determination and adjustment of user charges / tariff setting / fees.
- Identification of major obstacles, e.g. non-payment, with proposals to overcome such obstacles.

3.10 PHASES IX AND X: DEVELOPMENT OF THE WMPS FOR THE LOCAL MUNICIPALITIES AND THE CAPRICORN DISTRICT MASTER PLAN FOR INTEGRATED WASTE MANAGEMENT

Based on the findings of the previous phases, Waste Management Plans will be developed for each of the Local Municipalities viz. the Aganang, Blouberg, Lepelle-

Nkumpi and Molemole Local Municipalities. The Capricorn District Master Plan for Integrated Waste Management will be developed in conjunction with the development of the local plans, amalgamating and integrating them, together with the existing plans for the Polokwane Local Municipality, but at the same time incorporating all necessary regional aspects of waste management. The development of the local and district plans will effectively be concurrent, as the local plans should meet the requirements of the district, and *vice versa*. Strategic objectives will cover short-term (5 years) and long-term (10 year) planning.

The following general strategic objectives will also be considered when compiling an IWMPs:

- Establishment of the organisational structure for management of the different activities.
- Development and launching of an IWM awareness campaign and staff training courses.
- Ongoing data collection to augment the information currently available on waste management in the district. This will include conducting surveys for collecting data and information on identified gaps in information.
- Development of a waste information system (WIS), which meets the requirement, set out in the NWMS and WIS Action Plan.
- Identification of opportunities for more effectively managing waste.
- Vigilance against negative opportunism, e.g. unscrupulous entrepreneurs who may wish exploit opportunities for short-term gain.
- Co-operation with other authorities to bring about an institutional integrated approach to IWM, e.g. investigation and joint implementation of regional treatment and disposal facilities.
- Development of private-public partnership, as well as Municipal Service Partnerships (MSP's), to address complex and difficult IWM problems, e.g. joint hazardous waste treatment and disposal facilities.
- Development of SMME's to implement various aspects of the IWMP.
- Consideration and addressing, where appropriate, requirements of international conventions on waste, e.g. the Basel and Bomako Conventions.

Specific objectives, as identified in the ToR, will be met by the WMPs and the IWMP. These include (as discussed Section 1.5):

- The Master Plan developed will link to the Capricorn District Integrated Development Plan (IDP) (Ref. 7), as well as to the IDPs of the various local municipalities (Ref. 3, Ref. 6, Ref. 24, Ref. 36), and the Waste Management Plan already developed by the Polokwane Local Municipality (Ref. 30).
- All legislative requirements regarding waste management will be met and integrated into the WMPs and the District IWMP.

- Waste quantities and characteristics will be defined, and future generation rates predicted.
- Existing waste strategies and practices will be evaluated and those that are effective will be incorporated in the Plan. Strategies for improving practices that are ineffective will be included in the Plan.
- A refuse collection policy, together with tariffs and outlines for applicable by-laws must be developed for the municipality.
- Mechanisms for the control of illegal dumping will be investigated and described.
- Procedures for the closure and rehabilitation of illegal waste disposal sites will be described in detail.
- A landfill site operation and management strategy will be developed for each municipality.
- A landfill site policy, together with tariffs and applicable by-laws will be developed for each municipality.
- Recommendations will be made for the improvement of services, or where no services exist, for the establishment of systems for the collection, transportation, treatment and / or disposal of solid waste.
- Solutions will focus on job creation and options and / or examples of successful community projects should be investigated. Plans to ensure the socio-economic development of the district must be included in the action plans.
- Plans will be developed so that waste management services that are cost effective and of an acceptable standard can be delivered to all members of the community.
- The strategic objectives, as defined at a national and provincial level for waste management will be met, as well as those established by the ALM and the CDM.
- The objectives and action plans will cover each component of the waste cycle, viz.
  - Waste prevention
  - Waste minimization
  - Waste collection
  - Waste transportation
  - Waste treatment
  - Waste disposal or discharge
- Existing organisational structures will be evaluated, specifically considering whether these structures meet the needs of stakeholders.
- Legislative instruments will be assessed as to their efficacy. This includes the municipal bylaws.
- Economic instruments will be evaluated and plans to improve any shortcomings of said instruments will be incorporated.
- Financing options for the implementation of the Plan will be identified.

- Aspects such as "marketing" of waste management systems will be incorporated in the Plan.
- Partnerships e.g. public-private partnerships, public-CBO partnerships etc. will be considered as means of implementing and financing the Plan.
- Hazardous waste streams will be identified and requirements for dealing with the hazardous waste streams will be outlined. However full detailed planning of hazardous waste management will not be included in this plan. Detailed hazardous waste management should be developed under the Hazardous Waste Management Plan, which is to be developed by the Provincial Environmental Authorities (DFEAT).
- Public information systems and awareness programmes will be built into the Plan.
- Monitoring and review systems will be built into the implementation programme for the Plan.

Throughout the development of the Master Plan, the "Five P's of Effective Waste Management Planning", as given below, will be borne in mind.

The Five P's of Effective Waste Management Plans

The following is based on the recommendations in the US EPA's "Decision Maker's Guide to Solid Waste Management" (US EPA. 1995)

Planning:	Develop and follow Comprehensive Plan based on realistic long-term forecasting.
Price:	Decisions based on sound economic analysis of community and government resources.
Publicity:	Maintain strong public support and commitment through education & communication.
Politics:	Necessary for financing support – need effective communication with political leaders.
Perseverance:	Acknowledge that visible results may only materialize in the long run.

3.11 DELIVERABLES

As required by the ToR, the two outcomes of the study will be:

- A Phase 1 Feasibility Study
- The Integrated Waste Management Plan.

The required output of the study will be presented to the Client and the Local Municipalities in the form of the following reports:

- Aganang Local Municipality: Status Quo Report

- Blouberg Local Municipality: Status Quo Report
- Lepelle-Nkumpi Local Municipality: Status Quo Report
- Molemole Local Municipality: Status Quo Report (this report)
- Capricorn District Municipality: Status Quo Report
- Aganang Local Municipality: Needs Assessment and Strategic Analysis
- Blouberg Local Municipality: Needs Assessment and Strategic Analysis
- Lepelle-Nkumpi Local Municipality: Needs Assessment and Strategic Analysis
- Molemole Local Municipality: Needs Assessment and Strategic Analysis
- Capricorn District Municipality: Needs Assessment and Strategic Analysis
- Capricorn District Municipality: Interim Report on Infrastructure Development Options
- Capricorn District Municipality: Interim Report on Institutional Development Options
- Capricorn District Municipality: Interim Report on Financing Options
- Aganang Local Municipality: Waste Management Plan
- Blouberg Local Municipality: Waste Management Plan
- Lepelle-Nkumpi Local Municipality: Waste Management Plan
- Molemole Local Municipality: Waste Management Plan
- Capricorn District Municipality: Integrated Waste Management Plan (District Master Plan)

4 POLICY, LEGISLATION, GUIDELINES AND STRATEGIES

4.1 GOVERNMENT POLICIES, LEGISLATION AND GUIDELINES

The consultant has identified and reviewed all relevant documents for the Project including study reports, policies, legislations, statistics, etc. A detailed list of government policies, acts and regulations, provincial ordinances, by-laws, provincial and regional plans, reference documents and research papers (including but not limited to) that must be complied with, or may be useful and consulted in order to define relevant aspects that the IWMP must address, is included in Table 4.1 to Table 4.7 on the following pages.

A brief discussion of the waste management principles, as governed by various legislation, policy documents and declarations, which must be adhered to in the WMPs follows. Legislative requirements are not, however discussed in detail here, as this is covered in the Master Status Quo Report for the entire Capricorn District. The Capricorn District Status Quo Report, together with all specific relevant policies, strategies and legislative requirements, will be forwarded to the MLM in both hard copy and electronic format (where available).

On a local level all the Local Municipalities were consulted in order to determine what policies and legislation were available. The only documents regarding policies and / or legislation that are available at Local Municipality level are the Integrated Development Plans for each Local Municipality.

Table 4.1 Government policy documents and white papers

Policy and White Papers	Authority
Government Policy	
Environmental Management Policy	DEAT
A Minerals and Mining Policy for South Africa	DME
White Papers	
Wise Land Use, White Paper on Spatial Planning and Land Use Management, July 2001	Ministry of Agriculture and Land Affairs
White Paper on Integrated Pollution and Waste Management for South Africa, March 2000. A Policy on Pollution Prevention, Waste Minimisation, Impact Management and Remediation.	DEAT

Table 4.2 National acts

Act	Sections	Authority
Environmental Conservation Act (Act 73 of 1989)	19, 20, 21, 22, 24, 26	DEAT
Environment Conservation Amendment Act (Act 98 of 1991)	Whole	DEAT
Environment Conservation Amendment Act (Act 79 of 1992)	8, 9, 13	DEAT
Environment Conservation Second Amendment Act (Act 115 of 1992)		DEAT
Environment Conservation Amendment Act (Act 94 of 1993)	8, 9	DEAT

Table 4.2 National acts (cont.)

Act	Sections	Authority
Environment Conservation Second Amendment Act (Act 189 of 1993)		DEAT
Environment Conservation Amendment Act (Act 52 of 1994)		DEAT
Environment Conservation Second Amendment Act (Act 50 of 2003)		DEAT
Environment Conservation Act Extension Act (Act 100 of 1996)		DEAT
National Environmental Management Act (Act 107 of 1998)		DEAT
National Environmental Management Amendment Act (Act 56 of 2002)		DEAT
National Environmental Management Amendment Act (Act 46.of 2003)		DEAT
National Water Act (Act 36 of 1998)	20, 21	DWAF
National Water Amendment Act (Act 45 of 1999)		DWAF
National Forests Act (Act 84 of 1998)		DWAF
Environmental Laws Rationalisation Act (Act 51 of 1997)		DEAT
Mineral and Petroleum Resources Development Act (Act 28 of 2002)		DME
Mine, Health and Safety Act (Act 29 of 1996)	5, 6, 12, 23, 98	DME
Electricity Act (Act 41 of 1987)	25	DME
Electricity Amendment Act (Act 46 of 1994)		DME
Electricity Amendment Act (Act 60 of 1995)		DME
Nuclear Energy Act (Act 131 of 1993) (partially repealed)		DME
Nuclear Energy Act (Act 46 of 1999)		DME
Atmospheric Pollution prevention Act (Act 45 of 1965)**	24	DoH
Hazardous Substances Act (Act 15 of 1973)	2, 3, 19, 29	DoH
Health Act (Act 63 of 1977)****	20, 27, 30, 31, 33, 34, 36, 38	DoH
Human Tissue Act (Act 65 of 1983) ****	37	DoH
Occupational Health and Safety Act (Act 85 of 1993)		DoH
Development Facilitation Act (Act 67 of 1995)		DLA
Physical Planning Act (Act 125 of 1991)		DoLG
Organised Local Government Act (Act 52 of 1997)		DoLG
Local Government Transition Act (Act 209 of 1993)		DoLG
Local Government Transition Amendment Act (Act 34 of 1994)		DoLG
Local Government Transition Second Amendment Act (Act 51 of 1995)		DoLG
Local Government Transition Amendment Act (Act 61 of 1995)		DoLG
Local Government Transition Second Amendment Act (Act 89 of 1995)		DoLG
Local Government Transition Second Amendment Act (Act 97 of 1996)		DoLG
Local Government Transition Second Amendment Act (Act 51 of 2002)		DoLG
Municipal Systems Act (Act 32 of 2000)		DoLG
Municipal Systems Amendment Act (Act 44 of 2003)		DoLG
Municipal Finance Management Act (Act 56 of 2003)		DoLG

Table 4.2 National acts (cont.)

Act	Sections	Authority
Sectional Titles Act (Act 95 of 1986)	28	DPW
Sectional Titles Amendment Act (Act 29 of 2003)		DPW
Housing Act (Act 107 of 1997)	9	DoHous
Housing Amendment Act (Act 28 of 1999)		DoHous
Housing Second Amendment Act (Act 60 of 1999)		DoHous
Housing Amendment Act (Act 4 of 2001)		DoHous
National Building Regulations and Building Standards Act (Act 103 of 1977)	10, 11, 12, 17	DTI
National Building Regulations and Building Standards Amendment Act (Act 49 of 1995)		DTI
National Roads Act (Act 54 of 1971)	16	DoT
National Roads General Amendment Act (Act 27 of 1994)		DoT
National Roads Amendment Act (Act 24 of 1996)		DoT
National Road Traffic Act (Act 93 of 1996)		DoT
National Road Traffic Amendment Act (Act 8 of 1998)		DoT
National Road Traffic Amendment Act (Act 21 of 1999)		DoT
South African National Roads Agency Limited and National Roads Act (Act 7 of 1998)		DoT
National Road Safety Act (Act 9 of 1972)		DoT
Transport Act		DoT
Animals Protection Act (Act 71 of 1962)	2, 5	DoA
Animal Health Act (Act 7 of 2002)		DoA
Meat Safety Act (Act 40 of 2000)		DoA
Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act 36 of 1947)	7*bis*	DoA
Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Amendment Act (Act 44 of 1997)		DoA

** To be replaced by the *Air Quality Management Draft Bill (of 2003)* (see Table 4.3) when passed into legislation.

**** To be replaced by the *National Health Bill (Bill 32 of 2003)* (see Table 4.3) when this is passed into legislation.

Table 4.3 National bills and draft bills

Bill	Sections	Authority
National Health Bill (Bill 32 of 2003)		DoH
Air Quality Management Draft Bill (62B of 2003)		DoH
National Environmental Management Act Second Amendment Bill (Bill 56 of 2003)		DEAT

Table 4.4 Regulations, proclamations and explanatory notes

Regulations, Proclamations and Explanatory Notes	Sections	Authority
Hazardous Substances Act • Government Notice R453, GG5467 of 25/03/1977 • Government Notice R73, of 11/01/1985 • Government Notice R2920, of 23/10/1992 • Government Notice R247, of 26/02/1993		DME
Environmental Conservation Act: • Proclamation R29, of 1995 • Proclamation R43, of 1996 • Government Notice R1182, GG18261 of 05/09/1997 • Government Notice R1183, of 05/09/1997 • Government Notice R1184, of 05/09/1997 • Government Notice R850, GG22652 of 07/09/2001 • Government Notice R670 & R672, GG23401 of 10/05/2002 • Government Notice R1111, GG25289 of 01/08/2003		DEAT
National Environmental Management Act • Explanatory Memorandum: Government Notice No.555, 30/07/2001		
Sectional Titles Act • Regulations (Annexure 9: Conduct Rules)	2,7	DPW
Occupational Health and Safety Act • Government Notice R692, GG22506 of 30/07/2001		DoH

Table 4.5 Provincial and local government legislation

Provincial Ordinances and Local Government By-Laws
Provincial Ordinances
Local Government Ordinance
Town Planning and Township Ordinance
Builder's Refuse
Special Industrial, Hazardous, Medical and Infectious Refuse
Disposal Sites
Littering, Dumping and Ancillary Matters

Table 4.6 National and other guidelines

Guidelines	Source
Minimum Requirements for Landfill, 2nd Edition, 1998	DWAF
Minimum Requirements for the Handling and Deposit of Hazardous Waste, 2nd Edition, 1998	DWAF
Minimum Requirements for Monitoring at Waste Management Facilities, 2nd Edition, 1998	DWAF
The Identification and Classification of Dangerous Substance and Goods, SABS 0228	SABS
Integrated Environmental Management Series: Checklist for Environmental Characteristics, 1992	DEAT
EIA Regulations: Implementation of Sections 21.22 and 26 of the Environmental Conservation Act, 1998	DEAT
Agenda 21: An agenda for Sustainable Development in the 21st Century, 1998	DEAT
Sludge Disposal Guidelines	DoA
Code of Practice for the Bulk Handling and Storage of Hazardous Chemicals	Chamber of Mines

Table 4.7 Other relevant documents

Other Documents	Source
Polokwane Declaration	
State of the Environment Studies	
Guide Plans	Provincial Govt
Northern Province Department of Public Works, Management Plan (Statement of Public Service Commitment) 2002-2007, ver 1.1, 18 July 2001	Limpopo Province, Dept. Public Works
Integrated Development Plans	
Aganang Municipality Integrated Development Plan, Draft, June 2002	Aganang Municipality
Blouberg Municipality Integrated Development Plan, Third Draft, July 2002	Blouberg Municipality
Capricorn District Municipality Summary Reviewed Integrated Development Plan 2004-2007, Second Draft, April 2004	Capricorn District Municipality
Lepelle-Nkumpi Municipality Integrated Development Plan, July 2002	Lepelle-Nkumpi Municipality
Molemole Local Municipality, The Five-Year Municipal Development Plan, 2002-2007	Molemole Local Municipality
Local Structure Plans	Local Gov
Land Development Objectives	Local Gov

4.2 POLOKWANE DECLARATION

In September 2001, delegates from government and civil society in South Africa met in Polokwane for the, first ever, National Waste Summit. There the delegates shared a common concern about the economic and social impact of environmental degradation, and pledged their determination to promote appropriate and efficient use of natural resources while protecting South Africa's people and the environment (Ref. 27).

At the summit the need for urgent action was recognised, leading to the declaration of a waste management system that contributes to sustainable development and produces a measurable improvement in the quality of life - calling on all South Africans to commit themselves to the effective control and minimisation of waste (Ref. 27). This declaration, referred to as the *Polokwane Declaration*, not only gives recognition to the need for urgent action, but also set goals for tackling waste management in the country. The main goals set are (Ref. 29):

1. The stabilisation of waste generation and the reduction of the disposal thereof by 50% by the year 2012.
2. The development of a plan for ZERO WASTE to landfill by the year 2022.

Having set these goals, the *Polokwane Declaration* also takes the form of an implementation programme, and has 28 clearly defined steps, as listed below (Ref. 27). These steps will be incorporated into the WMPs.

1. Explore the use of economic instruments to support waste management initiatives by June 2002.
2. Develop and provide the educational resources necessary to allow public participation in the waste elimination process.
3. Develop capacity.
4. Develop a Waste Information System by April 2002.
5. Establish systems that ensure that physical and financial responsibility for waste is borne by the product producers. (**Polluter pays principle**)
6. Avoid the need to establish new, or expand existing, waste disposal / reprocessing facilities.
7. Create employment and economic empowerment opportunities through increased product re-use and material recycling.
8. Develop a comprehensive legislative and regulatory framework by June 2002.
9. Set up a multi-stakeholder forum consisting of national, provincial and local government, business and civil society.
10. Implement sustainable poverty relief projects.
11. Provide comprehensive waste management services.
12. Develop a compliance mechanism.
13. Raise environmental awareness.
14. Develop skills in advocacy and lobbying.
15. Streamline administration services that deliver effective environmental waste management services.

16. Participate actively in regulatory mechanisms by monitoring and contributing to effective management of disposal sites.
17. Encourage other alternative **recovery** methods.
18. Avoid the pollution of waste resources, and the social impacts caused by the disposal of waste.
19. **Reduce** generation of all types of waste.
20. Utilise **cleaner** production **technologies** and methods of production.
21. Set waste reduction targets.
22. Strengthen relationships between government and industry by improving transparency and trust.
23. Manufacture more environmentally-friendly products.
24. Contribute towards improved networking and information sharing.
25. Engage in programmes that promote responsible advertisement and labelling of products.
26. Formal reporting within the framework of a negotiated agreement.
27. Promote a sustainable Public & Private Partnership in order to improve waste management service delivery.
28. Promote **recycling** opportunities that are environmentally and socially sustainable.

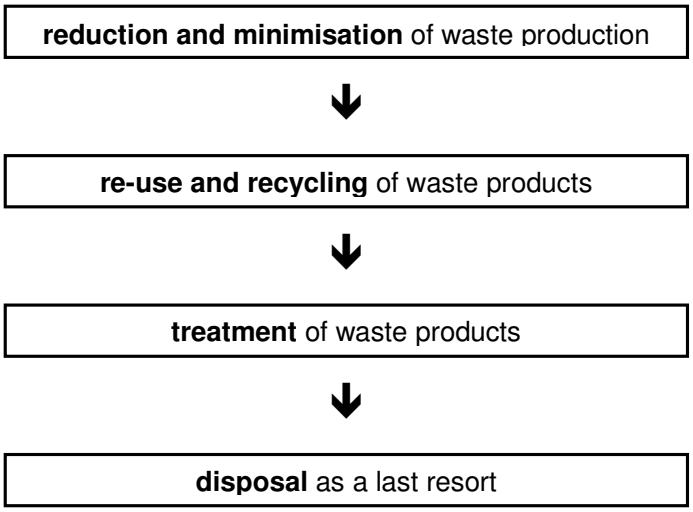
To say these are ambitious goals is an understatement, but they are nevertheless laudable and efforts that work towards their achievement should be vigorously pursued. (Ref. 29)

4.3 NATIONAL WASTE MANAGEMENT STRATEGY

The government has already taken steps to action the *Polokwane Declaration* in the form of the *National Waste Management Strategy* (NWMS), which in fact predates the Declaration by a few years. The NWMS presents a long-term plan for addressing key issues, needs and problems experienced with waste management in South Africa. Its strategic objectives are many but focus on:

- creating a holistic and integrated approach to managing waste,
- ensuring sustainable environmental and public health protection,
- developing waste information systems (WIS),
- rigorous law enforcement and
- pursuing the principle that the Polluter Pays.

It sets out a plan of action on how waste should be dealt with in the future, the focus of which is a hierarchy system. This aims first to promote, in order of priority:



The NWMS also notes that there is a need for law reform in this area. According to the then Minister of Environmental Affairs and Tourism, Vali Moosa, the way pollution and waste is currently being dealt with is fragmented and uncoordinated and what is needed is a single piece of legislation that deals with the issue (Ref. 29).

To date, that single piece of legislation has yet to be enacted although there is a *National Integrated Waste Management Bill* in the pipeline. At present, local authorities are responsible for the collection and disposal of refuse and solid waste and are required to enact by-laws to regulate this function.

4.4 ENVIRONMENT CONSERVATION ACT

Waste disposal, however, is regulated by the Environment Conservation Act (Act 73 of 1989). In terms of section 20 of that act,

'*no person may establish, provide or operate a waste disposal site without a permit issued by the Minister of Water Affairs and Forestry*'.

In addition, no person may discard waste anywhere but at a waste disposal site or other facility approved by the Minister. Any person contravening these provisions is guilty of an offence and may be liable for a fine not exceeding R 100 000 or imprisonment for up to 10 years or both (Ref. 29).

In September of this 2003, that National Assembly approved the *Environment Conservation Amendment Bill* (45B-03), which will amend section 20 and related provisions when it is enacted. The overall objective of the amendment is to facilitate

the Government's general policy on integrated waste management and pollution control and its main features are (Ref. 29):

1. The transfer of responsibilities allocated to the Minister of Water Affairs and Forestry, in terms of section 20 of the Act with regard to the permitting and administration of landfill waste sites, to the Minister of Environmental Affairs and Tourism;
2. A provision enabling the Minister of Environmental Affairs and Tourism, with the concurrence of the Minister of Finance, to enact regulations that impose compulsory charging, deposit systems and levies on specified waste streams; and
3. The regulation of certain activities and the control of products that may or are likely to have significant detrimental effects on the environment or human health when introduced into waste streams.

The changes are not major in the overall picture but they are indicative of government's ambition to pursue an integrated and holistic approach. They also specifically address issues that were previously left vague in the Act. There is now no doubt that the Minister can enact regulations such as the recent Plastic Bag regulations. It is also clear the products such as asbestos could be regulated in terms of these amendments. These amendments also show that government is prepared to pursue incentives to address waste management in addition to its traditional 'command and control' approach (Ref. 29).

One possible area of concern in respect of the amendments is the transfer of management of landfills from the Ministry of Water Affairs and Forestry to that of Environmental Affairs and Tourism. Although provision has been made for transfer of staff from one to the other, it is imperative that this occurs in a manner that ensures that the capacity and skills developed within Water Affairs are retained. f not, waste management could be set back severely (Ref. 29).

4.5 MINIMUM WASTE MANAGEMENT AND DISPOSAL REQUIREMENTS

Integrated waste management is an internationally accepted four-step approach used to manage waste. These steps are simply outlined in the Department of Water Affairs and Forestry Guideline Document *"Waste Management and the Minimum Requirements"* (Ref. 21). These steps are in accordance with the international concepts of waste reduction and minimisation practises in the following order of priority:

REDUCE ► REUSE ► RECYCLE

The four steps of Integrated Waste Management include

- ***Step 1***: Industries, businesses, agriculture and the individual should use processes that make the least possible waste i.e. **reduce** waste generation at source. This is sometimes referred to as using "*Cleaner Technology*".
- ***Step 2***: Anything that can be used again should be taken out of the waste stream. Ideally where possible such waste items should be **reused**, and where this is not possible waste material should be **recycled**. It is important to note that reuse of waste material is better than recycling, as it requires a smaller energy input, and associated cost, to make the waste material useful again. Reuse and recycling of material is referred to as *"Resource Recovery"*.
- ***Step 3***: Some waste can be compacted to take up less space, and treated so that it is less dangerous. Such treatment of waste will extend the lifespan of landfill sites and reduce the total amount of land required for the disposal of a given initial volume of uncompacted waste.
- ***Step 4***: All waste remaining after steps 1 to 3 must go to a properly designed and operated landfill (sanitary landfill).

The first three steps are not yet enforced, but will, in future, be controlled by the *National Integrated Waste Management Act* (Draft Bill still being prepared). This Act will make sure that waste is controlled from its creation to its disposal (Cradle to Grave principle).

For the implementation of Step 4, legally waste may only be disposed of on a landfill that has a permit from the Department of Water Affairs & Forestry (The Environment Conservation Act, Act 73 of 1989). To set standards and help with the issuing of permits, the Department has published a Waste Management Series, three documents which cover all four waste management steps:

- *Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste.*
- *Minimum Requirements for Waste Disposal by Landfill.*
- *Minimum Requirements for Monitoring at Waste Disposal Facilities.*

In them, waste management guidelines and the minimum standards that must be met to protect the environment, are set out. The Department requires that anyone dealing with waste should, at the very least, meet these standards, and this is why the standards are called *Minimum Requirements*. These documents can be obtained free of charge from the Department of Water Affairs and Forestry. A full set of documents will be acquired for the Aganang Local Municipality.

It is important to note that the *Minimum Requirements* have been developed so as to apply a number of main principles for the control of waste. These principles, as outlined below, will also be incorporated into the WMPs.

Cradle-to-grave	A policy of controlling waste from its creation (cradle) to its final disposal (grave) (Ref. 21).
Duty of care principle	The individual or organisation that produces the waste (generator) is, under all circumstances, responsible for the waste from cradle-to-grave (Ref. 21).
Polluter pays principle	The person who causes pollution must pay for its cleanup and for any damages caused (Ref. 21).
Precautionary principle	Unknown waste must be treated as extremely hazardous until it is identified and classified (Ref. 21).

4.6 AGANANG LOCAL MUNICIPALITY INTEGRATED DEVELOPMENT PLAN

A five-year development plan, 2002 to 2007, has been developed for the Aganang Local Municipality by Tukishi Development Consultants (Ref. 36).

As part of the IDP process, the municipality identified and adopted a number of priority issues. This was done through a process of public consultation and participation. It is important to note that waste management was identified as one of the Key Performance Areas as adopted by the ALM. The IDP does identify waste management, or lack thereof as a problem, and but no specific objectives, strategies or projects related to waste management have been proposed. Waste removal is only priority 12 on the infrastructure priority list. Percy 1, Uitkyk and Rosenkranz was identified the areas where clinic development with regards to infrastructure is a priority. As a result of this, it might be expected that municipal funding that will be allocated to waste management will be limited, with the bulk of available funding going to addressing the issues and aspects identified as priority by the ALM. This must be taken into account when developing the ALM WMP, by:

- Identifying alternative sources of funding outside the ALM for waste management services.
- Identifying alternative service providers who can be contracted by the ALM to provide waste management services.
- Low cost, low maintenance and management solutions must be sought, so that effective waste management can be achieved with minimum effort, as it can be expected that municipal services and time will be focussed on addressing other more pressing needs.

A number of problems and strategies concerning other issues that can be built into, or would affect, a waste management strategy have, however been identified in the IDP. These problems, the proposed strategies for dealing with said problems, and the manner in which waste management systems would be affected, either negatively or positively by proposed strategies, are outlined in Table 4.8 on the following pages.

Table 4.8 Priority issues and strategies identified in the Aganang IDP that would affect waste management

Problem (Ref. 36)	Objectives (Ref. 36)	Strategies (Ref. 36)	Impact on Waste Management
Roads: Lack of passable & regularly maintained roads	• To ensure that proper roads, especially access roads, are constructed • To ensure that roads in use are regularly maintained.	• Grade 450km of internal streets • Grade 1 500km of access rods by June 2007	• Poor roads will impact negatively on waste collection and transport systems, making it difficult to provide necessary services to areas where roads are not easily passable. • ALM priority plans for road development & maintenance must therefore be considered when designing waste collection and transport routes.
SMME Development: Lack of concentrated effort to develop and maintain the emergence of SMME's	• To establish and strengthen poverty alleviation projects. • To monitor all funded poverty alleviation projects.	• Community capacity output • Business plans assessment • Allocation of funds • Conducting research on poverty • Compiling a directory of stakeholders in the development field • Participate in disaster committees in municipalities • Monitoring and evaluation of projects.	• As stated previously, an objective of the CDM is to promote the development of SMME's as part of the waste management programme & systems that are to be developed. • As part of the ALM WMP it would therefore be beneficial if there were co-operation between those sectors of the municipality dealing with SMME development, & those dealing with waste management. Duplication of efforts with regard to SMME development can thus be avoided. • Any existing programme for the development of SMME's could be beneficial to the development of SMME's in the waste management sector. By providing opportunities for SMME's in this sector this will also be mutually beneficial to such SMME development programmes as new opportunities will be provided for SMME's.
Strengthening the revenue collection system: Lack of sufficient revenue base for the municipality to deliver on its electoral mandate.	• To have a sound and excellent revenue collection • To develop policies.	• Complete policy development	• The financial sustainability of any waste management programme that may be implemented is of prime importance. Should the programme adopted not be financially sustainable it will fail. • When setting levies for waste collection, other levies payable to the municipality for other services must be taken into account. • There must be co-operation between the different service providing sectors in the MLM so that a reasonable balance can be obtained for the levies charged for various services.

Cont….

Table 4.8 Priority issues and strategies identified in the Aganang IDP that would affect waste management (cont.)

Problem (Ref. 36)	Objectives (Ref. 36)	Strategies (Ref. 36)	Impact on Waste Management
Development of By-Laws:	To develop and implement the by-laws and policies by 2007.	• Compilation of by-laws and policy drafts • Community consultation • Adoption of literature • Publication by MEC	• The development of the by-laws is closely related to the waste management with regards to tariffs and procedure.
Regulation and allocation of sites: Town Planning Scheme and provision of rural housing.	To develop a plan for the whole municipality To provide rural housing to all 18 wards.	• Budget • Tender process • Appointment • Monitoring and evaluation	• The development of areas is critical in determining the position of key infrastructure with regards to waste management.
Development of programmes for data collection.	Development and management of GIS	• Acquire GIS system • Link GIS system to District and Provincial Government	• The acquiring of a GIS system will greatly assist in future studies with regards to waste management.

5 INTERESTED AND AFFECTED PARTIES (IAPS)

5.1 LOCAL GOVERNMENT STRUCTURES

Waste management and disposal (excluding hazardous waste) is a function of Category B Municipalities, namely Local Municipalities. As such, the Local Municipalities, in this instance the Aganang Local Municipality (ALM), are some of the most important parties that must be involved in the process of developing the WMPs.

Although waste management is a Category B Municipal function, it may be found that regional waste systems and infrastructure will offer the best solutions to current waste management problems. Regional government, the Capricorn District Municipality, is therefore also a key stakeholder, and the Client for this project.

While the ALM will be responsible for the implementation of the WMP, it is essential that there is "buy-in" by the affected communities to the proposed WMP. The Ward Councils act as the communication bridge between the ALM and the communities. It is therefore essential that the Ward Councils be kept informed of the process of developing the WMPs, so that they can, in turn, keep their community members informed of the process. Community approval of the WMP must also be obtained through the Ward Councils.

Details of the ALM and CDM representatives for this project are included in ***Appendix A***.

5.2 PROVINCIAL GOVERNMENT STRUCTURES

A large amount of the legislation governing solid waste management and practices is controlled and monitored at either provincial or national level. It is therefore important that the various relevant provincial and national government departments / structures be recognised as IAPs, and be included in the consultative process as and when required. Where necessary, these Departments must also be informed of the development of the WMPs. This will include obtaining final approval of the WMPs and IWMP from DFEATE and DEAT.

On a provincial level, IAPs include:

- Department of Water Affairs and Forestry (DWAF)
- Department of Finance, Economic Affairs, Tourism and Environment (DFEATE)
- Department of Local Government and Housing (DoLG)
- Department of Health and Welfare (DoHW)
- Department of Public Works (DPW)
- Department of Education (DE)

Details of various Provincial Government representatives for this project are included in ***Appendix A***.
On a national level, affected government departments include:

- Department of Water Affairs and Forestry (DWAF)
- Department of Environment Affairs and Tourism (DEAT)
- Department of Health (DoH)
- Department of Local Government (DoLG)
- Department of Public Works (DPW)
- Department of Transport (DoT)
- Department of Land Affairs (DLA)
- Department of Minerals and Energy (DME)
- Department of Agriculture (DoA)
- Department of Trade and Industry (DTI)
- Department of Housing (DoHous)

5.3 COMMUNITY REPRESENTATIVES AND KEY STAKEHOLDERS

Whilst conducting the survey, details of all community representatives with whom the local project representative held interviews, or from whom information was gathered, were captured. Where available, the following information regarding these key stakeholders was collected:

- Name
- Position
- Address
- Contact numbers

Included in ***Appendix B*** is the completed list of key community stakeholders identified during the survey. In addition, the names of all community contact persons are included in the results of the general and detailed surveys, included in ***Appendix H*** to ***Appendix V***. Included in these appendices is information pertaining to representatives and contact persons for:

- The village or general community
- The business community
- Non-Governmental Organisations (NGOs)
- Community Based Organisations (CBOs)
- Schools, nursery or pre-schools and crèches.
- Polices stations
- Clinics and hospitals
- Mines
- Waste removal entities and waste contractors
- Landfill sites
- Waste treatment facilities
- Community groups or individuals practicing waste recycling, reuse and / or composting

5.4 COMMUNITY BASED ORGANISATIONS (CBOs)

As previously mentioned, for any new waste management systems and practices that may be implemented, either at district or local government level, to be successful and sustainable, such practices must have the approval and support of the communities in which they are to be implemented. The communities must also have a good understanding of aspects such as:

- The reasons why certain management methods / practices are to be adopted as opposed to other options
- The costs of waste management, with specific understanding of how community, and individual, practices can affect such costs e.g. littering is expensive, as there is an associated clean-up cost.
- The responsibility of the community itself when it comes to successful waste management. This includes aspects such as payment of levies.
- The proposed time frame for the implementation of the waste management plan.
- The intended outcome of implementing a waste management plan.

Community Based Organisations (CBOs) often form the backbone of rural and semi-rural communities. These organisations are therefore considered to be extremely important when wanting to initiate new programmes, practices or even ideas in the communities. Having been established by the communities themselves, and normally comprising duly elected community representatives; these organisations generally have the approval of the community. Different types of CBOs also represent different sectors of the communities, and it may be possible to reach an entire community using CBOs as a “gateway” into the community. It is also believed that CBOs play an essential role in education of the communities, and as such can facilitate environmental and waste education and awareness programmes.

As noted, the ToR calls for the development of waste management solutions that will promote the development of SMME's. Some types of CBOs are suited to being expanded and developed into SMME's. For example, and CBO that exists for the purposes of promoting agricultural activities e.g. market gardening, could be expanded and developed into an SMME focussing on composting of waste.

Considering these factors, CBOs in the communities were identified as part of the waste survey. Details of the CBOs identified are included in ***Appendix M***. A summary of the CBOs identified through the survey is included in Table 5.1 on the following page. The distribution of the types of CBOs identified is represented in Figure 5.1.

Table 5.1 Summary of Community Based Organisations identified through waste survey

Type of CBO	Number
Total Number	52
Ward Committees	19
Women's Organisations	3
Youth Organisations	4
Church Organisations	1
Water Committees	15
Other	10

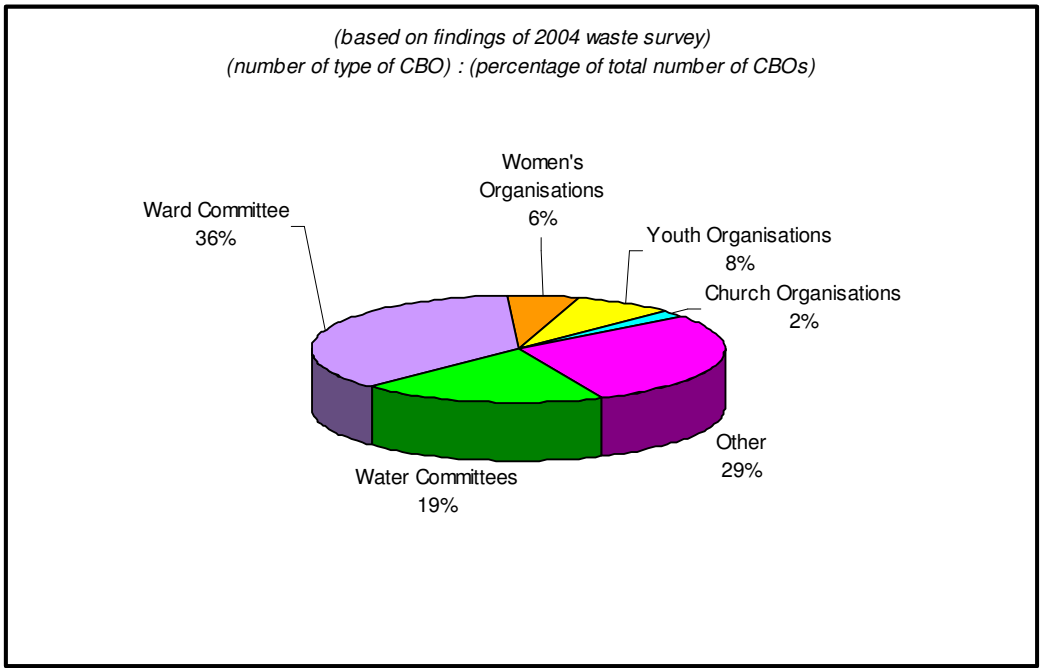


Figure 5.1 Chart: Aganang 2004 - Types of Community Based Organisations
(based on findings of 2004 waste survey)

5.5 NON-GOVERNMENTAL ORGANISATIONS (NGOs)

As with community-based organisations, non-governmental organisations can provide a gateway into communities. NGOs in the communities were therefore also identified as part of the waste survey. Details of the NGOs identified are included in ***Appendix L***. A summary of the NGOs identified is given in Table 5.22.

Table 5.2 Summary of Non-Governmental Organisations identified through waste survey

Village	Ward	Name of NGO	Role / Function of Organisation
Rametloana	Ward 10	Rametloane Development Forum	Unknown
Manamela 2	Ward 12	Traditional Healers Organisation	To promote the role of traditional healers in the community
Semaneng	Ward 13	Ward 13 Youth Organisation	Capacity building for the youth
Dibeng	Ward 14	SANCO	To oversee some community structures. Facilitating service delivery in community.

6 DEMOGRAPHICS

6.1 BASE POPULATION

Base population figures for 2004 have been derived in two ways.

- Firstly, demographic data available from Census 1996 and Census 2001 has been extrapolated to give estimates of the current populations.
- Secondly, as part of the waste survey conducted under the auspices of this appointment, estimates of the number of households in each village were obtained. Using the average number of persons per household in 2004, as extrapolated from the census data, an estimate of current population figures was obtained.

The population figures obtained by using the above two methods were then compared to determine whether a reasonable estimate of the population was being determined.

6.1.1 Population figures based on Census 1996 and Census 2001 statistics

There are some important points that should be noted when assessing the value of the population figures obtained by extrapolating statistical data from Census 1996 and Census 2001.

- Census data is only available at ward level, whilst an estimate of the current number of households was conducted at village level.
- Since both Census 1996 and Census 2001 were conducted, the ward boundaries have been changed. The figures determined per ward will therefore not apply to the current wards. These figures will therefore have to be considered cumulatively, i.e. for the entire Aganang Municipal Area, when being compared to current ward population figures.
- As effectively only two data points, Census 1996 and Census 2001, are available for each type of data, it is only possible to extrapolate the data on a linear basis. This linear extrapolation may provide a reasonable estimate of current populations, as the time gap between 2001 and 2004 is relatively short. However, growth trends may well not be linear, and population projections could therefore not be accurate.
- Due to the uncertainty of the impact of HIV / AIDS on mortality rates, the impacts of increasing death rates due to HIV / AIDS have not, at this time, been accounted for when projecting population figures using the census data. The potential effects of HIV / AIDS are, however discussed in Section 6.12.
- In the full set of statistical data received for Census 1996 and Census 2001, there were discrepancies in the total population size and total number of households as given in different sections of each full data set. The statistical data for 1996 and 2001 has therefore been adjusted to give the

average total population size and total number of households as determined from all such counts through each data set.

- Experience in other provinces has shown that population data as obtained from Census 1996 and Census 2001 does not necessarily account for the entire population. It has been found that comparing census data to other data, such as figures for levels of attendance at schools as provided by the Department of Education, more than 10% of the population of school going age was not accounted for in either census.[1] This may not necessarily be true of the Census data available for the Limpopo Province, but such problems should be borne in mind when utilising the census data for predictions for long term planning.

Details of demographic data per ward, as determined from Census 1996 and Census 2001 statistics, are included in ***Appendix D***.

A summary of the population figures as determined by each of the above two methods per village (based on household count) and per ward (based household count and census data) is included in ***Appendix E***.

Considering these figures it can be seen that there is some discrepancy between the population sizes per ward as determined by the different methods. This can, however be accounted for by the fact that, as previously mentioned, ward boundaries have changed since 2001 when the last census conducted. The estimates of the current total population of Aganang, as determined by the two methods are very similar, being as follows:

- Based on estimated number of households, total population of Aganang in 2004: 154 656 persons.
- Based on extrapolation of Census 1996 and Census 2001 data, total population of Aganang in 2004: 151 967.

As these total population figures are very similar, it is believed that this is a reasonable estimate of the current population size – in the order of 155 000.

A breakdown of the population figures per ward (based on number of households per village) is given in Table 6.1, and represented in Figure 6.1. From this it can be seen that the population is very evenly distributed through Aganang, but concentrated in Wards 4, 8 and particularly 10. This will affect waste management in that it may be necessary to consider waste transfer from the smaller wards to a nearby central location in one of the more densely populated wards, or even a regional centre, as the development of significant waste management infrastructure in the wards with smaller populations may well not be justifiable.

[1] Private communication, Mr. C.R.H. Clanahan, referring to experiences when working as part of the team writing the Mpumalanga State of Environment Report (Ref. 28).

Table 6.1 Aganang 2004 population per ward

(based on estimated number of households: waste survey 2004, and extrapolation of census data for average number of persons per household)

Ward	2004 Population
Ward 1	8,504
Ward 2	9,410
Ward 3	8,319
Ward 4	12,742
Ward 5	8,540
Ward 6	6,655
Ward 7	8,191
Ward 8	12,168
Ward 9	9,967
Ward 10	17,841
Ward 11	4,893
Ward 12	10,108
Ward 13	10,035
Ward 14	6,549
Ward 15	3,986
Ward 16	7,701
Ward 17	2,511
Ward 18	6,537
TOTAL	154,656

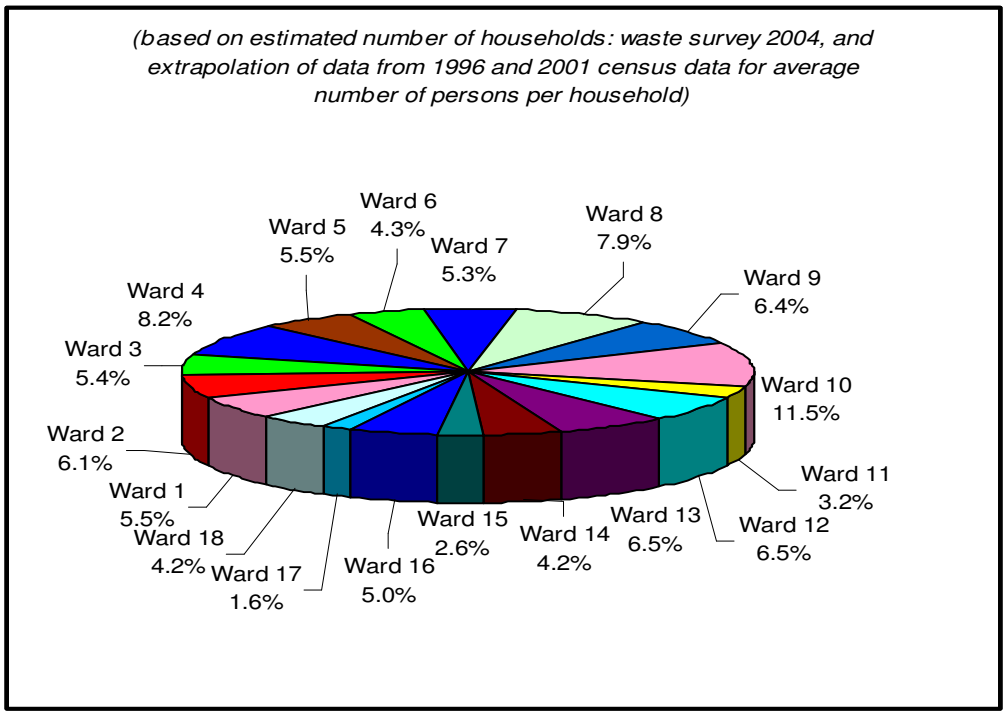


Figure 6.1 Aganang - 2004 Demographics – Population Distribution per Ward

Population distribution for Aganang by gender and by age is given in Table 6.2. Population distribution by gender by age is represented Figure 6.2, and population by age is shown in Figure 6.3. It can be seen that approximately 55% of the population is female. As the majority of the population, as well as the persons who are normally responsible for aspects such as home care, including waste management, it is essential that any waste management plan consider gender issues.

Just over 70% of the population is under the age of 35. This is significant, as this is the sector of the population that is most severely impacted by the HIV / AIDS epidemic (see Section 6.12.2 for possible impacts of HIV / AIDS on waste management).

Table 6.2 Aganang – 2004 demographics – population distribution: by gender and by age

(based on extrapolation of data from 1996 and 2001 census data)

	Number	Percentage
Total	114 019	
Total Males	67,218	45.0%
Total Females	82,434	55.0%
0 to 4	16,094	10.7%
5 to 14	44,747	29.8%
15 to 34	45,877	30.5%
35 to 64	30,591	20.3%
Over 65	13,100	8.7%

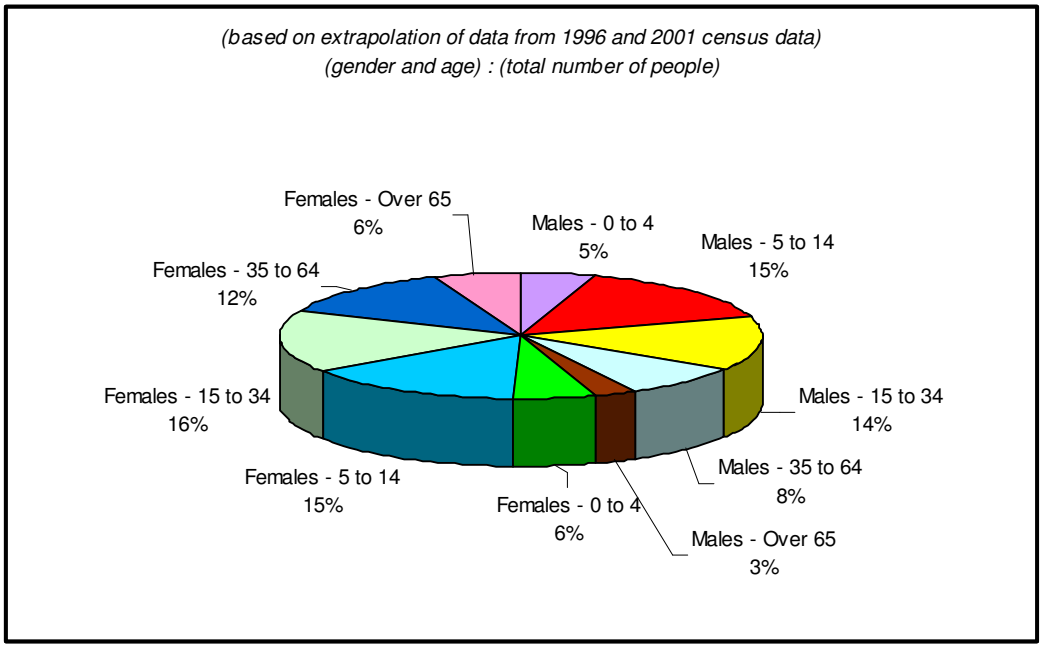


Figure 6.2 Chart: Aganang – 2004 demographics – population distribution: gender by age

(based on extrapolation of data from 1996 and 2001 census data)

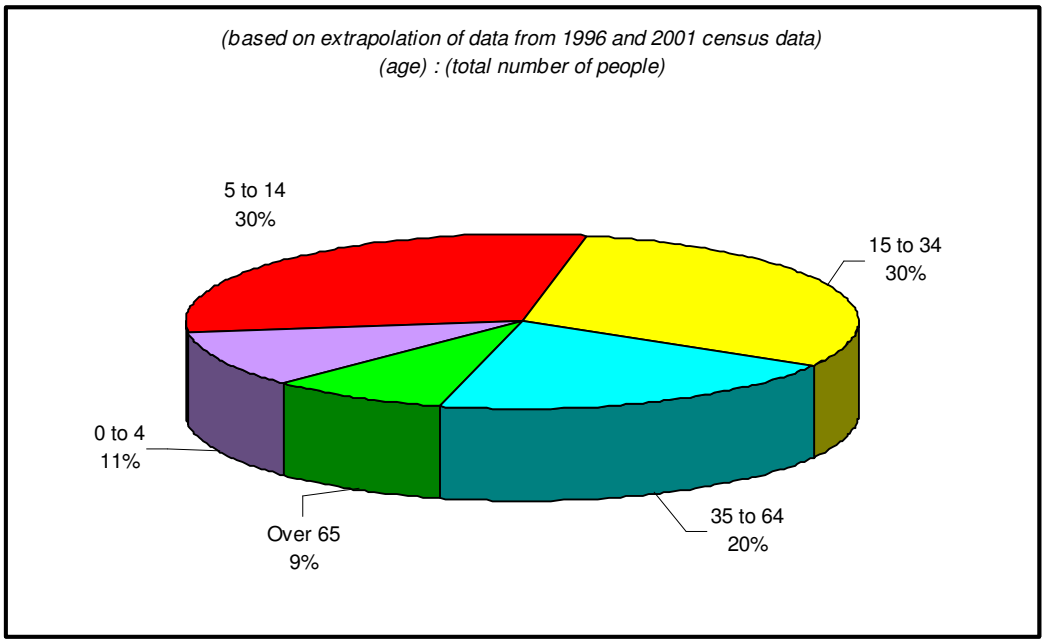


Figure 6.3 Chart: Aganang – 2004 demographics – population distribution: age

(based on extrapolation of data from 1996 and 2001 census data)

Figure 6.4 shows the percentage of disabled persons in Aganang. Approximately 8,0% of the population suffers from some form of disability, with the majority of disabled persons (37,5%) suffering from some form of communication, intellectual, mental or emotional disability.

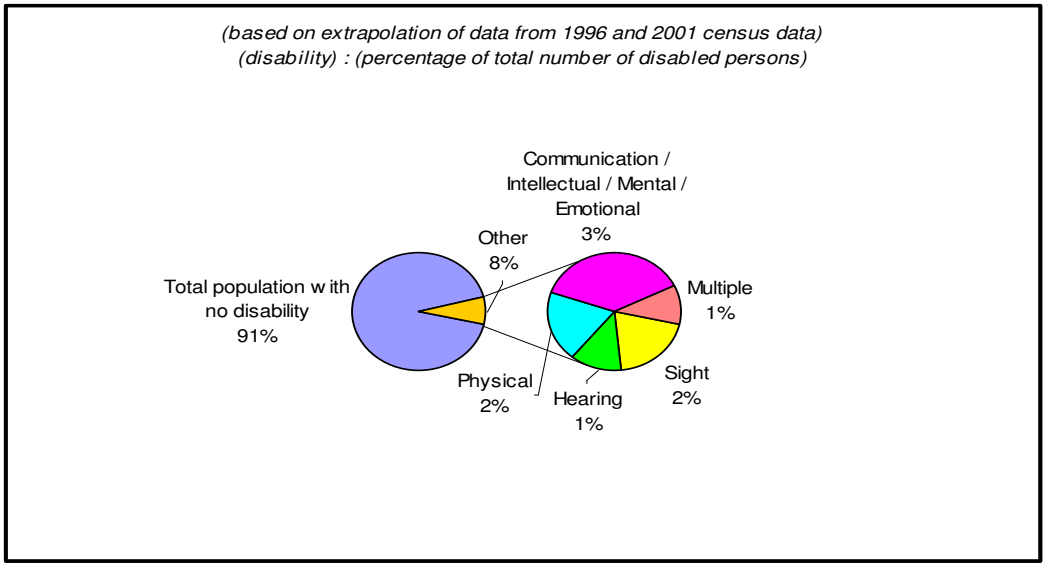


Figure 6.4 Chart: Aganang – 2004 demographics – disabilities

(based on extrapolation of data from 1996 and 2001 census data)

6.2 POPULATION DISTRIBUTION

Possible population distributions can be defined as:

- High income, low density: HL
- Middle income, middle density: MM
- Low income, high density: LH
- Informal settlements: IS

The majority of the population distribution in Aganang falls either into the categories of low income, high density (LH) or informal settlements (IS). The villages are characterised by informal settlements, while in the more urbanised areas the tendency is a low income-high density exists.

6.3 AVERAGE HOUSEHOLD SIZE

As typical of low income, rural or peri-urban communities, more than 30% of households are larger than 2 person households, with 40% of households being larger than 4 person households. This is shown in Figure 6.5. It is, however, surprising that as much as 16% of households are only single person households. This should be noted as costs per capita for household waste collection will be higher with higher numbers of small households.

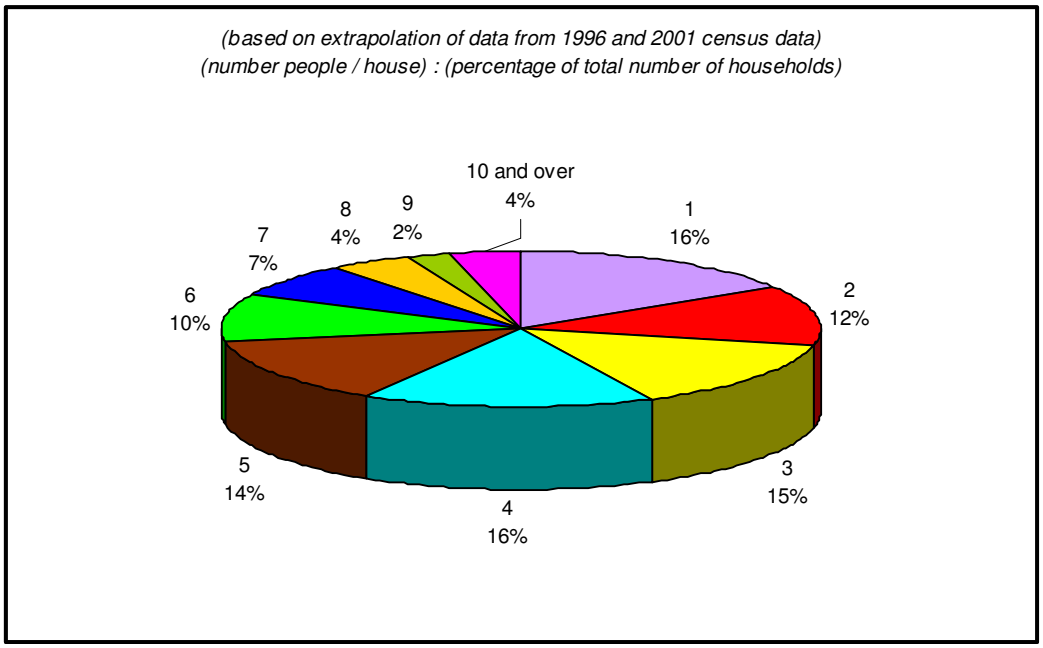


Figure 6.5 Chart: Aganang – 2004 demographics – average number of persons per household

(based on extrapolation of data from 1996 and 2001 census data)

6.4 LEVEL OF EMPLOYMENT

Levels of employment in Aganang are extremely low, with only 12% of persons above legally employable age being employed (see Figure 6.6). It is, however, important to note that, by the definitions of Census 1996 and Census 2001, 69% of the employable population is defined as "Not economically active". This is understood to mean that these persons are not actively seeking employment. It is not, however, clear whether a percentage of these persons are employed or active in the informal sector, whether it be through hawking or similar activities.

This low level of employment can have a negative impact on aspects such cost recovery through household levies, as there will be an associated low level of household income. It does, however, indicate the urgent need for the creation of employment through any waste management programme that may be instituted. Such job creation could be at government (municipal) level, through employment by larger private companies,

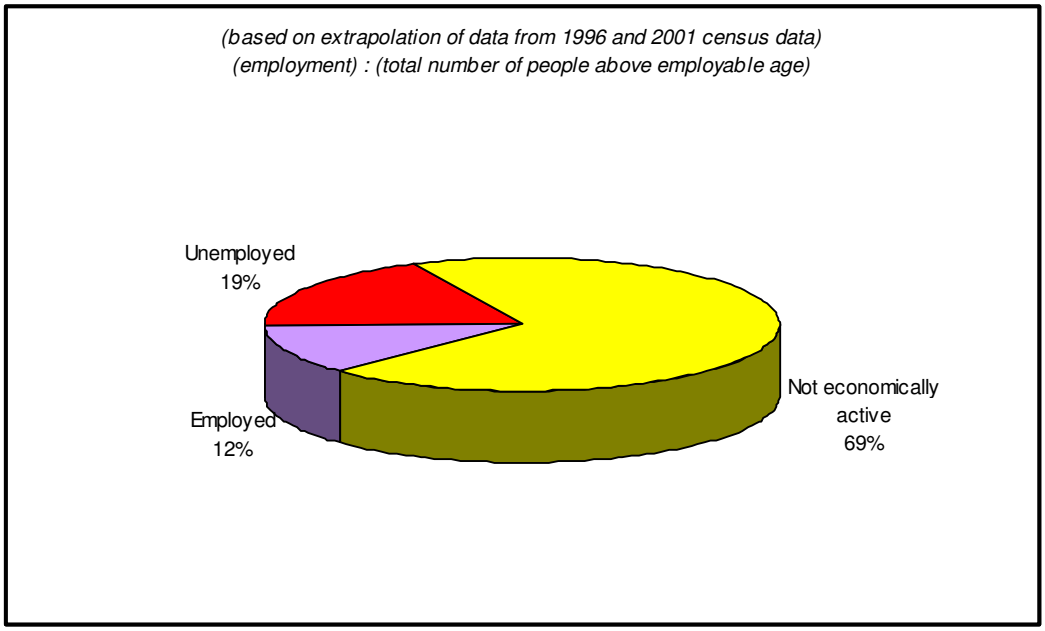


Figure 6.6 Chart: Aganang – 2004 demographics – level of employment
(based on extrapolation of data from 1996 and 2001 census data)

Figure 6.7 shows the level of employment in different economic sectors. Majority of employment is in three main sectors, viz.

- Community, social or personal work: 33%
- Wholesale / retail: 20%
- Private households: 15%

There is effectively no industrial activity in the municipal area, with only 5% of the population being employed in manufacturing, in this instance small-scale manufacturing.

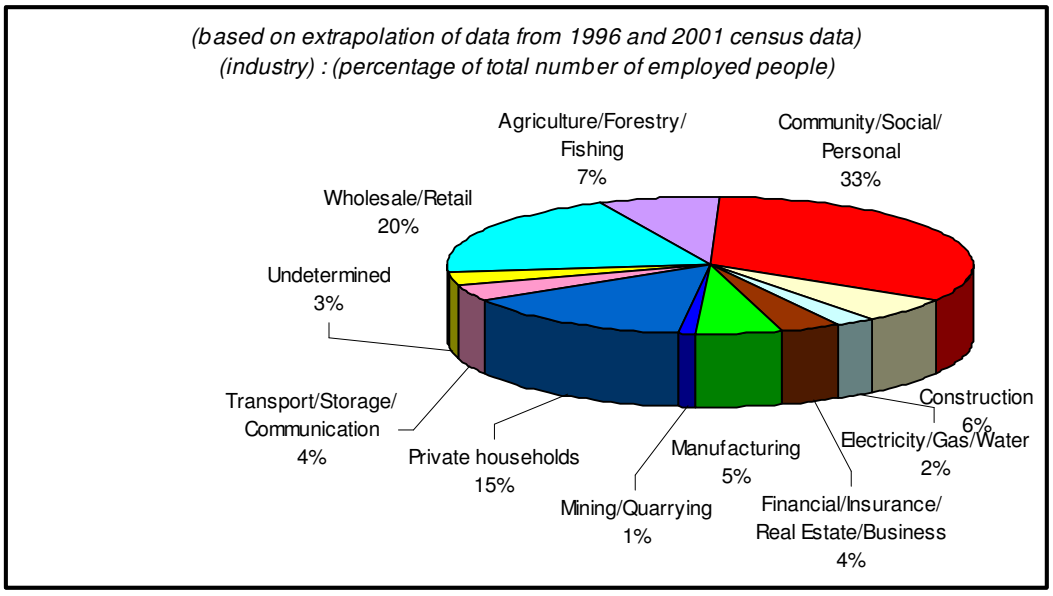


Figure 6.7 Chart: Aganang – 2004 demographics – labour force: employment in different economic sectors

(based on extrapolation of data from 1996 and 2001 census data)

In a similar vein, Figure 6.8 shows the breakdown of occupations of the employed population. The three major occupations in Aganang are:

- Technicians: 36%
- Elementary: 23%
- Clerks: 10%

The high percentage of persons in elementary occupations (labour based occupations e.g. cleaning etc.) is indicative of a low level of education and skills in the community. This is, however, marginally offset by a relatively high number of technicians. This indicates that for the development of SMME's and of a local work force that could readily be employed in more sophisticated types of jobs in the waste management sector, a relatively high level of training will be required. There is, however, the advantage that the waste sector has the potential to generate high numbers of elementary jobs e.g. waste sorting for recycling; waste collection; composting etc.

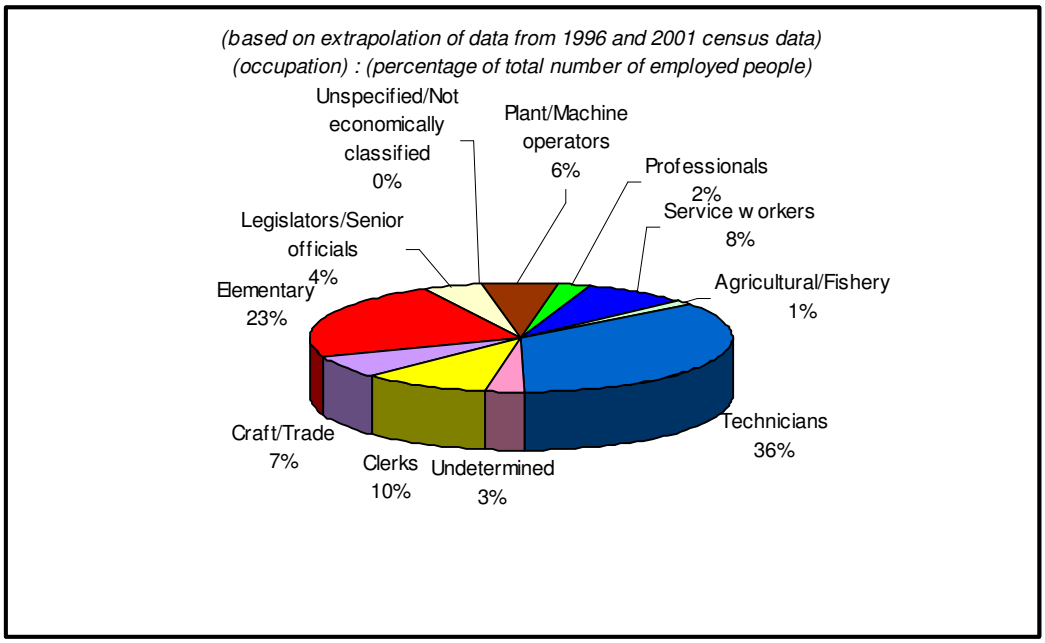


Figure 6.8 Chart: Aganang – 2004 demographics – occupations of employed population

(based on extrapolation of data from 1996 and 2001 census data)

6.5 HOUSEHOLD AND PER CAPITA INCOME

The average annual household income in 2001 is shown in Figure 6.9, while the average individual monthly income in 2001 is shown in Figure 6.10. Income statistics have not been extrapolated to give an estimate of household incomes in 2004, for two main reasons:

- The various income levels investigated in Census 1996 and in Census 2001 differ. It is therefore not possible to identify a trend in the levels of income from one census to the next, as the baseline scale differs.
- Income can also not be extrapolated purely on a population growth basis, as the element of inflation / wage increase, must somehow be brought into account.

Average annual disposable household income is generally classified into three levels for the purposes of assessing waste generation levels. These are defined as shown in Table 6.3.

Table 6.3 Income level classifications

Income level	Disposable household income per annum
High	R 10 000+
Medium	R 5 000 - R10 000
Low	R 0 - R5 000

(Ref. 20)

Considering the annual household income figures for 2001, it is evident that the majority of the Aganang households have either no income (26%) or fall into the low income bracket (16%), with 32% of the population falling into the medium income bracket. Waste generation rates are generally lower for lower income groups, and it must therefore, for planning purposes, be assessed whether the current distribution across income levels will remain relatively constant over the planning period, or whether there is the potential for a significant increase in average household income over said period.

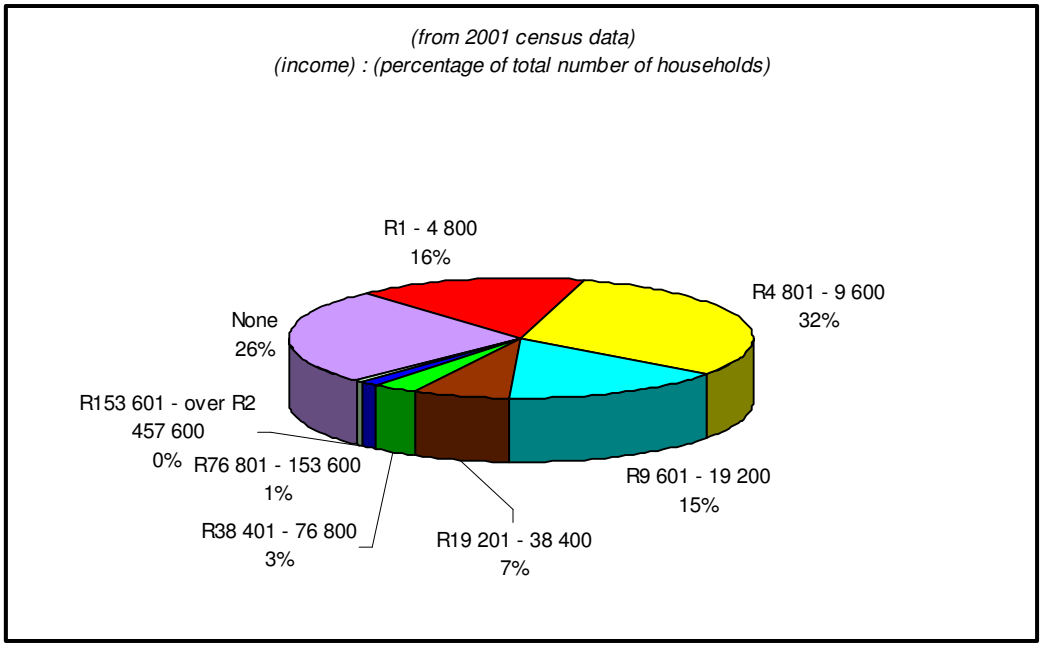


Figure 6.9 Chart: Aganang – 2001 demographics – 2001 – annual household income
(from 2001 census data)

Low-income levels in Aganang are also evidenced by the low average monthly individual income in 2001. More than 77% of the population had no income, correlating with only 23% of the population being employed. A further 19% of the population earned less than R 800 per month. This again emphasises the need for job creation, and the development of a waste management plan for the area that will generate income for the area.

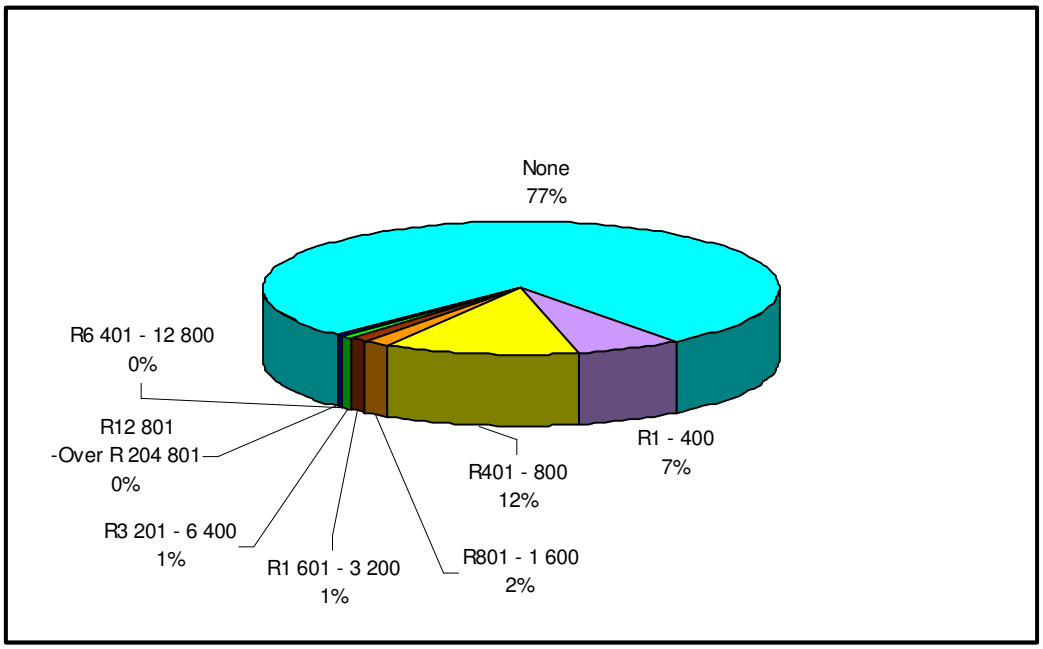


Figure 6.10 Chart: Aganang – 2001 demographics – 2001 – individual monthly income
(from 2001 census data)

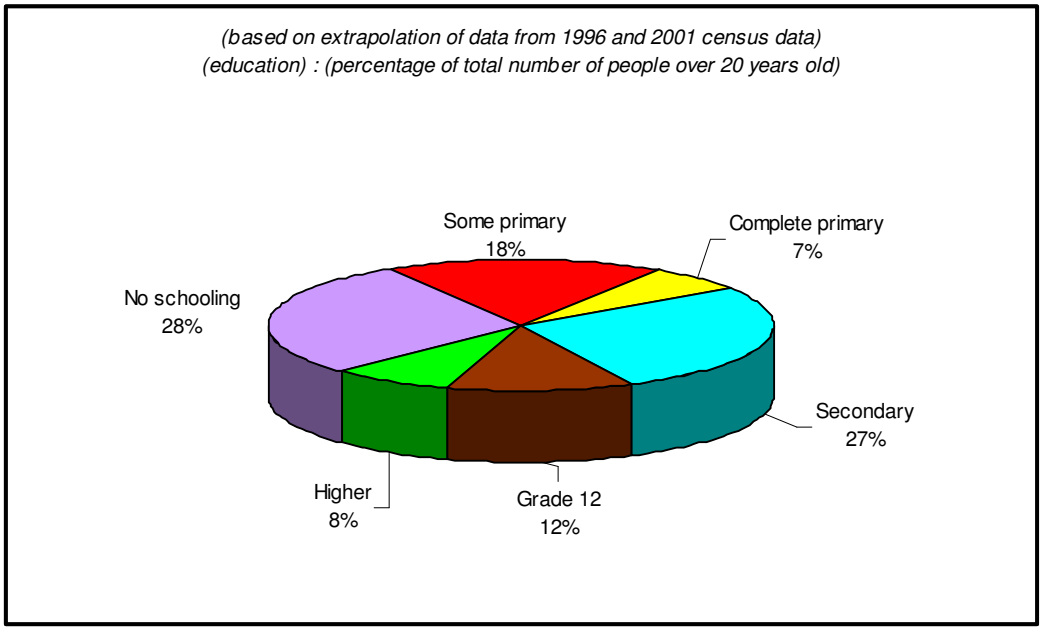


Figure 6.11 Chart: Aganang – 2004 demographics – highest education level obtained by over 20 year olds
(based on extrapolation of data from 1996 and 2001 census data)

6.6 AVERAGE LEVEL OF EDUCATION

The level of education in Aganang is low. Of persons over 20 years old, 46% have no schooling or have not completed primary school, while only 9% of the population have some form of higher education. This is shown in Figure 6.11.

As previously discussed, the low level of education in the region indicates that for the development of SMME's and of a local work force that could readily be employed in more sophisticated types of jobs in the waste management sector, a relatively high level of training will be required. There is, however, the advantage that the waste sector has the potential to generate high numbers of elementary jobs e.g. waste sorting for recycling; waste collection; composting etc. where little formal education will be required.

6.7 SCHOOLING

As part of the waste survey conducted, schools were identified in all villages surveyed, and detailed questionnaires regarding aspects such as number of learners, waste facilities available etc. were completed by numerous of the schools. The results of the school detailed questionnaires are included in ***Appendix J***. A summary of the findings with respect to numbers of schools and pupils is included in Table 6.4.

Table 6.4 Summary of education facilities and numbers of learners attending education facilities

Schools Identified in Waste Survey 2004					
Level of schooling	**Number of schools**	**Number of learners**	**Number of learners per school**	**Number of educators**	**Number of learners per educator**
Primary	66	17 498	265	520	34
Secondary	48	16 049	334	512	31
Combined Schools	0	0	0	0	0
TOTAL	114	33 547	599	532	65

When conducting the waste survey, the numbers of learners and educators per school were obtained directly from representatives of the various schools, often the principal of the school. It is therefore believed that the relative figures, such as number of learners per school and number of learners per educator, as determined from the waste survey, are reasonably reliable.

Table 6.5 Estimate of number of learners based on census data

Population Figures Based on Census 1996 and Census 2001			
	1996	**2001**	**2004 (Projected)**
5 to 14	46 810	45 330	44 738
15 to 34	43 154	44 682	45 865
Total population (5 to 34)	89 964	90 012	90 603
Population Figures Based on Census 1996 and Census 2001 adjusted to give estimate of number learners			
78% of 5 to 14	36 512	35 357	34 896
25% of 15 to 34	10 789	11 171	11 466
78% of 5 to 14 + 25% of 15 to 34	47 301	46 528	46 362

Total population figures for the age groups 5 to 14, and 15 to 34, as determined from the Census data, are given in Table 6.5. Based on these population figures a very rough estimate of the number of persons attending school was obtained. This was done by assuming linear population distributions across the age groups, and 100% attendance at school of persons aged 7 to 20.

It can be seen that using the census data gives a greater number of learners than given in the Waste Survey (estimate 46 362 learners in 2004 based on census data, compared to 33 547 learners as given in Waste Survey, a difference of less than 28%). This indicates that the population figures as provided in Census 2001 and Census 1996, may well be higher than the actual population.

6.8 MODE OF TRANSPORT TO WORK OR SCHOOL

The distribution of mode of travel used to work or school in 2001 is shown in Figure 6.12. The majority of the persons who do actually travel to work or school travel by foot. This could be due to work and places of education being close to places of residence, but is more likely a result of both lack of funds for transport, as well as a lack of suitable public transport systems.

This indicates that should any work opportunities be created through any waste management programmes or projects that are to be established, then places of work should ideally be located close to the work force's places of residence.

An additional factor that should be borne in mind, both with a large amount of travel on foot, as well as use of public transport systems, is that levels of littering can be expected to be high on commonly used routes, or at gathering points such as taxi ranks. Such routes and locations should be identified in the waste management plan and targeted for regular "clean-up" activities. Facilities such rubbish bins should also be located along such routes or at gathering points.

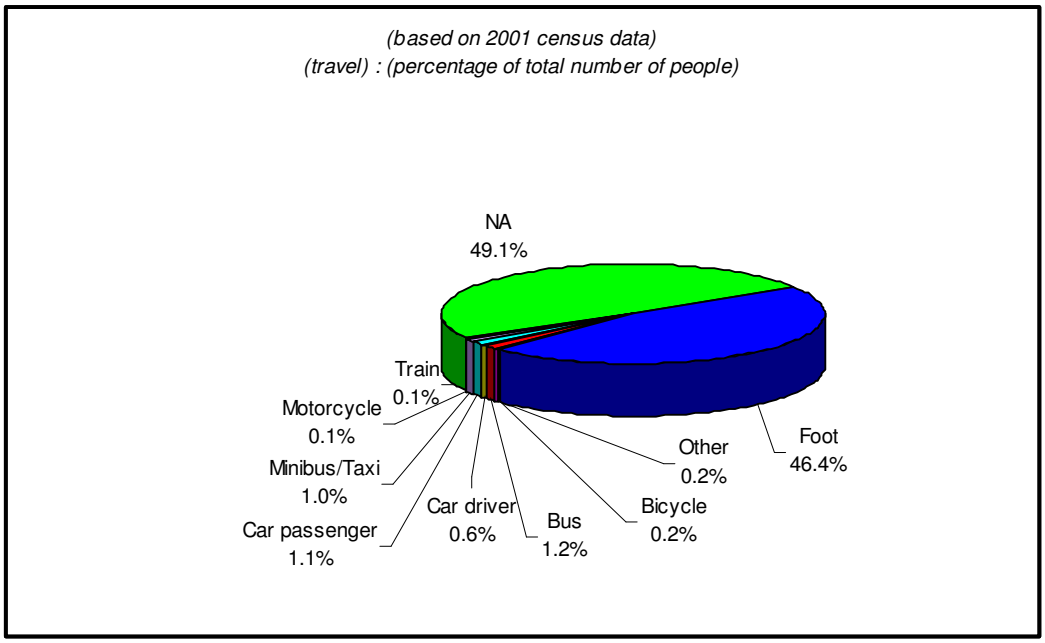


Figure 6.12 Chart: Aganang – 2001 demographics – mode of travel for work and school

(based on 2001 census data)

6.9 LEVEL OF BASIC SERVICES

6.9.1 Level of housing

The level of housing in the Aganang area is unexpectedly high for an area that is largely rural or peri-urban. Up to 91% of housing in the area can be considered formal housing (see Figure 6.13).

It was noted when conducting the waste survey that 57 new housing developments, at RDP level, are currently being planned or in progress, or have recently been completed (see ***Appendix H****: Responses to main (general) village questionnaires)*. It is estimated that some 4 428 houses will be constructed under the auspices of these developments. This comprises some 12,4% percent of the total estimated 35 778 households in Aganang (estimated from waste survey).

6.9.2 Source of energy for lighting

Again, based on the census figures, the level of provision of electricity to households for lighting is relatively high, with some 68,5% of households using electricity for lighting. The other main source of energy for lighting is candles, with approximately 27,3% of households using candles for light (Figure 6.14).

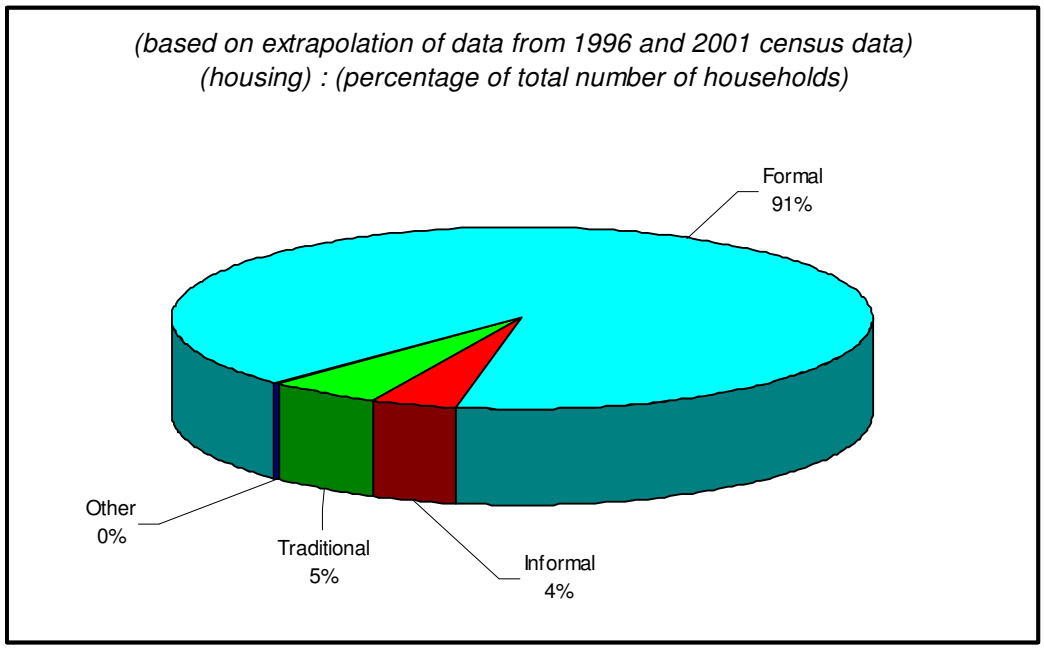


Figure 6.13 Chart: Aganang – 2004 demographics – dwelling type
(based on extrapolation of data from 1996 and 2001 census data)

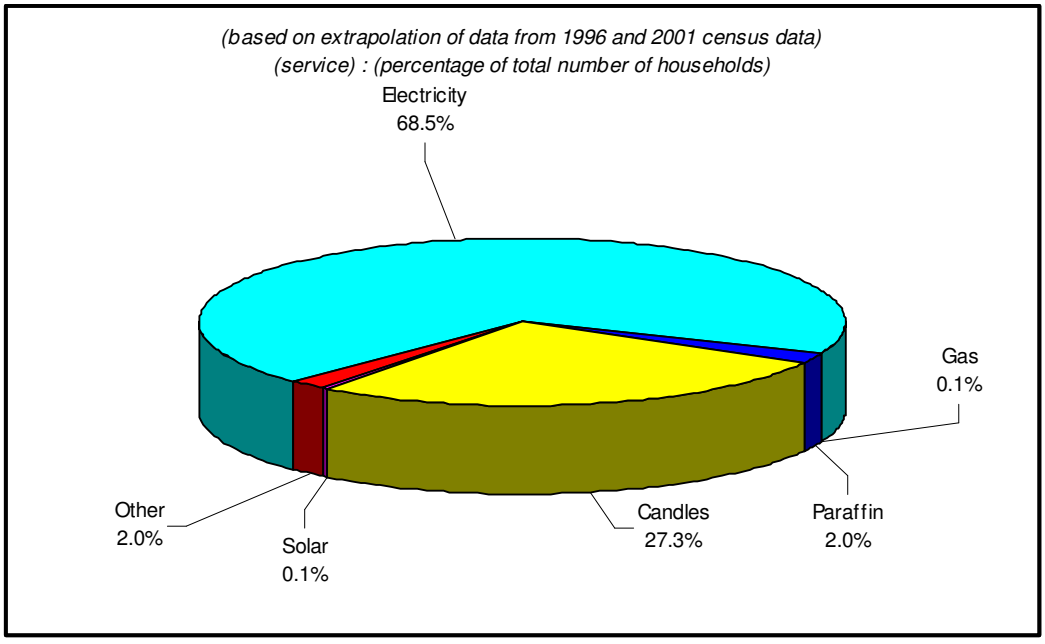


Figure 6.14 Chart: Aganang – 2004 demographics – source of energy for lighting
(based on extrapolation of data from 1996 and 2001 census data)

Although census data gives an indication of what energy source is used for lighting, there is no data available on what energy source is used for cooking.

This is significant when considering waste management aspects, as if wood fires are used for cooking, then it is often the case that waste such as cardboard and garden waste will be burnt. Should this be the case then it may be possible to make less provision for waste of this type in the waste management programme. It must, however, be borne in mind that ideally all households will ultimately use electricity, thus the time period for provision of electricity must be assessed when considering long term waste planning, as extending the provision of electricity in the communities may possibly result in increased waste generation rates.

6.9.3 Refuse collection / waste management services

According to the census data, only 11% of the Aganang population do not have any refuse collection or waste management services, with 88% of the community using what is defined as “own dump”, and 0% of the community using “communal dumps” (0). In the opinion of the study team, the use of “own dump”, as well as communal dumps, is effectively the equivalent of having no waste management services. In all instances such dumps would be illegal, unless on private property. In addition, even if such dumps are on private property, the volumes of waste dumped here will accumulate, with problems associated with poorly managed waste developing e.g. odours, flies, vermin such as rats etc. Considering these figures, effectively only 1% of the Aganang population receive any form of waste management services. This correlates closely with the findings of the waste survey (see ***Appendix H***), where it was found that some 0% of the population live in communities where waste collection services are provided, although these services need significant improvement.

6.9.4 Sanitation

As can be seen in Figure 6.16, levels of sanitation in the community are relatively low, although is to be expected in more rural and peri-urban, low-income communities. Only 4,7% of the population have some form of flush or chemical toilet. The remainder of the population either do not have any sanitation at all (20,9%), or are reliant on a form of pit or bucket latrine (58,7%).

This is significant in that sludge generation from waste water treatment plants will be limited, but volumes of sludge collected from pit latrines, using honey-suckers or similar, will be relatively high.

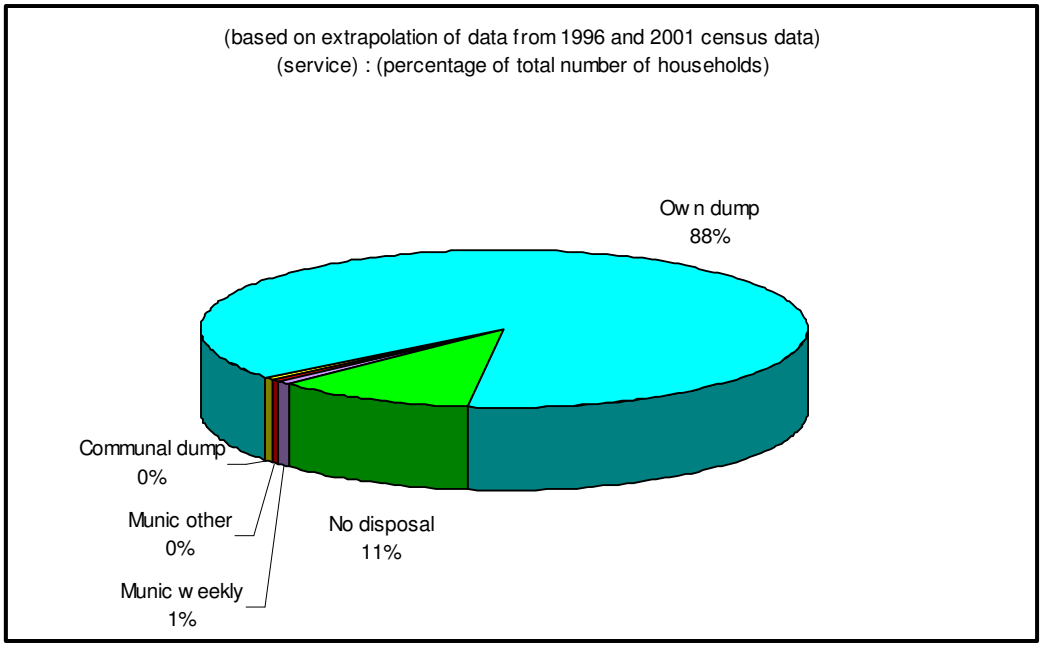


Figure 6.15 Chart: Aganang – 2004 demographics – refuse collection / waste management services

(based on extrapolation of data from 1996 and 2001 census data)

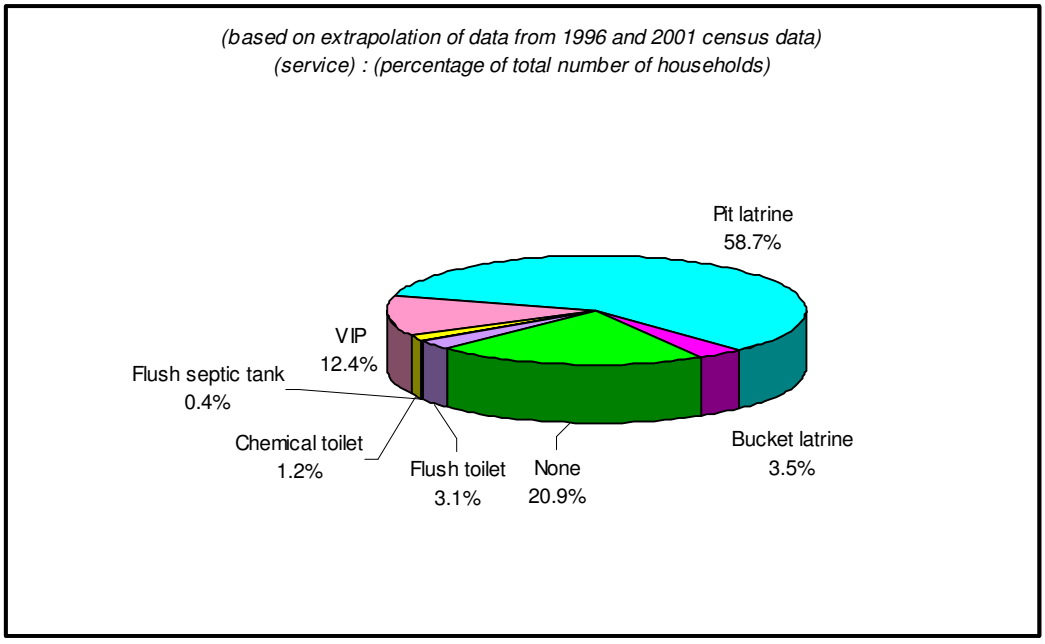


Figure 6.16 Chart: Aganang – 2004 demographics – sanitation

(based on extrapolation of data from 1996 and 2001 census data)

6.9.5 Water supply

The level of water supply systems in Aganang is also relatively high, considering its rural / peri-urban , low-income status. Based on census data, only 0,5% of the population are reliant on water taken directly from rivers, streams, dams, pools or even stagnant water. A significantly low percentage of the population do, however obtain water from water vendors. This means that the community will most likely be paying a lower per capita cost for water supply than numerous other rural / peri-urban communities. This would, in turn, affect the communities ability to pay for waste management services, as their base income is not being spent on essential service viz. water supply.

If this hypothesis is in fact correct, then higher levels of payment for water would increase as the extent of more formal water supplies grow in the communities. This would again mean that the sustainability of waste management systems, from a financial perspective, would be linked to the provision of other basic services.

An aspect that is considered positive with the relatively high levels of water supply in the communities is that water should be relatively accessible for any composting, waste recycling programmes etc. that could be initiated in the communities.

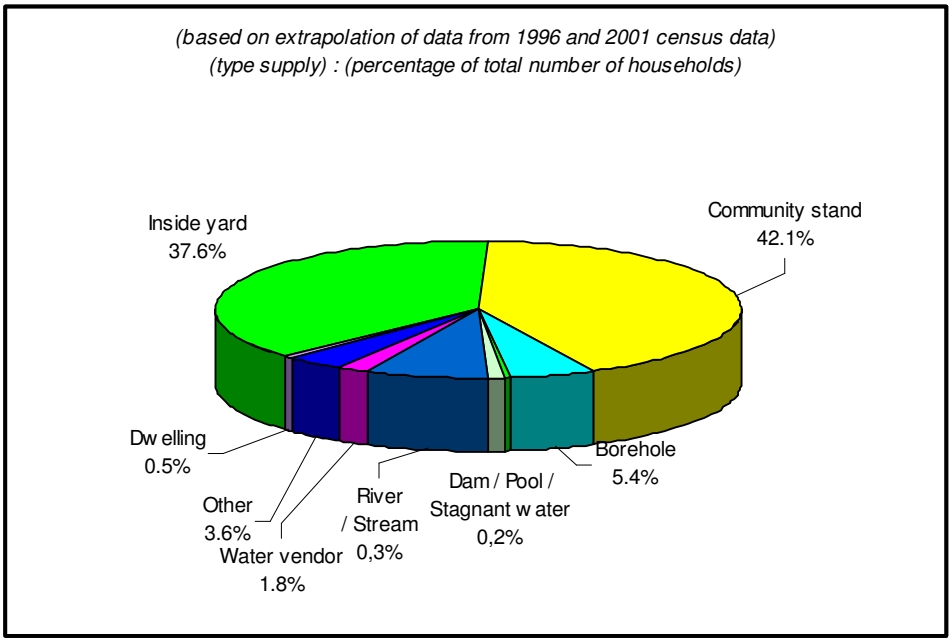


Figure 6.17 Chart: Aganang 2004 demographics – water supply
(based on extrapolation of data from 1996 and 2001 census data)

6.10 POPULATION GROWTH RATE

Population growth rates per ward, per gender and age, as determined based on the census data, are shown in Table 6.6 on the following page.

The population growth rates vary considerably across the region, from –2,6% in Ward 2, to +5,7% in Ward 9, with an overall growth rate of approximately 0,8%.

These figures indicate that there are overall negative population growth rates in seven of the eighteen wards of Aganang, viz. Wards 2, 3, 8, 10, 13, 15 and 17. In addition, there are negative growth rates in specific sectors of the population in other wards.

It is believed that these negative population growth rates can be attributed to two main factors, namely:

- Migration from rural areas to more urbanised areas, and
- Increasing death rates caused by HIV / AIDS.

Considering the entire Aganang population, it is difficult, if not impossible, to determine which of the above-mentioned factors are the main cause of the decline in the population. Amongst both men and women, the most significant decline in population occurs in the age groups 0 to 4 years, 5 to 14 years and 15 to 34 years. These age groups would be those most significantly impacted by both migration and HIV / AIDS deaths.

In the case of migration, the 15 to 34 year age group is the most economically productive and employable sector of the population, and would therefore be those most likely to migrate to more urban areas in search of jobs. In the case of women migrating, either permanently or for work, it is becoming more common that they take their children and babies with them, as opposed to leaving them in the rural areas with older relatives to care for them. Thus, increasing migration of age group 15 to 34, could result in an associated reduction in the number of children / babies, age group 0 to 4 years, in the communities. There could however, also be significant migration in the age group 5 to 14, with children leaving the rural areas to attend schools. Also, as more children in this age group are left as orphans, they may migrate to the towns where they believe they can eke out a living on the streets.

In the case of increasing HIV / AIDS deaths, the 15 to 34 year age group will be the most severely affected. This is the most sexually active sector of the population, and as such the highest incidence of HIV occurs in this age group. Thus, as the rate of deaths due to HIV / AIDS increases (see Table 6.8), this will be the sector of the population that will be the most severely affected.

Table 6.6 Population growth rates per gender and age

	Total	Males - 0 to 4	Males - 5 to 14	Males - 15 to 34	Males - 35 to 64	Males - Over 65	Females - 0 to 4	Females - 5 to 14	Females 15 to 34	Females 35 to 64	Females Over 65	Males - Total (given)	Females - Total (given)
Total	0.8%	-3.7%	-0.5%	1.1%	3.5%	2.7%	-2.5%	-0.6%	0.5%	2.0%	3.6%	0.3%	0.4%
Ward 1	1.0%	-4.5%	0.4%	2.2%	2.4%	4.8%	-4.4%	-0.4%	-0.1%	2.3%	3.7%	0.8%	0.2%
Ward 2	-2.6%	-5.4%	-4.5%	-2.8%	-1.9%	0.3%	-5.8%	-4.4%	-4.0%	-1.8%	-0.3%	-3.5%	-3.6%
Ward 3	-0.5%	-5.1%	-1.9%	-2.0%	2.7%	3.9%	-4.5%	-0.8%	-1.3%	2.9%	4.6%	-1.5%	-0.2%
Ward 4	4.2%	1.1%	2.9%	5.1%	6.7%	9.6%	-1.3%	2.8%	2.6%	4.7%	7.6%	4.2%	3.0%
Ward 5	1.0%	-3.1%	0.6%	0.4%	5.0%	0.7%	-2.8%	-0.3%	0.8%	1.8%	2.1%	0.7%	0.4%
Ward 6	0.5%	-3.8%	-0.6%	-0.1%	4.6%	4.2%	-3.1%	0.3%	0.2%	1.5%	4.4%	0.1%	0.5%
Ward 7	1.3%	-4.0%	0.5%	2.4%	4.9%	2.1%	-2.9%	0.4%	0.3%	2.6%	4.0%	1.0%	0.7%
Ward 8	-1.0%	-5.8%	-2.2%	0.2%	3.2%	-0.7%	-4.8%	-1.7%	-0.6%	0.9%	0.4%	-1.3%	-1.1%
Ward 9	5.7%	2.2%	5.4%	3.9%	6.6%	1.9%	5.6%	5.0%	5.5%	5.4%	7.6%	4.5%	5.5%
Ward 10	-0.9%	-6.2%	-2.7%	-1.1%	0.2%	1.8%	-3.0%	-3.3%	-1.6%	-0.1%	-0.1%	-2.0%	-1.8%
Ward 11	0.4%	-4.9%	0.5%	2.2%	2.3%	4.7%	-1.7%	-1.6%	1.1%	1.8%	4.4%	0.7%	0.4%
Ward 12	4.1%	-1.3%	2.8%	3.2%	5.4%	3.4%	-0.4%	0.4%	3.5%	3.8%	6.8%	2.7%	2.6%
Ward 13	-1.1%	-7.1%	-3.3%	0.0%	1.6%	1.9%	-4.1%	-2.9%	-1.9%	0.2%	3.9%	-1.9%	-1.5%
Ward 14	0.3%	-4.2%	-2.9%	-1.1%	1.4%	1.5%	-2.6%	1.3%	2.2%	-0.1%	1.4%	-1.7%	0.8%
Ward 15	-0.6%	-4.9%	-1.8%	-0.2%	2.1%	1.3%	-0.1%	-1.1%	-1.0%	1.7%	1.2%	-0.9%	-0.2%
Ward 16	2.7%	-1.2%	0.3%	4.1%	6.8%	3.9%	-2.4%	-0.1%	2.2%	4.7%	7.2%	2.4%	2.0%
Ward 17	-0.2%	-5.4%	-0.1%	1.2%	3.3%	0.7%	-4.0%	-3.6%	1.1%	2.8%	0.5%	0.1%	-0.6%
Ward 18	1.9%	-2.5%	0.2%	2.2%	5.5%	3.3%	-0.2%	-0.2%	1.6%	3.4%	4.7%	1.4%	1.5%

The increasing number of deaths due to HIV /AIDS, will impact on the age group 0 to 4 years almost as severely as on that of 15 to 34 years. As the incidence of HIV / AIDS increases in the latter age group, so too will the incidence increase in new born babies, who have been infected by mothers who have not had access to appropriate treatment during their pregnancies, or have infected their children through breast feeding.

The 0 to 4 year age group will be further impacted in that they will lack the necessary care and attention as more and more adults die, leaving orphans who are unable to fend for themselves. Again, the youngest children will be most severely affected, as they will not have any basic survival skills.

Considering medium to long-term planning for solid waste management, the main point of concern is whether to plan for growing or declining populations. It is not believed critical that there is uncertainty as to the population growth rates at this time, but it will become increasingly important to have a good estimate of population sizes and growth rates as long term plans are conceptualised and implemented. It is, therefore, extremely important that a system be instituted whereby population sizes and growth rates can be monitored and determined more easily, thereby facilitating long term planning for, not just waste management services, but all developments and development programmes. Such systems would include aspects such as detailed records of birth and death rates, causes of death, numbers of pupils attending schools, and numbers of households in a given community.

6.11 BIRTH AND DEATH RATES

Birth and death rates for Limpopo Province, per gender and age, 2001, are shown in Table 6.7. The 2001 average death rate for all persons (all age groups) in Limpopo Province is in the order of 1,167 deaths per thousand persons per annum, with the death rate being higher amongst men (1,294 deaths per thousand men per annum) than amongst women (1,060 deaths per thousand women per annum). The 2001 average death rate for the adult population (+15 years) is 1,789 deaths per thousand per annum.

Table 6.7 Limpopo Province: 2001 birth and death rates

Birth and death rates derived from "Causes of Death Statistics' for 2001 (Courtesy Department of Health and Welfare, Limpopo Province)

Source of population figures http://www.statssa.gov.za/extract.htm (Courtesy Department of Health and Welfare, Limpopo Province)

Age	Male Deaths	Male Population	Male Deaths / 1000	Female Deaths	Female Population	Female Deaths / 1000	Total Deaths	Total Population	Total Deaths / 1000
0-4	176	299 651	0,587	145	302 870	0,479	321	602 521	0,533
5-9	28	358 763	0,078	26	361 218	0,072	54	719 981	0,075
10-14	41	374 656	0,109	18	379 586	0,047	59	754 242	0,078
15-19	55	344 877	0,159	39	350 684	0,111	94	695 561	0,135
20-24	90	219 622	0,410	124	257 290	0,482	214	476 912	0,449
25-29	151	152 995	0,987	248	214 448	1,156	399	367 443	1,086
30-34	221	122 022	1,811	253	174 749	1,448	474	296 771	1,597
35-39	266	109 672	2,425	211	165 408	1,276	477	275 080	1,734
40-44	247	91 351	2,704	187	134 172	1,394	434	225 523	1,924
45-49	231	76 155	3,033	142	113 749	1,248	373	189 904	1,964
50-54	226	63 346	3,568	121	87 450	1,384	347	150 796	2,301
55-59	183	46 317	3,951	115	64 226	1,791	298	110 543	2,696
60-64	237	41 853	5,663	181	70 432	2,570	418	112 285	3,723
65-69	207	30 004	6,899	210	62 952	3,336	417	92 956	4,486
70-74	235	27 501	8,545	276	61 081	4,519	511	88 582	5,769
75-79	179	15 779	11,344	147	29 270	5,022	326	45 049	7,237
80-84	171	12 799	13,360	283	29 613	9,557	454	42 412	10,705
85	156	7 421	21,021	327	19 658	16,634	483	27 079	17,837
Total Population	3 100	2 394 784	1,294	3 053	2 878 856	1,060	6 153	5 273 640	1,167
Total Adult Population (15+)	2 855	1 361 714	2,097	2 864	1 835 182	1,561	5 719	3 196 896	1,789

As death and birth rate figures for years other than 2001 are not currently available, it cannot be determined whether there is a trend in changing mortality rates in the province. However, as shown in Table 6.8, from 1995 to 2000 there was an increase of 31% in the number of adult (15+) deaths that could be attributed to AIDS. Projecting these figures, as shown in Figure 6.18, this could have increased to as much as 76% by 2004 (best fit – polynomial projection). Should the death rate of adults due to causes other than AIDS remain relatively constant, this would mean that there would be an approximate increase of 158% in adult mortality rates from 2000 to

2004, or 126% from 2001 to 2004. Considering the death rates for the Limpopo province for 2001, this increase in the adult death rate would result in an increase from 1,789 adult deaths per thousand per annum, to approximately 4,043 adult deaths per thousand persons per annum. This is possibly the worst-case scenario, with the actual death rate currently lying somewhere between these two figures (1,789 to 4,043 deaths per thousand adults per annum).

Table 6.8 Estimated percentage of adult (15+) deaths due to AIDS in South Africa

Year starting 1 July	% of deaths due to AIDS
1995	9%
1996	14%
1997	19%
1998	26%
1999	33%
2000	40%

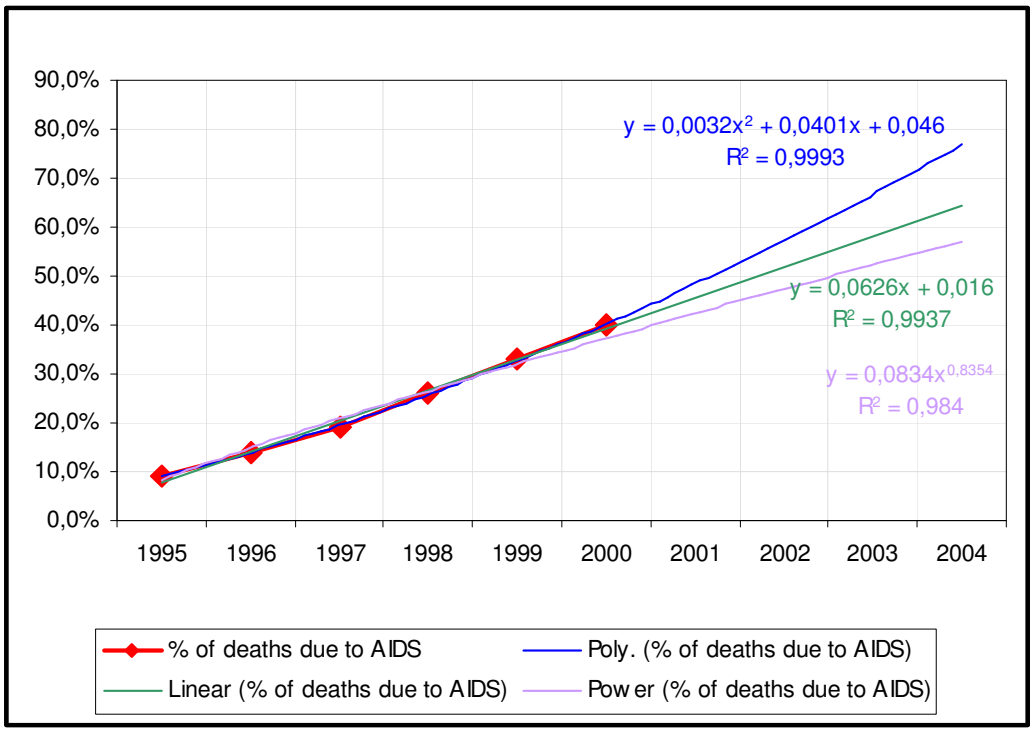


Figure 6.18 Estimated percentage of adult (15+) deaths due to AIDS in South Africa

(Ref. Journ-AIDS (2003): HIV / AIDS in South Africa. Journ-AIDS: HIV/AIDS Resources for Journalists. A CADRE Media Support Project. http://www.journ-aids.org/HIV-AIDS)

6.12 HIV / AIDS

6.12.1 General impacts of HIV / AIDS in Southern Africa

The first reported cases of HIV occurred in South Africa in the mid 1980's. Since that time South Africa has become not only one of the countries most severely affected by HIV in the world. (Ref. 25), but has one of the fastest growing HIV epidemics in the world. (Ref. 33)

The HIV / AIDS epidemic in Southern Africa is a development issue. Without access to life prolonging treatment, and reductions in current rates of infection, the epidemic will negatively impact on all sectors of society. Even with the provision of appropriate medical treatment, the disease will have a significant economic impact on the country.

The economic impact of AIDS includes costs to both the public and private sectors, as well as to individual households and communities. Costs to workplaces include:

- Increasing numbers of staff falling ill, with associated increases in costs of medical services that must be borne by employers e.g. medical aid contributions.
- The need to replace and train new staff members.
- Costs associated with reduced productivity owing to attendance at funerals, and caring for friends and families living with HIV/AIDS. (Ref. 26)

The greatest economic cost will, however, be felt at the household and community level, where increasing amounts of personal income will be expended on health-care and support and funerals. These costs can only be covered through diverting expenditure away from core resources. (Ref. 26)

As an increasing number of people become too sick, too poor or too overburdened to provide for themselves and their families, HIV/AIDS will impact negatively on food production, employment levels, and household income levels. The United Nations warns that HIV/AIDS threatens to destabilise countries across the southern and sub-Saharan Africa, by undermining social services, weakening communities and creating an increasing orphan population. (Ref. 26)

6.12.2 Potential impacts of HIV / AIDS on the waste management sector

As with every other service provision sector, considering the general impacts of HIV / AIDS on society, it can be seen that the epidemic could have a significant impact on the waste management sector. Potential impacts on the sector are discussed on the following pages. It must be noted that the potential impacts discussed give possible worst-case scenarios, where actions such as

HIV / AIDS prevention and education programmes have no impact on the spread of the disease.

- ***Population projections for planning purposes***
  Although the understanding of the HIV / AIDS epidemic has improved dramatically over the last decade, there is still uncertainty as to how it will impact on population growth rates, possibly even resulting in a decline in populations in some areas. This makes long term planning for the provision of services, including waste management, extremely difficult, particularly where costly infrastructure development may be required at the outset of a planning period.

- ***Ability to pay at individual, household or community level***
  As stated previously, the greatest economic cost of HIV / AIDS will be felt at the household and community level, where increasing amounts of personal income will be expended on health-care and support, and funerals. In addition, as the most productive sector of the population (age 15 to 34) is likely to be the most severely affected by the disease, the average income per household will decrease as more people become unable to work due to illness. This will severely impact on the individual, household and community ability to pay for the provision of basic services such as waste management.

  Part of long-term financial planning for the provision of basic services generally incorporates at least some level of cost recovery, through payment of levies or rates, from the receiving community. A reduction in the effective disposable income of communities must therefore be taken into account when evaluating the potential income from levies or rates, and assessing external funding requirements for the provision of a given service (here waste management).

- ***Ability to pay at corporate / company level***
  The potential costs of the HIV / AIDS epidemic to workplaces are outlined previously in Section 6.12.1. These costs can be expected to have an impact on the overall profitability of the private sector, as well as on the financial requirements of the government sector. In the private sector, this will, in turn, affect the potential for economic growth and expansion, particularly into new types of business or development ventures where initial capital input will be required. It may even impact on the sustainability of some businesses, making them no longer economically viable. This would be particularly true of businesses / enterprises that are labour intensive; as well as of SMME's, where the effective float that an enterprise would have to carry additional expenses will generally be smaller than in the case of larger businesses.

A decrease in the ability of the private sector to invest in new developments must be considered when planning for waste management. This is particularly true in South Africa, where some of the goals of long term waste management planning include the development of SMME's and of public-private partnerships for the delivery of waste management services, and for associated enterprises such as manufacturing from recycled materials.

- ***Ability to pay at government / municipal level***

  In low-income communities it is likely that some form of government (municipal) subsidy will be required for the provision of adequate waste management services. This subsidy could be provided from various funding sources, including direct contributions from municipal funds or local government annual budgets, from donor or private funding, grants or loans etc. Here, the source of funding for such subsidies is not necessarily important, rather, what must be considered is the total pool of funds available for use by local government, and the total cost of all types of service provision, including medical services, housing, water, sanitation, schooling etc. Should the cost to local government of medical services increase significantly, which could be expected with the growth of the HIV / AIDS epidemic, then less funding will be available for the provision of other services. Local government will then have to either divert funds from the provision of basic services other than medical services, or will have to seek additional funding sources. Ideally, such funding should not take the form of loans, as the local government ability to pay back any loans will also be reduced.

  The actual costs accrued for the running and management of all local government divisions will also increase with the increase of the epidemic. As previously mentioned, costs to the workplace, including government employers, will include aspects such as:

  - Increases in costs of medical services that must be borne by employers e.g. medical aid contributions.
  - Training for new staff members.
  - Costs associated with reduced productivity due to absenteeism owing to illness, attendance at funerals, and caring for friends and families living with HIV/AIDS.

  Additional costs such as these will again affect local governments' ability to pay for the provision of basic services. Funds will necessarily have to be redirected from payment for service provision and infrastructure development etc. to administrative, management staff and training costs to ensure that the municipality can continue to run efficiently.

- ***Medical waste***
  As the number of persons affected by HIV / AIDS increases, so too will the demand for medical services increase, with an associated increase in medical waste volumes. Due to the highly infectious nature of the disease, the type of medical waste generated will necessarily be defined as hazardous waste. Provision must therefore be made for the safe disposal of increasing hazardous medical waste, as the HIV / AIDS epidemic grows.

- ***Severity of impacts of no waste management***
  The severity of the impacts associated with no provision of waste management services could increase as the prevalence and incidence of the disease increases. When conducting the waste survey, comments from the community indicated that through lack of provision of waste management services, the risk of HIV / AIDS infection of the general public, particularly children, is increased. The risk of infection could be increased through increased numbers of open type wounds (cuts, abrasions etc.), and treatment of such wounds, resulting from injuries caused by waste; through children playing with infected waste such as condoms, hospital sharps and other medical waste etc. Typical comments from the community indicating problems of this nature follow:
  - *"Waste **causing injury & accident to community members, especially children playing with waste. Waste such as broken glass** and plastics also causing death amongst livestock."*
  - *"Waste is a serious concern to the community. Some community members dig waste pits in the corners of their yards, whilst other just throw waste in the veldt. **Children play with waste, which poses an extreme health hazard, e.g. children have been found playing with used condoms which they use as balloons.** It is therefore essential that waste management be implemented."*
  - *"A senior professional nurse was ecstatic to hear of this project which is investigating the status quo of the waste management situation in the Capricorn District. She noted that patients come to the clinic suffering from food poisoning, particularly children who have eaten remains from tins of spaghetti, fish etc. that they have found, that are off. Other patients suffer from other diseases that are related to waste. **She has also encountered children playing with used condoms.** She therefore feels it critical that the municipality consider waste management a priority."*
  - *"A Headman noted experienced problems e.g. **children play in illegal waste dumps which results in injury to the children**. The illegal dump is not fenced. Should the municipality take care of waste it will benefit the community. It was also noted that during the dry season or droughts, one of the main causes of death of livestock is complications arising from livestock having eaten plastic bags."*

- ***Institutional and private sector capacity and sustainability***
  As mentioned above, HIV / AIDS could have severe impacts on both the public and private sector through resultant increases in absenteeism and rapid turnover of staff. This will not only have cost implications in the workplace, but will also affect the capacity of both the public and private sector to deliver services. Aspects that will affect capacity include:
  - Rapid turnover of staff could result in insufficient training for persons entering the workplace, as it becomes a matter of urgency to fill posts that become vacant.
  - There can be an expected loss of expertise in the workplace, as, with a rapid turnover of staff through increasing mortality rates, there may be insufficient time for persons with experience to transfer skills. In addition, the level of experience of persons in the work place could be expected to drop, with an associated drop in levels of expertise.
  - Should there be rapid turnover of staff in higher echelons in the workplace, this could result in problems such as poor management. Generally, to achieve good management and efficient running of any enterprise, a certain level of continuity is required. Such continuity as may be required could be lost through absenteeism or loss of staff.

  Not only the capacity, but also the sustainability of institutions and businesses could be affected, particularly of SMME's. With high levels of absenteeism, the actual staff contingent in any institution or enterprise may have to be increased to ensure that there is sufficient capacity to complete all work required even when there are a large number of staff absent. This would have particularly severe impacts on SMME's, where there is often the situation that there is not a duplication of skills within the company.

6.12.3 Accounting for HIV / AIDS impacts in long-term planning

Considering the potential severity of the impacts of HIV / AIDS on the waste management sector, it is essential that the current and projected situations regarding the disease be taken into account when developing intermediate and long-term plans for the sector. The situation with respect to HIV / AIDS in the district should be extrapolated or projected, and applied to demographic data available at local level, when intermediate to long-term projections for waste generation rates, potential income from levies etc. are done. These projections must also consider the possible impacts (positive) of interventions such as the Government's programme on HIV/AIDS is outlined in the HIV/AIDS / STD Strategic Plan for South Africa, 2000-2005.

For these reasons, the findings of three important studies investigating the current (or recent) situations regarding HIV / AIDS in South Africa have been included in this report. These studies are:

- The National Antenatal Clinic (ANC) HIV prevalence survey.
- The Nelson Mandela / HSRC Study of HIV/AIDS: South African National HIV Prevalence, Behavioural Risks and Mass Media Household Survey 2002 (Ref. 32).
- The Actuarial Society of South Africa: AIDS 2000 - AIDS and demographic model.

These studies do not, however, give statistics on HIV / AIDS prevalence; infection rates etc. at district or local level, but only at country and provincial level. For this reason the current situation with respect to the disease in South Africa and the Limpopo Province as a whole, and not at district level, is discussed below.

6.12.4 Key terms and understanding HIV/AIDS statistics

To assist the reader in having a clearer understanding of the findings of the studies on HIV / AIDS, a number of key terms related to HIV / AIDS statistics are defined below.

- *"**HIV prevalence**: Is the estimated percentage of the adult population living with HIV at a specific time (Ref. 37). Prevalence is always expressed as a percentage. It describes the HIV trends in terms of time, place (province) and age. National level prevalence surveys are usually conducted using pregnant women attending antenatal clinics as the sample population (Ref. 12). However, they can be conducted amongst a sample of the general population (for example, as was done in the Nelson Mandela/HSRC Survey), but also in workplaces, in specific communities, or amongst particular populations (for example sex workers, or truck drivers)."* (Ref. 25, Ref. 26)

- *"**HIV incidence** Is the number of new infections occurring over a given time period among previously uninfected people. This is usually expressed as a number of a particular population – for example, it is estimated that there are 600 new infections occurring per day."*

  "Measuring new infections is a complex process and is usually estimated rather than being measured directly."

  "Estimates are usually derived from antenatal prevalence surveys, by estimating incidence using prevalence rates amongst young people (e.g. 15-19 year olds) as it is more likely that any infections in this group will have occurred quite recently. Although there are limitations to this approach, changes in HIV prevalence amongst younger age groups may reflect important new trends in the epidemic (Ref. 37)". (Ref. 26)

- *"**Mortality Rate -** Mortality rates are the measure of number of deaths per number of persons in a given area and time."* (Ref. 25)

- *"**Confidence Interval -** The term "95% confidence interval (CI)" is often used in HIV prevalence and behavioural surveys. Confidence intervals show how precise an estimate is. For example, the HIV prevalence of 15-19 year olds might be estimated to be 13% – but we need to know how precise that estimate is. What the 95% CI shows is the level of confidence that is influenced by the number of observations of HIV infection – so for example, the sample size might have been too small to make a very accurate estimate, and what is then given is the likely range of the estimate. In the case of the example, the researchers would say that they believe that the rate is 13%, but because of the limitations of their sample, this might range from 10% to 16%, with a 95% likelihood that it is 13."*

  "Narrower CI ranges indicate a higher level of sampling efficiency – so a CI range of 12%-14% is better than a range of 10%-16%, in the case of our example." (Ref. 26)

6.12.5 National Antenatal Clinic (ANC) HIV prevalence survey

The Antenatal Clinic Survey (ANCs), conducted by the Department of Health, has been undertaken in South Africa since 1990. This ongoing study comprises an anonymous, unlinked survey among pregnant women attending antenatal care at selected sites in all nine provinces of the country. The survey involves analysis of blood drawn from approximately 18 000 women in their third trimester in October each year and tests are done for HIV and for syphilis. Results are analysed by province and by age and estimates are made for the population as a whole.

The data derived from the ANCs provides an estimate of HIV prevalence amongst pregnant women attending public sector antenatal clinics. These prevalence levels provide us with a picture of the HIV epidemic over time.

According to the ANCs (Ref. 12), it was estimated that nationally 24,8% of pregnant women were infected with HIV by the end of 2001, with HIV prevalence increasing to 26,5% in pregnant women by the end of 2002. It was also estimated that approximately 4,74 million people in South Africa were living with HIV/AIDS by the end of 2001.

Figure 6.19 shows the trends in HIV infection amongst women attending antenatal clinics in South Africa from 1990 to 2002. (Ref. 25, Ref. 26)

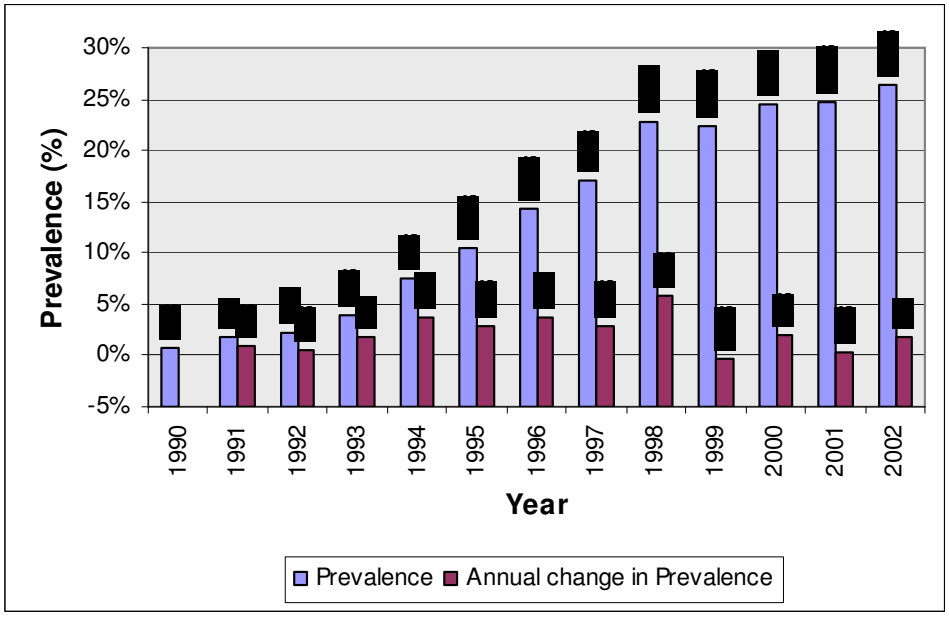


Figure 6.19 HIV prevalence trends among antenatal clinic attendees in South Africa, 1990 - 2002

Source: Department of Health, 2003. National HIV and Syphilis Antenatal Sero-Prevalence Survey in South Africa: 2002

- ***Provincial HIV prevalence estimates***
  The sampling design for the ANCs has been such as to enable reliable estimates of HIV at provincial level. Provincial prevalence rates show the geographic variations in the HIV epidemic. As expected, the provinces are at different stages of the HIV epidemic and the epidemiological pattern of HIV is not the same for all provinces. Table 6.9 shows the provincial HIV prevalence estimates in antenatal clinic attendees, from 1996 to 2002. Figure 6.20 shows HIV prevalence by province in 2000 and 2001.

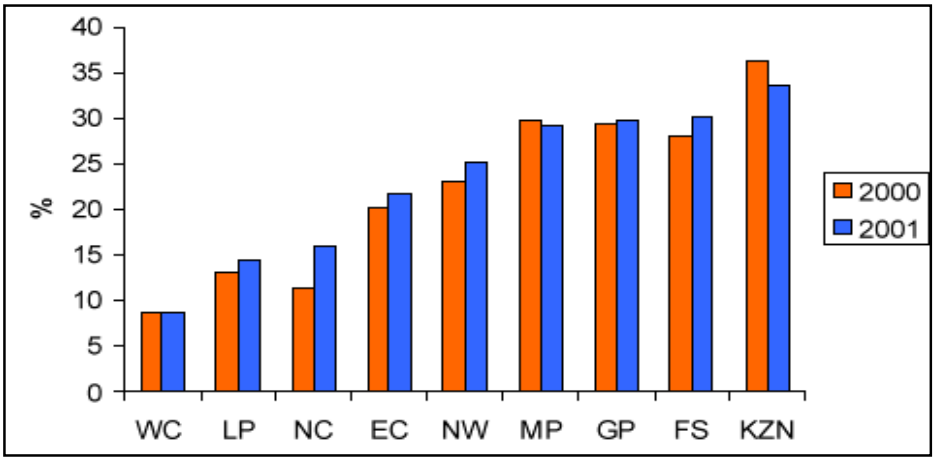


Figure 6.20 HIV prevalence by province among antenatal clinic attendees in South Africa, 2000-2001

Table 6.9 Provincial HIV prevalence estimates: Antenatal clinic attendees, South Africa 1996-2002

	W. Cape	E. Cape	N. Cape	Free State	KwaZulu-Natal	Mpumalanga	Limpopo Province	Gauteng	North West	NATIONAL
1996	3.1	8.1	6.5	17.5	19.9	15.8	7.9	15.5	25.1	
1997	6.3	12.6	8.6	19.6	26.9	22.6	8.2	17.1	18.1	
1998	5.2	15.9	9.9	22.8	32.5	30.0	11.5	22.5	21.3	
1999	7.1 (4.4-9.9)	18.0 (14.9–21.1)	10.1 (6.6-13.5)	27.9 (24.7–29.8)	32.5 (30.1–35.0)	27.3 (25.2–30.7)	11.4 (9.1-13.5)	23.9 (21.7–26.0)	23.0 (19.7–26.3)	22.4 (21.3–23.6)
2000 (95% CI)	8.7 (6.0–11.4)	20.2 (17.2-23.1)	11.2 (8.5–13.8)	27.9 (24.6–31.3)	36.2 (33.4–39.0)	29.7 (25.9–33.6)	13.2 (11.7– 14.8)	29.4 (27.2–31.5)	22.9 (20.1–25.7)	24.5 (23.4–25.6)
2001 (95% CI)	8.6 (5.8– 11.5)	21.7 (19.0–24.4)	15.9 (10.1–21.6)	30.1 (26.5–33.7)	33.5 (30.6–36.4)	29.2 (25.6–32.8)	14.5 (12.2-16.9)	29.8 (27.5–32.1)	25.2 (21.9–28.6)	24.8 (23.6–26.1)
2002 (95% CI)	12.4	23.6	15.1	28.8	26.5	28.6	15.6 (13.2-17.9)	31.6	26.2	26.5

Figures given as percentage estimated HIV infection (95% CI). N.B. The true value is estimated to fall within the two confidence limits, thus the confidence interval is important to refer to when interpreting data.
Taking into consideration that the survey was limited to women of childbearing age, estimates reflect only 15-49 year-olds.

- ***HIV point prevalence estimates by age group***

  The ANCs shows that there are different trends between HIV prevalence in young and older women. HIV prevalence trends by age group among antenatal clinic attendees in South Africa 1999-2001 are given in Table 6.10. Nationally HIV prevalence among teenagers was estimated at 15.4% in 2002, having declined from 16,1% in 2000. This decline is not, however, statistically significant. HIV prevalence in the 20 to 29 year age group did not show an increase from 2000 to 2001, whilst there was a significant increase in HIV prevalence amongst women in the 30 to 39 year age category. This is clearly shown in Figure 6.22 and Figure 6.21. The drop in prevalence in the younger age groups is indicative of a behavioural change in this sector of the population, and of the probable positive impact of HIV / AIDS intervention programmes on the spread of the disease.

Table 6.10 HIV prevalence trends by age group among antenatal clinic attendees in South Africa 1999-2001

AGE GROUP	Est HIV+ (95%CI) 1999	Est HIV+ (95%CI) 2000	Est HIV+ (95%CI) 2001
<20	16.5 (14.9-18.1)	16.1 (14.5 –17.7)	15.4 (13.8 –16.9)
20-24	25.6 (24.0-27.3)	29.1 (27.4-30.8)	28.4 (26.5 –30.2)
25-29	26.4 (24.6-28.3)	30.6 (28.8-32.4)	31.4 (29.5 –33.3)
30-34	21.7 (19.1-23.8)	23.3 (21.5-25.1)	25.6 (23.5 –27.7)
35-39	16.2 (14.1-18.3)	15.8 (13.9-17.7)	19.3 (17.0 –21.5)
40-44*	12.0 (8.5- 15.6)	10.2 (6.9- 13.3)	9.1 (6.2 –11.9)
45-49*	7.5 (-.77-15.9)	13.1 (2.1-24.0)	17.8 (4.3 –31.4)

**The true value could lie anywhere between the Confidence Intervals (CI)*

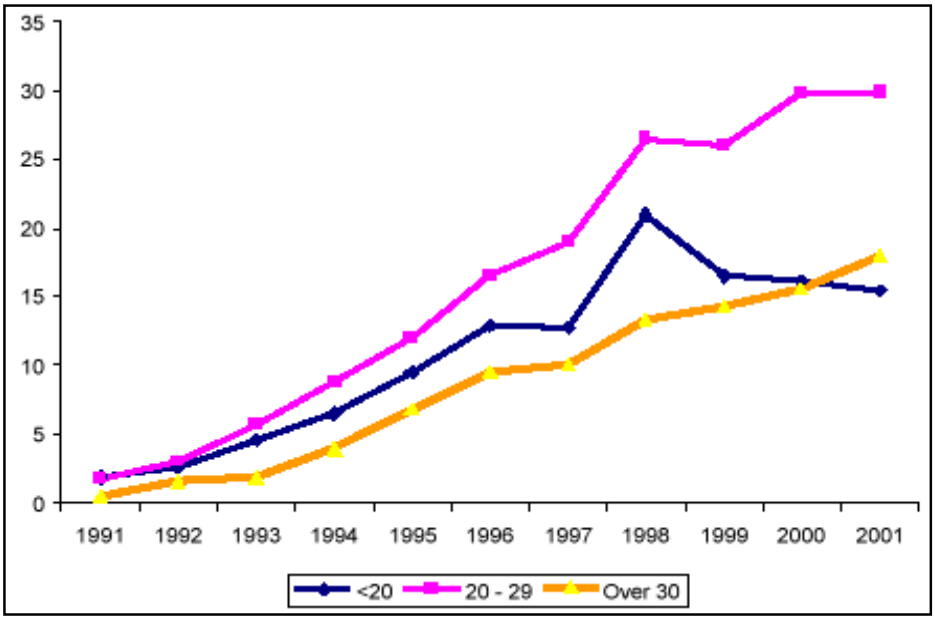


Figure 6.21 HIV prevalence by age, South Africa Antenatal Clinics. 1991 - 2001

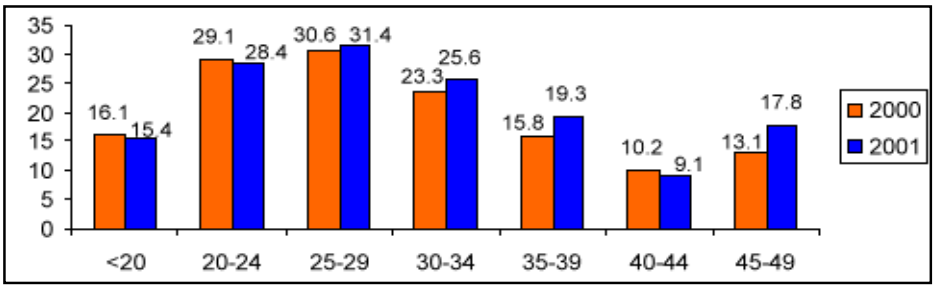


Figure 6.22 HIV prevalence by age group among antenatal clinic attendees in South Africa, 2000-2001

N.B. The sample size for women in the 45 to 49 year age group is small. Thus the prevalence rate in this group should be read with caution, as confidence intervals are wide.

- ***Summary of key findings from the ANCs***

  A summary of the key findings of the ANCs is given in Table 6.11. Estimates for HIV prevalence amongst the total population are derived from antenatal data through the use of assumptions and mathematical modelling (Ref. 37).

  When evaluating these findings, it must be noted that the ANCs has limitations in estimating national prevalence as it is limited to currently or sexually active pregnant women of a limited age group (15-49), does not include men and excludes women utilizing private medical services in South Africa (Ref. 12). The survey also does not provide information on race or geotype. (Ref. 25, Ref. 26)

Table 6.11 Summary of key findings from the ANCs 2002 (Ref. 26)

HIV Prevalence amongst pregnant women attending ANC in South Africa 2002		26,5% of pregnant women
Estimated number of people living with HIV / AIDS in South Africa		5,3 million
Females 15-49		2 950 711
Males 15-49		2 307 952
Babies Infected during 2002		91 271
HIV prevalence amongst ANC attendees in South Africa 2002		
<20		14,8%
20-24		29,1%
25-29		34,5%
30-34		29,5%
35-39		19,8%
40+		17,2%
HIV prevalence amongst ANC attendees by province 2002	**Percentage**	**95% Confidence Interval**
KwaZulu-Natal	36,5%	33,8-39,2%
Gauteng	31,6%	29,7-33,6%
Free State	28,8%	26,3-31,2%
Mpumalanga	28,6%	25,3-31,8%
North West	26,2%	23,1-29,4%
Eastern Cape	23,6%	21,1-26,1%
Limpopo	15,6%	13,2-17,9%
Northern Cape	15,1%	11,7-18,6%
Western Cape	12,4%	8,8-15,9%

Source: Department of Health, 2003. National HIV and Syphilis Antenatal Sero-Prevalence Survey in South Africa: 2002

6.12.6 Nelson Mandela / HSRC Study of HIV/AIDS: South African National HIV Prevalence, Behavioural Risks and Mass Media Household Survey 2002 (Ref. 32)

The Human Sciences Research Council (HSRC), Medical Research Council (MRC), Centre for AIDS Development Research and Evaluation (CADRE) and ANRS, conducted a national HIV prevalence household survey of South Africans over the age of two in 2002. Funded by the Nelson Mandela Foundation, the survey provided detailed information on HIV infection rates by age, race, sex, province and geotype, as well as information on knowledge, attitudes and behaviours.

The survey sampled people living in households and hostels throughout South Africa. This study drew a sample of 9 963 people countrywide and included anonymous saliva-based HIV tests from 8 840 participants. It estimated that 11.4% of South Africans, 4.5 million people, were living with HIV/AIDS (Ref. 32).

HIV prevalence in Limpopo Province, 2002, was estimated at 9,8% (95% confidence interval 5,9 to 13,7%) (Ref. 32).

- ***HIV point prevalence estimates by age group***
  In South Africa, study results showed that 15,6% of persons aged 15-49 years tested positive (2002). The burden of the epidemic is, however, uneven between sexes, with women (17,7%) having much higher HIV prevalence than men (12,8%).

- ***HIV prevalence estimates by age group***
  In the Limpopo Province, HIV prevalence amongst youth (15 to 24 years) was found to be the lowest in the country, and was estimated at some 5,6%.

Table 6.12 HIV prevalence by age group in Limpopo Province – 2002 (Ref. 32)

Age Group	Sample size (n)	HIV Positive (%)	95% Confidence Interval
Total	679	9,8	5,9-13,7
15-24	unknown	5,6	3-11,5
15-49	unknown	11,5	7,5-17,5

- ***HIV prevalence estimates by geotype***
  The study found that HIV prevalence varies considerably with geotype e.g. urban formal, urban informal etc. (see Table 6.13). These variations could well be attributed to different cultural influences and behaviour, different

economic levels and different levels of education in the different types of communities. This is important when considering the impact of the disease in the Capricorn District. The majority of the communities in Capricorn, and Aganang, fall into the categories "urban formal" and "urban informal". As shown in Table 6.13, HIV prevalence in these communities is far higher than in tribal or farm communities, and it can therefore be expected that the HIV prevalence levels in these communities could be higher than the average for the province.

Table 6.13 Overall HIV prevalence by geotype, South Africa 2004 (Ref. 32)

Locality Type	Sample size (n)	HIV Positive (%)	95% Confidence Interval
Total	8 428	11,4	10,0-12,7
Urban formal	5 098	12,1	10,3-14,0
Urban informal	841	21,3	16,2-26,5
Tribal	1 906	8,7	6,5-10,9
Farms	583	7,9	4,8-11,1

- ***Summary of key findings from the Nelson Mandela / HSRC study on AIDS***

  A summary of the key findings from the Nelson Mandela / HSRC study is given in Table 6.14. Estimates for the entire population are based on applying findings to the census. It should be noted that the wide confidence intervals indicate that in some cases the sample sizes were quite small. The Actuarial Society of South Africa (Ref. 1) cautioned that this may have resulted in bias in relation to prevalence rates relating to province, race and amongst children aged 2-14 (Ref. 26).

Table 6.14 Summary of key findings from the Nelson Mandela / HSRC study on AIDS (Ref. 26)

	Percentage	95% Confidence Interval
Estimated overall prevalence 2002	11,4%	10,0-12,7%
Males	9,5%	8,0-11,1%
Females	12,8%	10,9-14,6%
Estimated total living with HIV / AIDS 2002		4,5 million
Estimated HIV prevalence per age group 2002		
Children 2-14	5,6%	
Persons aged 15-24	9,3%	7,3-11,2%
Females 15-24	6,1%	3,9-8,3%
Males 15-24	12,0%	9,2-14,7%
Persons aged 15-49	15,6%	
Females 15-49	17,7%	15,2-20,4%
Males 15-49	12,8%	
HIV prevalence by race amongst persons aged 15-49 in South Africa 2002		
African	12,9%	
White	6,2%	
Coloured	6,1%	
Indian	1,6%	
Over all HIV prevalence by province 2002	**Percentage**	**95% Confidence Interval**
KwaZulu-Natal	11,7%	8,2-15,2%
Gauteng	14,7%	11,3-18,1%
Free State	14,9%	9,5-20,3%
Mpumalanga	14,1%	9,7-18,5%
North West	10,3%	6,8-13,8%
Eastern Cape	6,6%	4,5-8,7%
Limpopo	9,8%	5,9-13,7%
Northern Cape	8,4%	5,0-11,7%
Western Cape	10,7%	6,4-15,0%

Source: Nelson Mandela/HSRC Study of HIV/AIDS: South African National HIV Prevalence, Behavioural Risks and Mass Media, Household Survey 2002

6.12.7 Actuarial Society of South Africa: AIDS 2000 - AIDS and demographic model

In a response to the HSRC/Nelson Mandela HIV Household Survey, the Actuarial Society of South Africa (ASSA) drew attention to the small sample size and its relation to the provincial prevalence breakdown, race and the prevalence rate found amongst children aged 2-14.

The Actuarial Society of South Africa (ASSA) is a voluntary association of actuaries working in the field of HIV/AIDS. The ASSA AIDS Model 2000 is one in a series of epidemiological models developed by ASSA since 1996. This model enables predictions to be made of the impact of the epidemic at both the national and regional level through calibrating to reproduce past antenatal clinic survey data and the number of adult deaths recorded by the Department of Health on the population register (adjusted for an estimate for under-recording). As such the models represent the triangulation of data from the census, antenatal survey and registered deaths by some of the country's top actuaries, demographers and epidemiologists. The model provides data according to two scenarios one in which there is no change and another which takes change factors into account (Ref. 2) (Ref. 26).

Table 6.15 Summary of key data from the ASSA 2000 AIDS and Demographic Model (Ref. 26)

	Change Scenario 2003	Change Scenario 2004	No Change Scenario 2003	No Change Scenario 2004
Total Population	46 855 936	47 241 158	46 361 337	47 223 831
Total HIV infections	6 844 911	7 040 721	7 027 931	7 373 071
Babies infected	62 388	57 707	91 438	93 552
AIDS deaths in '03	329 729	408 045	339 500	423711
Accumulated AIDS deaths	978 139	1 345 872	987 061	1 367 429
Prevalence rate				
Total	14,6%	14,9%	15,0%	15,6%
Adults 20-65	25,3%	25,9%	25,4%	26,4%
Adult men 20-65	26,3%	26,7%	26,0%	27,0%
Adult women 20-65	24,4%	25,0%	24,9%	25,8%
Women 15-49	27,3%	27,9%	27,4%	28,5%
Incidence rates (new infections)	630,899	561 434	774 173	741 169
Life expectancy at birth	51	49	50	48
Total AIDS orphans in middle of the year	391 052	527 054	391 137	527 406

Source: ***www.assa.org.za/aidsmodel.html***

6.12.8 AIDS mortality in South Africa (Ref. 25)

AIDS affects mortality rates in South Africa. According to a report by the MRC (September 2001), the pattern of mortality from natural causes has shifted from old to the young over the last decade.

The ASSA600 AIDS and Demographic model of the Actuarial Society of South Africa (ASSA) was selected to model the impact of AIDS on mortality in the MRC. The model was calibrated to reproduce the prevalence of HIV recorded by the national antenatal care (ANC) surveys up to 1997. Table 6.16 gives the estimated percentage of adult (15+) deaths due to AIDS.

Table 6.16 Estimated percentage of adult (15+) deaths due to AIDS in South Africa

Year starting 1 July	% of deaths due to AIDS
1995	9%
1996	14%
1997	19%
1998	26%
1999	33%
2000	40%

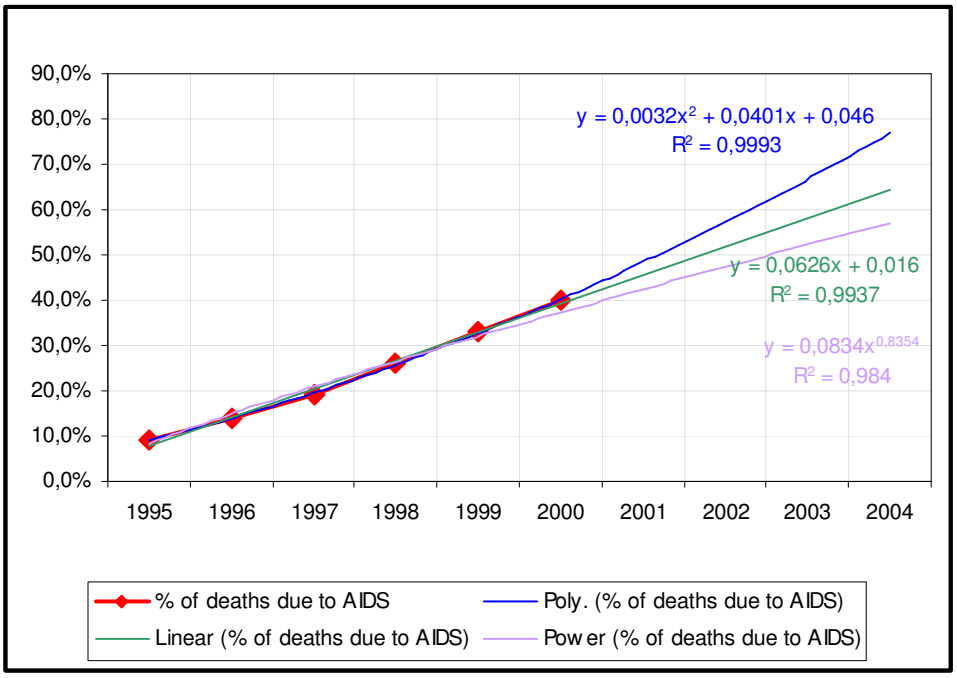


Figure 6.23 Estimated percentage of adult (15+) deaths due to AIDS in South Africa

(Ref. Journ-AIDS (2003): HIV / AIDS in South Africa. Journ-AIDS: HIV/AIDS Resources for Journalists. A CADRE Media Support Project. http://www.journ-aids.org/HIV-AIDS)

As discussed previously, from 1995 to 2000 there was an increase of 31% in the number of adult (15+) deaths that could be attributed to AIDS (Table 6.16). Projecting these figures, as shown in Figure 6.23, this could have increased to as much as 76% by 2004 (best fit – polynomial projection). Should the death rate of adults due to causes other than AIDS remain relatively constant, this would mean that there would be an approximate increase of 158% in adult mortality rates from 2000 to 2004, or 126% from 2001 to 2004. Considering the death rates for the Limpopo province for 2001, this increase in the adult death rate would result in an increase from 1,789 adult deaths per thousand per annum, to approximately 4,043 adult deaths per thousand persons per annum. This is possibly the worst-case scenario, with the actual death rate currently lying somewhere between these two figures (1,789 to 4,043 deaths per thousand adults per annum).

6.12.9 HIV/AIDS in South Africa

As shown by the variation in the findings of the various studies discussed in the preceding sections, there is still a degree of uncertainty as to the levels of prevalence, incidence etc. of HIV / AIDS in South Africa. Estimates of the current situation in the country are dependent on aspects such as sample size tested, the limitations of the sample (e.g. only pregnant women) and the types of mathematical and statistical models used, which are in turn based, to some extent, on assumptions made about the epidemiology of the disease.

A comparison between the findings of the National Antenatal HIV Prevalence Survey 2001 and the HSRC/Nelson Mandela HIV Survey 2002 is given in Table 6.17. Here it can be seen that there are quite large differences between the findings of the two studies, with estimates of prevalence in Limpopo Province varying from 9,8% (Nelson Mandela / HSRC Survey 2002) to 14,5% (National Antenatal HIV Prevalence Survey 2001).

Considering these variations in findings from study to study, some agreement must be reached as to what would be the best model / study findings to use when assessing the potential impact of HIV / AIDS on the waste management sector. In addition, an assessment must be made as to what level of “change scenario” (i.e. catering for the impact of HIV / AIDS intervention programmes) will be utilised when making projections for future requirements.

Table 6.17 Comparison between findings of National Antenatal HIV Prevalence Survey 2001 and the HSRC/Nelson Mandela HIV Survey 2002

	National Antenatal HIV Prevalence Survey 2001	HSRC/Nelson Mandela HIV Survey 2002
National HIV Prevalence		
	24.8% of pregnant women	11.4% of South Africans
	4.74 million South Africans	4.5 million South Africans
Provincial Prevalence		
Gauteng Province	29.8%	14.7%
Mpumalanga	29.2%	14.1%
KwaZulu Natal	33.5%	11.7%
Free State	30.1%	14.9%
North West	25.2%	10.3%
Eastern Cape	21.7%	6.6%
Limpopo Province	14.5%	9.8%
Northern Cape	15.9%	8.4%
Western Cape	8.6%	10.7%
Prevalence by race		
African	-	12.9%
White	-	6.2%
Coloured	-	6.1%
Indian	-	1.6%
Prevalence by age		
<20	15.4%	
20-24	28.4%	
25-29	31.4%	
Children (2-14)		5.6%
Youths (15-24)		9.3%
≥25		15.5%

Source: Ref. 25

6.12.10 Government response (Ref. 25)

The Government's programme on HIV/AIDS is outlined in the HIV/AIDS / STD Strategic Plan for South Africa, 2000-2005. The goals of this strategy are:

- To reduce the number of new HIV infections (especially amongst youth).
- Reduce the impact of HIV/AIDS on individuals, families and communities.

The programme focuses on five main areas:

- ***Prevention:*** Promoting safe and healthy sexual behaviour, improve the management and control of STDs, reduce mother to child transmission, address issues relating to blood transfusion and HIV, provide appropriate post-exposure services, improve access to voluntary counselling and testing (VCT).
- ***Treatment:*** Care and Support: Provide treatment, care and support services in health facilities, provide adequate treatment, care and support services in communities, develop and expand the provision of care to children and orphans.
- ***Legal and human rights:*** Create an appropriate social environment, develop and appropriate legal and policy framework.
- ***Research, monitoring and evaluation:*** Ensure AIDS Vaccine development, investigate treatment and care options, conduct policy research, conduct regular surveillance.
- ***In terms of government budgeting on HIV/AIDS:*** The Department of Finance allocated R1 billion in 2001/02 and R1.8 billion in 2004/05. The Minister of Finance indicated towards the end of 2002 that the budget for HIV/AIDS would be increased to R3.3 Billion.

6.12.11 Conclusions

The findings of the 2001 antenatal survey show that HIV/AIDS is a significant health problem in South Africa. It was estimated that 4.74 million individuals were then infected with the HI virus despite the intensive HIV prevention programmes that are in place. These high prevalence rates have significant implications on the future burden of HIV associated disease and the ability of the health system to cope with provision of adequate care and support facilities.

A striking observation that can be made on HIV prevalence estimates however is that the prevalence of HIV though still high, did not increase between 2000 and 2001. Although this trend was continued into 2002, these findings indicate that the rapid growth of the South African epidemic may be slowing down. Figure 6.19 shows that the national prevalence rate of increase slowed in its increase since 1998. This is referred to as a levelling off, plateau or stabilisation in growth.

Whilst HIV prevalence trends have their limitations as a marker of overall reduction in new HIV infections, this slowing down factor is supported by what is emerging from syphilis trends and HIV trends in teenagers. Syphilis infection is an important indicator of greater biological susceptibility to HIV infection and sometimes an indication of possible high-risk behaviour of the infected individual. The 2001 antenatal survey has shown an ongoing

reduction in rates of syphilis in women at antenatal care facilities. As shown in this report the decrease since 1998 is very notable. It is reasonable to associate the reduction on syphilis at antenatal clinics with a host of intervention activities and in particular the intensified programme on syndromic treatment and management of STIs in antenatal service provision points.

The second set of data, which provides information supportive of the argument that the HIV epidemic in South Africa is stabilizing relates to HIV prevalence rates in women / girls under 20 yrs. HIV trends in teenagers are considered a good indicator of behavioural change aimed to reduce HIV infection such as a delay in sexual debut and condom use. As demonstrated, the early decline and stabilization are very encouraging.

The findings of the surveys discussed here are an important pointer to the magnitude of the HIV/AIDS problem that South Africa confronts. The full participation of all sectors of society and the strengthened intersectoral involvement in implementing the HIV/AIDS and STI strategic initiatives will be critical to an effective national programme and maintaining the gains that South Africa is beginning to observe. The epidemiological trends in HIV prevalence should at this stage be a source of encouragement and leave no room for complacency as the numbers of individuals who are acquiring HIV infections each day is still high and the health care implications of the current infections are enormous.

This HIV survey and the expanded surveillance programme which places emphasis on high risk behaviour monitoring and monitoring HIV incidence will continue to be important in underpinning areas to strengthen the national response to HIV/AIDS.

7 WASTE AND LANDFILL CLASSIFICATION AND CHARACTERISTICS

7.1 WASTE CLASSIFICATION

Waste classification, and problems associated therewith, is extremely well described in the Department of Water Affairs and Forestry publication "*Waste Generation in South Africa (Baseline study in preparation for the National Waste Management Strategy for South Africa)"* (Ref. 20).

In this report it is noted that one of the major problems in waste reporting is the difference in definitions used. For this reason the definitions used by the DWAF in this report correspond with the CSIR report on *Hazardous Waste in South Africa* (Department of Environment Affairs 1992) as far as possible. Similarly, this study has applied the same definitions.

The definition of waste used in the DWAF report was taken from the Environment Conservation Act (Act 73 of 1989) to "*be all undesirable or superfluous by-products, emissions, residues or remainders of any process or activity, whether gaseous, liquid or solid, or a combination of these.*" For practical reasons, material was taken to become waste when it was committed to storage (to last three months or longer) or left the site, or entered the environment.

The National Water Act (Act 36 of 1998), Chapter 1, Section 1 (1) (xxiii) further defines "waste" to include "*any solid material or material that is suspended, dissolved or transported in water (including sediment) and which is spilled or deposited on land or into a water resource in such volume, composition or manner as to cause, or to be reasonably likely to cause, the water resource to be polluted.*"

Using the definition given, the by-product from any process can be considered to be waste if it is to be stored for three months or longer, or enters the environment, or leaves the premises, even if for immediate reprocessing or use.

Waste generated within the borders of South Africa was classified firstly in terms of the *Minimum Requirements for Waste Disposal by Landfill* (Ref. 16) and then by *SABS 0228: Code of Practice for the Identification and Classification of Dangerous Substances and Goods* (South African Bureau of Standards 1995) (Ref. 34).

The initial classification in terms of the *Minimum Requirements* is to determine if the waste is either general waste or hazardous waste. If the waste is classified as general waste then no further classification is required. If the waste is classified as hazardous, it must then be further classified in terms of *SABS 0228*.

7.1.1 Hazardous waste

Hazardous waste can be defined as "*any waste that is a threat to human health or to the environment through risk of one or more of the following:*

- *explosions or fires*
- *chemical instability, reactions or corrosion*
- *infections*
- *acute toxicity*
- *eco-toxicity, or damage to natural systems*
- *accumulation in biological food webs, or persistence in the environment and hence requiring special attention, (i.e. that the waste could not, in its present form, be released to the environment, or put down the sewer, or disposed of on an ordinary municipal refuse landfill site)."* (Ref. 20).

SABS 0228 classifies hazardous waste further into nine classes based on the type of risk involved, as indicated in Table 7.1 on the following page.

In the DWAF report on waste generation (Ref. 20) it is noted that *SABS 0228* primarily makes provision for singular or unique substances, whilst in the actual waste management situation waste streams are most often combinations or mixtures of various different products, which can be in solution with water or other carriers. In addition, these waste streams usually vary in composition over time. For this reason the classification system for hazardous waste has been expanded further.

- ***Danger group allocation***
  Each substance listed in *SABS 0228* is allocated a unique number and a danger group symbol. Danger groups are allocated as follows:
  - Danger group I: substances and goods that present a very severe risk.
  - Danger group II: substances and goods that present a serious risk.
  - Danger group III: substances and goods that present a relatively low risk.
  - Danger group IV: substances and goods that present a very low risk.

- ***Classification of empty containers***
  Empty containers that have not been cleaned and containers that are not gas-free shall be classified in accordance with the class and the danger group of the dangerous substances they contained.

- ***Classification of waste***
  Waste of dangerous substances and goods (other than radioactive waste) shall be classified either as single entries or as suitable collective entries, preceded by the word "waste".

Table 7.1 Classification of waste into nine classes according to *SABS 0228: Code of practice for the identification and classification of dangerous substances and goods*

Class	Subclass	Description
Class 1: Explosives	Subclass 1.1	Substances and articles that have a projection hazard but not a mass explosion hazard
	Subclass 1.2	Substances and articles that have a mass explosion hazard
	Subclass 1.3	Substances and articles that have a fire hazard or a minor projection hazard
	Subclass 1.4	Substances and articles that present no significant hazard
	Subclass 1.5	Very insensitive substances that have a mass explosive hazard
Class 2: Gases	Subclass 2.1	Flammable gases
	Subclass 2.2	Non-flammable, non-toxic gases
	Subclass 2.3	Toxic gases
Class 3: Flammable liquids	This class comprises liquids capable of being ignited.	
Class 4: Flammable solids; substances liable to spontaneous combustion; substances that on contact with water, emit flammable gases	Subclass 4.1	Flammable solids
	Subclass 4.2	Substances liable to spontaneous combustion
	Subclass 4.3	Substances that, on contact with water, emit flammable gases
Class 5: Oxidising substances and organic peroxides	Subclass 5.1	Oxidising substances
	Subclass 5.2	Organic peroxides
Class 6: Toxic and infectious substances	Subclass 6.1	Toxic substances
	Subclass 6.2	Infectious peroxides
Class 7: Radioactive material	This class comprises materials that spontaneously emit ionising radiation.	
Class 8: Corrosives	This class comprises substances that, by chemical action, cause damage to living tissue or to other cargo.	
Class 9: Miscellaneous dangerous substances and goods	This class comprises any substance not covered by the other classes, but that has been or could be shown by experience to be of such a dangerous character that the provisions of this class should apply to it.	

Source: Ref. 20

- ***Classification of solutions and mixtures***
  According to *SABS 0228* a mixture or solution that contains both a dangerous substance identified by name in this standard and one or more non-dangerous substances, shall be classified in accordance with the class and the danger group of the dangerous substance, provided that the packaging is appropriate to the physical state of the mixture or solution, unless:
  - the mixture or solution is specifically identified by name in this standard.
  - the entry in this standard specifically indicates that it applies only to the pure substance.
  - the class, physical state or danger group of the solution or mixture is different from that of the dangerous substance.
  - there is significant change in the measures to be taken in emergencies.

  In addition, the following apply:
  - For a mixture or solution for which the above apply, the appropriate Not Otherwise Specified (NOS) entry should be used.
  - If a mixture or solution presents more than one hazard, clause 19 and table 8 of SABS 0228 apply.
  - To each mixture and each solution relevant to clause 19, the qualifying word “solution” or “mixture,” as appropriate, shall be added for correct classification.
  - The technical names of not more than two of the constituents that most predominantly contribute to the hazards of the mixture shall be shown immediately after the NOS entry. If the classification
    * shows a subsidiary risk, one of these two names shall be that of the constituent that *compels* the subsidiary risk classification.

- ***Practical waste management classification system***
  In practice, waste management operators in South Africa have developed a slightly expanded classification system, which they have found to be more practical in their day-to-day handling of waste streams. The waste management company *WasteTech*, for example, used the classification shown in Table 7.2.

  The classification given in Table 7.2 was adopted by DWAF for the waste generation study (Ref. 20) for the following reasons:
  - the data recorded at hazardous landfill sites were at the time captured in accordance with this system
  - various waste contractors had found this system to be practical
  - the system was only slightly at variance with *SABS 0228*.

Table 7.2 Waste stream classification system as used by the company *WasteTech*

CLASS	DESCRIPTION	CLASS	DESCRIPTION
Class 1	**Explosives**	Class 6.1.4	Asbestos wastes
Class 2	**Gases**	Class 6.1.5	Pharmaceutical and veterinary compounds
Class 2.1	Flammable gases		
Class 2.2	Non-flammable gases	Class 6.1.6	Biocides and phytopharmaceutical substances
Class 2.3	Poisonous gases		
Class 3	**Flammable liquids**		
Class 3.1	Low flashpoint (<-18 °C)	Class 6.1.7	Cadmium containing wastes
Class 3.2	Intermediate flashpoint (-18 >°C < 61 °C)	Class 6.1.8	Aromatic polycyclic compounds
Class 3.3	Intermediate to high flashpoint (23 > °C < 61 °C)	Class 6.1.9	Lead containing wastes
		Class 6.1.10	Arsenic containing wastes
Class 3.4	High flashpoint (>61 °C)	Class 6.1.11	Vanadium containing wastes
Class 3.4.1	Mineral oil wastes	Class 6.1.12	Pesticides
Class 3.4.2	Tarry and distillation wastes and other chemical-based residues	Class 6.1.13	Hexavalent chromium containing wastes
		Class 6.2	Infectious substances
Class 3.4.3	Halogenated organic wastes	Class 6.2.1	Food-processing wastes
Class 3.4.4	Tarry materials from refining and tar residues from distilling	Class 6.2.2	Sewage (liquid or sludge)
		Class 6.2.3	Medical wastes
Class 3.4.5	Heterocyclic organic compounds containing oxygen, nitrogen and/or sulphur	**Class 7**	**Radioactive substances**
		Class 8	**Corrosives**
		Class 8.1	Acids
Class 3.4.6	Varnish sludge and paint sludge	Class 8.2	Alkalis
		Class 9	**Miscellaneous dangerous substances** *Any other substance which experience has shown, or may show, to be of a dangerous nature*
Class 4	**Flammable solids and substances**		
Class 4.1	Flammable solids		
Class 4.2	Spontaneously combustible	Class 9.1	Halogenated hydrocarbon solvent wastes from cleaning processes
Class 4.3	Dangerous when wet		
Class 5	**Oxidising substances**	Class 9.2	Heavy metal containing wastes (excluding those mentioned in 6.1)
Class 5.1	Peroxides, chlorates, perchlorates and acids		
Class 5.2	Organic peroxide	Class 9.3	Inorganic halogen containing waste
Class 6	**Poisonous (toxic) and infectious substances)**	Class 9.4	Inorganic sulphur containing wastes
Class 6.1	Poisonous substances		
Class 6.1.1	Polychlorinated biphenyl (PCB) wastes	Class 9.5	Laboratory chemicals (whose effect on the environment are not known)
Class 6.1.2	Cyanide containing wastes	Class 9.6	Phenol wastes
Class 6.1.3	Mercury containing wastes	Class 9.7	Paint residues not containing solvents

Source: Ref. 20

The 1992 CSIR study (Department of Environment Affairs 1992) did not classify waste in terms of *SABS 0228*. It based the classification in terms of the hazard rating or danger groups as follows:

- High hazard waste - Group 1 / Danger group I
- Moderately hazardous waste - Group 2 / Danger group II
- Low hazardous waste - Group 3 / Danger group III
- Potentially hazardous waste - Group 4 / Danger group IV
- Non hazardous waste - Group 5

It must be noted, however, that *SABS 0228* covers the identification and classification of dangerous substances and goods, and refers to pure chemicals. In general, a waste stream is a combination of chemicals and other constituents of varying concentrations.

7.2 WASTE CHARACTERISATION - WASTE GENERATORS AND CATEGORIES

7.2.1 Domestic and commercial waste

Domestic and commercial waste is classified as general waste in accordance with the Department of Water Affairs and Forestry's *Minimum Requirements for Waste Disposal by Landfill* (Ref. 16). This type of waste is also referred to in the literature as "urban waste", "household waste" and "refuse".

7.2.2 Health care waste

The waste from health care facilities such as clinics and hospitals is regulated in terms of the *SABS 0248: Code of Practice for the Handling and Disposal of Waste Materials within Health Care Facilities* (South African Bureau of Standards 1993) (Ref. 35). This waste can be termed medical waste, which is segregated into the following categories:

- human/animal anatomical waste
- infectious non-anatomical waste
- shops and similar waste
- chemical/pharmaceutical waste
- radioactive waste
- pressurised-container waste
- general waste.

7.2.3 Water treatment and supply waste

The major waste generated in this industry is sewage sludge. The volumes of sewage sludge generated can be calculated with reference to the Water Institute of Southern Africa publication entitled *Sewage Sludge - Utilisation and Disposal*, published in 1993. (Ref. 20)

7.2.4 Agricultural waste

Agricultural waste can be classified into three groups:

- solid waste
- liquid waste
- toxic waste.

Solid waste generated by agriculture is generally animal manure, whilst liquid waste includes the wash-water from stables and milk parlours. Toxic waste results from the disposal of pesticides and herbicides. (Ref. 20)

7.2.5 Services industry waste

The services industries include the construction industry, dry cleaning, photographic industry, storage and transportation. Service industries that exist in the Aganang magisterial area include construction, dry cleaning and transportation.

- ***Construction***
  The construction sector produces mainly building rubble and scrap, generally regarded as non-hazardous.

- ***Dry cleaning***
  Dry-cleaning operations use solvents such as perchloroethylene. These solvents are generally recycled, while dirt removed is disposed of at municipal landfills. Many operations do, however, have old equipment resulting in regular leaks and spills, which are generally flushed into the sewage / drainage systems.

- ***Transportation***
  The transportation sector produces mineral oil sludges from a variety of maintenance related operations. This sector also has a large number of backyard operators, which can result in waste oils etc. being disposed of in sewage or drainage systems.

7.2.6 Other waste generators and categories

Various other groups of waste generators include:

- *Mining waste*
- *Non-metallurgical industries waste*
- *Metallurgical and metals industry waste*
- *Power generation waste*

None of these types of waste generators occur in the Aganang magisterial area. These have therefore not discussed in further detail here.

7.3 LANDFILL CLASSIFICATION SYSTEM

As with types of waste, landfills are classified into various classes. When permits are granted for landfills, the landfill is classified and may only be utilized and operated in accordance with the *Minimum Requirements* for that classification. It is important to understand the Landfill Classification System, as this controls operating aspects such as the types of waste that may disposed of to a given site.

The format for the Landfill Classification System is based on the three parameters discussed in this section, i.e. waste type, size of operation and Site Water Balance, see Table 7.3. As seen from Table 7.3, the Landfill Classification System provides for ten different classes of landfill. These are **G:C:B$^-$, G:C:B$^+$, G:S:B$^-$, G:S:B$^+$, G:M:B$^-$, G:M:B$^+$, G:L:B$^-$, G:L:B$^+$, H:h** and **H:H**. Of the ten landfill classes, eight cater for general waste and two cater for hazardous waste. (Ref. 16)

Once the existing or proposed landfill site has been classified, the *Minimum Requirements* that apply to the class of landfill under consideration can be identified, using the *Minimum Requirements* tables.

Table 7.3 Landfill classification system (Ref. 16)

Waste class	**G General waste**								**H Hazardous waste**	
Size of landfill operation	**C** Communal landfill		**S** Small landfill		**M** Medium Landfill		**L** Large landfill		**H:h**	**H:H**
Site water balance	**B$^-$**	**B$^+$**	**B$^-$**	**B$^+$**	**B$^-$**	**B$^+$**	**B$^-$**	**B$^+$**	Hazard rating 3 & 4	Hazard rating 1-4
Minimum requirements										

Notes
B$^-$ = No significant leachate will be generated in terms of the Site Water Balance (Climatic Water Balance calculations plus Site Specific Factors), so that a leachate management system is not required.
B$^+$ = Significant leachate will be generated in terms of the Site Water Balance (Climatic Water Balance calculation and Site Specific Factors), so that a leachate management system is required.
h = A containment landfill which accepts Hazardous waste with Hazard Ratings 3 and 4.
H = A containment landfill which accepts all Hazardous waste, i.e. with Hazard Ratings 1, 2, 3 and 4.

7.3.2 General waste landfills (Ref. 16)

General waste landfills are sub-divided into four classes, based on magnitude of waste stream and size of operation. These classes are Communal, Small, Medium and Large. The larger the operation, the more stringent the *Minimum Requirements.*

The above classes of landfill are further sub-divided on the basis of the Site Water Balance.

- A **B⁻** landfill is a landfill that generates only sporadic leachate and does not require a leachate management system.
- A **B⁺** landfill is a landfill that generates significant leachate. All **B⁺** sites, with the exception of Communal sites, require leachate management systems, comprising liners and leachate collection systems. The *Minimum Requirements* for **B⁺** landfills are more stringent than for **B⁻** landfills.

7.3.3 Hazardous waste landfills (Ref. 16)

Any landfill, which receives significant quantities of hazardous waste, must be classified as a Hazardous Waste Landfill. **Because of the risk posed by Hazardous Waste Landfills, they must be conservatively lined containment sites, regardless of the Site Water Balance.** Hazardous waste landfills must therefore all be separated from the ground water regime by a liner and a leachate collection system.

Landfills which receive all types of hazardous wastes, including the most hazardous waste with Hazard Ratings 1 and 2, are termed **'H:H'** sites. Such landfills have to be designed, engineered and operated to the most stringent standards. Landfills which receive less hazardous wastes with Hazard Ratings 3 and 4 are termed **H:h** sites. These sites are permitted to receive specific loadings of hazardous wastes. The design standards for **H:h** sites are higher than for **G:L:B⁺** sites, but are not as stringent as for **H:H** sites.

7.3.4 Mono landfills (Ref. 16)

A mono landfill is one in which a single waste type is disposed. As in the case of multi-waste landfills, the waste type and hazard rating, the size of the waste stream and potential for generating significant leachate determine the class of landfill needed for its disposal. Mono landfills are therefore accommodated in the Landfill Classification System.

Certain 'delisted' hazardous wastes may not be co-disposed with other wastes, because of the risk of mobilisation of hazardous substances. In such cases, the delisted hazardous waste must be disposed of in a mono landfill.

7.3.5 Hazardous waste lagoons (Ref. 16)

Hazardous waste lagoons are not landfills. They are therefore not accommodated in the Landfill Classification System. As they do exist as a means of waste disposal, however, they are, however catered for in the design section of the *Minimum Requirements*.

7.3.6 Amendment of site classification (Ref. 16)

It must be noted that few general waste landfills in South Africa currently meet the *Minimum Requirements* for their classes. Examples of *Minimum Requirements* that are not met are liner design, sanitary landfill operation and final cover application.

The Permit Holder or Responsible Person must ensure at all times that the site is correctly classified. Should the class of the site change over time, the DWAF must be notified and the appropriate *Minimum Requirements* must be applied.

7.4 EXISITING WASTE GENERATORS AND CLASSIFICATION AND CHARACTERISTICS OF WASTE GENERATED

Based on the findings of the waste surveys, an estimate was made of the percentage waste being generated by different sectors. The percentages of waste generated by different sectors of the community with respect to the total waste generated in Aganang are shown in Figure 7.1. This shows that the bulk of waste generated in Aganang is domestic or general waste, with some medical waste being generated in the hospital and clinics, and a small quantity of general waste (2.16%) being generated by businesses in the area. Effectively no waste is generated by mines and / or industries in Aganang.

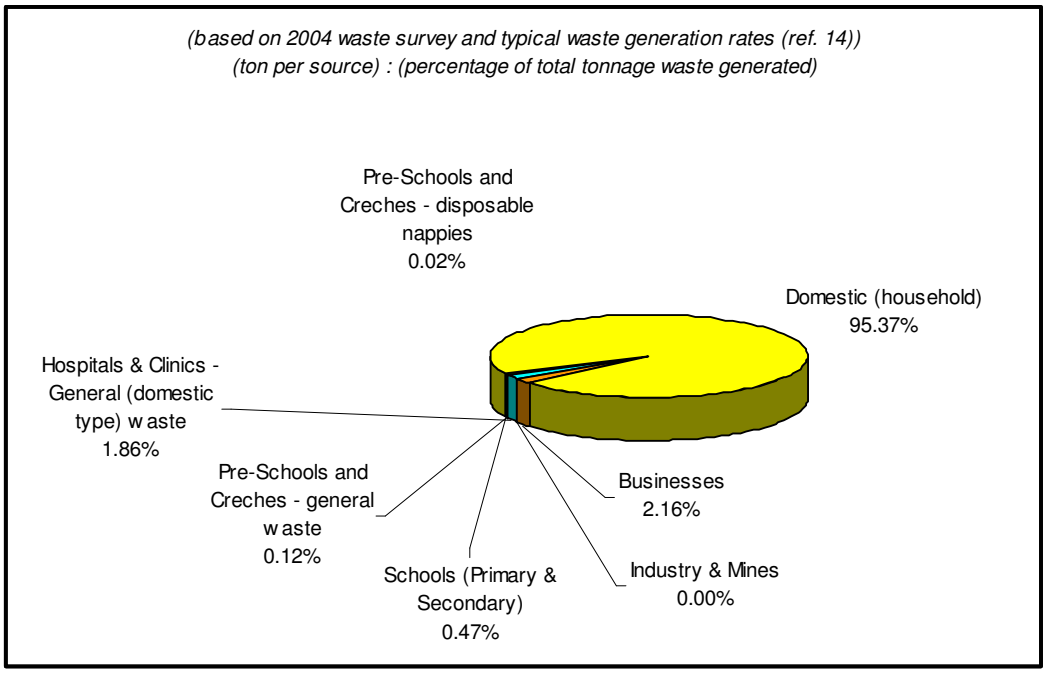


Figure 7.1 Chart: Aganang 2004 - Estimate of percentage waste generated from sectors of the community in Aganang
(based on 2004 waste survey and typical waste generation rates (ref. 20))

7.4.1 Domestic waste

Domestic / general waste produced can be furthered characterised according to the actual type of waste viz. plastics/ paper/ glass/ etc. Due to the emphasis on developing waste reuse and recycling programmes, it is important to determine actual quantities of the different types of waste generated both at household and business level. Knowledge of the percentages of different types of waste generated will facilitate the assessment of the economic viability of reuse and recycling programmes in the area.

A sampling programme was therefore implemented to assess the composition of domestic / household waste. Black bags were provided to a random sample of households in the Aganang area. The householders were required to dispose of all domestic waste into these bags, which were then collected after a given time period. Waste in the bags was then sorted to determine the actual composition of the waste viz. the various percentages of plastics/ paper/ glass etc..

Some problems were experienced with the sampling process, as the householders were found to not understand the purpose of the survey clearly. Householders were found to collect waste from other households in order to fill all the bags that were provided to them. In addition, waste that was normally used by the household e.g. food scraps that would normally be fed to dogs, or cardboard that would normally be used for starting cooking fires, was also disposed of in the bags. Although the sampling process was repeated when these problems were identified, it is still important to note that the results of the sampling may not be truly representative of the actual composition of waste as generated by the average households in Aganang.

Summary results of the household waste sampling process are shown in Table 7.4. The following trends were found in the composition of the household waste:

- Virtually no organic waste such as food scraps was disposed of. This was generally fed to domestic animals such as dogs and goats.
- Little cardboard was disposed of, as cardboard is often used for building fires for cooking. This may well change if electricity supply is extended in the area and more households use electricity for cooking purposes.
- The waste disposed of comprised varying amounts of cans, paper, glass and plastic. This varied from household to household and no definitive trends in the composition of the waste were determined.

Table 7.4 Results of survey to determine composition of household waste

Family Name	Number of persons / household	Number of refuse bags generated / week	Average volume of waste generated / household / week	Average volume of waste generated / person / week	Average volume of waste generated / person / year	Average mass of waste generated / person / year
			(m^3/week)	(m^3/week)	(m^3/annum)	(ton/annum)
Manthose	4	3	0,190	0,048	2,475	0,371
Raphasha	8	4	0,254	0,032	1,650	0,247
Mohokare	3	2	0,127	0,042	2,200	0,330
Paya	4	2	0,127	0,032	1,650	0,247
Molele	3	2,5	0,159	0,053	2,750	0,412
Average volume of black bag					(m^3)	0,063
Effective density of waste assumed (loose)					(ton / m^3)	0,150

Based on the findings of this sampling process, the average volume of waste generated per person is equivalent to between 0,247 ton/annum and 0,412 ton/annum.

7.4.2 Medical or health care waste generators

Medical waste generators include all hospitals, clinics and private medical, health care and veterinary practices. There are 7 clinics and 1 hospital in Aganang. Only 1 private medical or health care practice was identified through the waste survey. These medical or health care waste generators are listed below.

- ***Hospitals***
  - WF Knobel Hospital
- ***Clinics***
  - Perciel Clinic
  - Lonsdale Clinic
  - Mahlala Clinic
  - Maraba Clinic
  - Mashashane Clinic
  - Rosenkrans Clinic
  - Skoongesicht Clinic
- ***Private practices***
  - General practitioner; Dr Mamabola, Tibana

7.4.3 Hazardous waste generators

Potential hazardous waste generators, other than medical and health care waste, include industries, mines and various businesses such as dry cleaners etc. A total of 21 potential hazardous waste generators were identified in Aganang through the waste survey, including:

- ***Garages or petrol stations*** *– 13 number*
  - Tehma Filling Station; Ga-Manthlodi
  - Moses Filling Station; Ga-Maribana
  - Etosha Filling Station; Rosenkranz
  - Tibana Shopping Centre Filling Station, Tibana
  - Masenya Filling Station, Ga-Modikana
  - Lekiete Filling Station, Monyoanang
  - M-Shop Filling Station, Saaiplaas
  - Nyama Filling Station, Semaneng (Makgobane)
  - Monyepao Filling Station, Phoffu
  - Limburg Filling Station, Stirrum (Limburg)
  - Mohlonong Garage, Monotoane (Waterplaats)
  - Mashashane Filling Station, Ga-Mashashane
  - Serite Filling Station, Ga-Mashashane
- ***Mechanics, engine repairs, exhaust repairs etc.*** *– 19 number*
  - Nasoga; Kanana
  - Chokoe; Louisiana
  - Teffo; Tibana
  - MJ Tyres; Tibana
  - Moetagare Mechanics; Moetagare
  - Thaba; Ceres
  - David Mobotja; Mabilwane
  - Paul Matlamene Kaaka; Rametloane (Preezburg)
  - Telele; Ga-Ramakara
  - Bathokoa; Ga-Ramakara
  - Z Matlala; Saaiplaas
  - Sebete Welding Works; Bakone
  - Mike's, Manamela 2
  - Makone; Dibeng
  - F Ngoepe, Phoffu
  - Ngoepes, Phoffu
  - Mapeding; Monotoane (Waterplaats)
  - Leta; Manyapye
  - Ledi; Ga-Mashashane
- ***Agricultural suppliers*** *– 3 number*
  - Masenya; Ceres
  - Dinaar Seeds Production; Maupye

- Molema; Waschbank

A full list of the hazardous waste generators in the Limpopo Province that were identified in the DWAF baseline study on waste generation (Ref. 20) is included in Table 7.5 on the following pages. Those hazardous waste generators located in the Aganang municipal area are highlighted in yellow in the table.

Table 7.5 Potential hazardous waste generators in the Limpopo Province (Ref. 20)

Waste generation sector	Waste Code	Waste stream description	m^3/annum generated – Limpopo Province 2001	Class (Refer Table 7.2 for Class definition)
Adhesive and sealant manufacturing	None			
Fertiliser manufacturing	None			
Food and beverage manufacturing	FB02	Liquid food rests	7,5	6
	FB03	Fermentation waste	4 300,0	6
	Potential hazardous waste producers in this sector in Limpopo Province			
	Hygienik Dairies	Limpopo Dairy	Noord-Wes Dairy	SA Breweries
	Mandla Malt Manufacturing	Tholo Kudu Brewery	Traditional Beer Investments (Pty) Ltd	
Other chemical formulation	CF01	Other non-solvent (contained)	1,0	3
	Potential hazardous waste producers in this sector in Limpopo Province			
	Avodeau le-Taba Ltd			
Leather processing	None			
Non-metallic mineral products manufacturing	None			
Other manufacturing	None			
Paints and inks manufacturing	PA01	Liquid solvent (excluding recycled products)	240,0	3
	PA02	Other non-solvent (contained)	60,0	9
	Potential hazardous waste producers in this sector in Limpopo Province			
	Auto Paint and Industrial Supplies trading as Pro Paints	CTM Coatings & chemicals cc	Micro Paints	Noortra Paints
Pesticide manufacturing	None			

Table 7.5 Potential hazardous waste generators in the Limpopo Province (Ref. 20) (cont..)

Waste generation sector	Waste Code	Waste stream description	m^3/annum generated – Limpopo Province 2001	Class (Refer Table 7.2 for Class definition)
Pharmaceutical manufacturing	None			
Plastic and rubber conversion	PR04	Solvent waste	1,5	3
	Potential hazardous waste producers in this sector in Limpopo Province			
	Northern Province Pietersburg Retreading Works (Pty) Ltd	S&S Retreaders (Pty) Ltd	Trentyre	
Printing industry	PR01	Solvent containing waste	15,0	3
	Potential hazardous waste producers in this sector in Limpopo Province			
	B S B Drukpers	Classmate cc	Copy Cat	Hobbyprint cc
	Kirsten Drukpers	Leach Printers & Signs cc	Letaba Printers	Messina Drukkers
	Morester Drukkery	Morester & Noord-Transvaler	Noordelike Pers	Pietersburg Pers (Edms) Bpk
	Noordelike Pers	Potgietersrus Drukkery	Prontaprint	Sember (Edms) Bpk Review Drukkers
Pulp and paper manufacturing	PP05	Waste mineral oils	5,0	3
	Potential hazardous waste producers in this sector in Limpopo Province			
	Consolidated	Consolidated Citrus Containers (Pty) LTd	Houers Koop Bpk	Venbox
Chemical product recycling industry	None			
Textile industry	None			

Table 7.5 Potential hazardous waste generators in the Limpopo Province (Ref. 20) (cont..)

Waste generation sector	Waste Code	Waste stream description	m^3/annum generated – Limpopo Province 2001	Class (Refer Table 7.2 for Class definition)
Timber processing industry	TI01	Treatment sludge	15,5	6
	Potential hazardous waste producers in this sector in Limpopo Province			
	Burrah Nullah Sawmill	H L & H Mining Timber Tzaneen	Mondi Timber Products Shefeera Sawmill	Tzaneen Treated Timber cc
	Canyon Ridge Forests cc	Hans Merensky Northern Timbers	Northern Timber Saw Mill	Van Der Linde Houthandel
	Cashumi Saagmeule	Jocawa Houthandel	P T R	Van Der Merwe Saagmeule
	Duiwelskloof Saagmeule	Joubert, L Saagmeule (Edms) Bpk	Safcol - Timbadola Sawmill	Van Niekerk Saagmeule
	Duiwelskloof Treated	L T T Kreosootpale	Schoeman, J S Saagmeule	Vergelegen Saagmeule
	Figtree Saagmeule	Mogoboya Lumber cc	Scholtz (Pty) Ltd	Verkyk Kreosootpale Edms Bpk
	Geldenhuys Saagmeule (Edms) Bpk	Mondi Timber Products De Hoek Sawmills	Scotmar Timbers	
	Glengarry Sawmills	Mondi Timber Products Scholz Mill	Stevens Lumber Mills Lebowa (Pty) Ltd	Visagie Saagmeule
Chemical manufacturing industry	None			
Metallurgical	None			
Electrical and electrical products manufacturing	EP01	Soluble oil waste	25,0	3
	EP02	Inorganic sludges electro-plating / galvanised / other	55,0	9
	EP03	Solvent containing waste (non-halogenic)	5,0	3
	EP04	Solvent containing waste (halogenic)	3,0	6
	Potential hazardous waste producers in this sector in Limpopo Province			
	Electrical Motor Rewiring	Rewind Industrial	Sampat Switchboards cc	Venda Armature Rewinder
	Future Rewinders			

Table 7.5 Potential hazardous waste generators in the Limpopo Province (Ref. 20) (cont..)

Waste generation sector	Waste Code	Waste stream description	m^3/annum generated – Limpopo Province 2001	Class (Refer Table 7.2 for Class definition)
Other metal product manufacturing	MP04	Waste mineral oils	170,0	3
	MP05	Solvent containing waste (non-halogenic)	210,0	3
	MP06	Solvent containing waste (halogenic)	70,0	9
	Potential hazardous waste producers in this sector in Limpopo Province			
	Aukers Ingenieurswerke	Gerco Motoringenieurs	Kisu Investments (Pty) Ltd	Ross & Son Motor Engineers
	B E C Construction cc	Hema Industrieel Bk	Model Ingenieurswerke Bk	Trekkon
	Backman G T (Edms) Bpk	Hersofaam Steel	Morpiet Brake & Clutch	Truck & Trailer
	Brakekor Bk	High Precision Eng Works	Noordstaal	Tzaneen Metal Products cc T/A Kryto Construction
	Cee Wee Sweis & Betonwerke	J & F Engineering	Norman & Co. (Pty) Ltd	Tzaneen Precision Motor Works (Pty) Ltd
	Chicos Welding Works	J M I Vervaardiging	Northern Province Steel	Venter Manufacturing Co.
	Danbrake Tzaneen (Pty) Ltd	Jacobs Ondernemings Bk	NTY Steelworks	Waterberg Sweiswerke
	Delta Meganiese & Hidrouliese Ingenieurs	Jocawa Houthandel cc	Potgietersrus Ingenieurs Werke (Edms) Bpk	Wirecor (Pty) Ltd
	Gatsrand Engineering (Pty) Ltd	KDC Engineering	Quick Pools	Yensteel (Pty) Ltd

7.4.4 Agricultural waste generators

The main agricultural waste generators are chicken farms. No chicken farms were logged during the Waste Survey.

7.4.5 Future potential waste generators

In order to identify future potential waste generators, planned projects were identified. This was done by consulting the current Environmental Impact Assessment (EIA) Register of the Provincial Department of Finance, Environmental Affairs and Tourism (DFEAT). All planned developments should be registered with the Department in order to obtain a Record of Decision with respect to the potential Environmental Impact of the proposed projects. These projects could either be potential waste generators during the development phase of the project e.g. water supply projects, and / or during the operating phase of the project e.g. agricultural developments. Projects that are planned for Aganang, as identified from the DFEAT EIA register, are listed in Table 7.6.

Table 7.6 Projects planned for development in Aganang, as identified from the DFEAT EIA register

Project Description	Location
EXPLOSIVES	None
DAMS & WEIRS	None
RESERVOIRS	None
BULK WATER SUPPLY	Aganang
Sedie bulk water supply	Aganang
Kgabo Park bulk water supply	Aganang
Mangata bulk water	Aganang
Ga-Mapodile bulk water supply	Aganang
Manamela water supply	Aganang
Ramoshoane water supply	Aganang
Marowe bulk water supply	Aganang
Rampuru upgrading of reticulation	Aganang
Monywaneng water supply	Aganang
Phago water supply	Aganang
Laastehoop water supply	Aganang
Flora bulk water supply	Aganang
Lonsdale bulk water supply	Aganang
SEWERAGE	None
GRAZING FIELDS	None
ROADS	
Upgrading of road D19	Aganang
WASTE DISPOSAL	None
SCHEDULED PROCESSES- PROCESSING PLANTS	None
HAZARDOUS SUBSTANCES- MOSTLY PETROL STATIONS	None
Fuel tank at NTK Matlala (Zaaiplaas)	Aganang
AGRICULTURAL PROJECTS	None
Rezoning of Kalkfontein 1001LS	Aganang
CANALS	None
RESORTS	None
Kalkfontein Entertainment complex	Aganang
BIOLOGICAL PEST CONTROL	None
TOWNSHIP DEVELOPMENT	
Chuene Park Township	Aganang

8 WASTE QUANTITIES

8.1 TYPICAL WASTE GENERATION RATES

8.1.1 Domestic and commercial waste

The character of domestic or general waste generated is mainly dependant on the demographics of the area generating the waste. Factors influencing the characteristics of waste generated include:

- cultural characteristics,
- number and density of dwellings,
- population size and density,
- percentage employed, and
- income levels (Mayet 1993) (Ref. 20)

Numerous studies have, however, found that general waste generation depends on two main variables, viz.:

- population and dwelling density
- income level.

In the DWAF baseline study on waste generation (Ref. 20) it is noted that much of the work investigating waste generation rates in South Africa has been based on surveys conducted in regional areas, with the only significant result being the average unit generation rate. Waste production rates can therefore not be predicted on the basis of community composition or income levels. The matter is further complicated in that, as the demographics of an area change, so does the waste stream. As quality of life increases so the density of waste falls and the volume increases (Lombard 1994).

The study notes that the demographics and waste generation patterns in different areas can be divided into a number of socio-economic levels. In most studies three levels are identified, i.e. low income, middle income and high income. These divisions are also the result of the current status of South Africa as a mixture of developed and developing sections of society. (Ref. 20)

There was significant variance between the data gathered for waste generation for the DWAF baseline study and for the volumes of waste disposed at landfill sites. An alternative approach to determining the general waste generation volumes was therefore sought. At the time of the study Mayet's[2] thesis was the only publication that proposed a model to determine waste generation in South Africa. This model was therefore implemented and tested.

[2] M A G Mayet (1993): *Domestic Waste Generation in the Urban Core of the Durban Functional Region.* MSc thesis

Mayet proposed a model for domestic waste generation based on income level. He noted that the higher the income, the greater the per capita generation of waste. Mayet's model proposes three socio-economic levels, each with its own waste generation rate. Average domestic waste generation rates, based on income levels, as defined by Mayet (1993) are given in Table 8.1.

Table 8.1 Income level vs. domestic waste generation rate (Mayet 1993).

Income level	Disposable income per annum	Average domestic waste generation rate	
		(m^3 / capita / annum)	(t / capita / annum)
High	R10 000+	2,7	0,43
Medium	R5 000 - R10 000	0,75	0,17
Low	R0 - R5 000	0,24	0,08

Source: Ref. 20

The DWAF study found that the correlation between the calculated volumes based on income level converted to tonnage, using an average density of 250 kg/m^3, and the waste received at landfills was accurate with a variance of 3%. Using an average density of waste did not, however reflect the correct ratios between the population and the waste densities of the three socio-economic levels.

Despite some shortcomings, the DWAF study found that the good correlation between the overall landfill deposition data and the model using Mayet's multipliers allowed for confidence in the prediction of waste generation using the multiplier method.

The results of the application of Mayet's model to the data for the Limpopo Province, as determined in the DWAF baseline study, are given in Table 8.2.

Table 8.2 Results of the application of Mayet's model on waste generated per province by three socio-economic levels.

Regional authority	Disposable income per capita	Income level	Population	Generation rate		Effective density of waste
				m^3 / a	t / annum	t / m^3
Limpopo Province						
Bushveld District Council	7 853	Middle	204 734	0,75	0,17	0,227
Northern District Council	1 867	Low	5 485 209	0,24	0,08	0,333

Source: Ref. 20

Considering the data presented in Table 8.2, the Aganang magisterial area can be defined as a low-income socio-economic level. Typical waste generation rates as used for the Northern District Council, Limpopo Province, should therefore be used to calculate waste quantities in the area. These rates are, however, considerably lower than those determined from the household waste sampling exercise conducted as part of this assignment. As discussed in Section 7.4.1, the average mass of waste generated per person as determined by means of the household waste sampling process is equivalent to between 0,247 ton/capita/annum and 0,412 ton/capita/annum.

Table 8.3 General waste generation in South Africa (DWAF and Statistics SA)

	General waste	Percentage per province	Population	Per capita waste generation
	(m^3/yr, 1998)	(%)	(1996 Census)	(m^3/P/yr)
Mpumalanga	3 831 000	9,1	2 800 711	1,37
Eastern Cape	2 281 000	5,4	6 302 525	0,36
Free State	1 675 000	4,0	2 633 504	0,64
Gauteng	17 899 000	42,4	7 348 423	2,44
KwaZulu-Natal	4 174 000	9,9	8 417 021	0,50
North West	1 625 000	3,8	3 354 825	0,48
Northern Cape	733 000	1,7	840 321	0,87
Limpopo	**1 470 000**	**3,5**	**4 929 368**	**0,30**
Western Cape	8 543 000	20,2	3 956 875	2,16
TOTAL	42 230 000	100%	40 583 573	1,04

Source: Mpumalanga State of the Environment Report, 2003 (Ref. 28)

Alternative general waste generation rates per province are defined in the Mpumalanga State of Environment Report (Ref. 28). These are given in Table 8.3. Here, the per capita waste generation rate for the Limpopo Province is given as 0,30 m^3/capita/annum, equivalent to approximately 0,100 ton/annum at the same density as used by Mayet for low-income households (0,333 ton/m^3). This is slightly higher than the generation rate defined when applying Mayet's model, 0,24 m^3/capita/annum (0,08 ton/capita/annum) for the Northern District Council, but still lower than that determined from the household waste sampling exercise. Due to this discrepancy in recommended and survey-based general waste generation rates, waste generation in the Capricorn District has been calculated for a lower limit estimate using 0,24 m^3/capita/annum or 0,08 ton/capita/annum, and for an upper limit estimate using 0,412 ton/capita/annum.

8.1.2 Health care waste

The DWAF baseline study recommends the use of the mean generation rate of hospital waste per hospital bed as given by BS 3316: 1973, based on bed occupancy of between 70-80% (80% occupancy for Limpopo Province). The waste generation rate is defined by the mean of 1,95 kg / bed / day, and also includes a component of general waste. This waste generation rate does not, however, necessarily apply to clinics where only out-patients are treated.

8.1.3 Water and waste water treatment

Sewage sludge is the major waste generated by this sector. For The DWAF baseline study on waste generation, the volumes of sewage sludge were calculated with reference to the Water Institute of Southern Africa publication entitled *Sewage Sludge - Utilisation and Disposal*, published in 1993. In this publication Ekema notes that the average production rate of sewage sludge is 50 grams per person per day. Provision for the disposal of sludge is important since it can impact significantly on local groundwater resources.

As South Africa develops and more and more areas are connected to waterborne sanitation, sludge production will increase rapidly. It is therefore conceivable that sludge production could double within 20 years. (Ref. 20)

8.2 DETERMINATION OF WASTE QUANTITIES

No definitive information regarding waste quantities collected, recycled, treated or disposed of in the Aganang municipal area was available. Quantities of general waste generated in the area was therefore determined from the following:

- Information gathered from the surveys, as uncompacted waste in m^3/annum or ton/annum.
- Calculations using waste generation factors in m^3/annum or ton/annum using typical waste generation rates as discussed in Section 8.1. These calculations were based on population figures, number of households and the number of beds per hospital.

8.2.1 General waste

As discussed above, quantities of general waste generated in the area was therefore determined from the following:

- Information gathered from the surveys, as uncompacted waste in m^3/annum or ton/annum.
- Calculations using waste generation factors in m^3/annum or ton/annum using typical waste generation rates as discussed in Section 8.1. These calculations were based on population figures, number of households and the number of beds per hospital.

Details of minimum and maximum estimates of volumes (masses) of household waste generated per village are included in ***Appendix I***. Other general waste is generated by businesses, schools and pre-schools or crèches. Details of total general waste generated by these sectors of the community are given in ***Appendix I***, ***Appendix J*** and ***Appendix K*** respectively. Details of the volumes of general waste generated by hospitals and clinics are given in ***Appendix P***.

In summary, it is estimated that the total household waste currently generated in Aganang is some 20 482 ton / annum to 78 029 ton/annum. This is shown in Table 8.4.

The large discrepancy between the minimum and maximum estimate of quantity of waste generated on Aganang is due to the large difference between the minimum and maximum per capita waste generation rates used. This discrepancy indicates the importance of improving the current estimate of per capita general or household waste generation. It is, however, likely that the minimum and maximum estimates for total general waste generated could well be indicative of the two extreme conditions in economic growth in the area viz. minimum waste generation can be expected if there is no economic growth in the area and household incomes remain low. The maximum total waste generation could be representative of potential conditions should there be sound economic growth in the area, with the average household income rising above R 5 000 / household per annum.

Table 8.4 Estimate of average mass of general waste generated in Aganang per annum, by sector

Waste category	Assumptions	Mass of waste generated per annum (ton/annum)
Minimum estimate average mass household waste produced / annum	Ave 0,08 ton/capita/annum	13 864
Maximum estimate average mass household waste produced / annum	Ave 0,412 ton/capita/annum	71 401
Average mass of sewerage sludge produced / annum	Ave 0,018 ton/capita/annum	3 163
Average mass of general waste produced by businesses / annum	Ave of 6,3 black bags/business/week – determined from survey	1 615
Average mass of general waste produced by schools / annum	Ave 0.22 kg/person/week – determined from survey 42 066 persons	355
Average mass of general waste produced by nursery schools and crèches / annum	Ave 1.04 kg/child/week (including children at schools not using nappies) – determined from survey Ave 1 732 children or babies	93.22
Average mass of disposable nappy waste produced by crèches / annum	Ave 6.81 kg/person/annum – determined from survey 1 732 children or babies	11.8
Average mass of general waste produced by hospitals and clinics / annum	Ave 154.4 ton/clinic/annum – determined from survey 7 clinics and 1 hospital and 1 surgery	1 390
TOTAL Average mass of general waste produced in Aganang per annum	Minimum	20 482
TOTAL Average mass of general waste produced in Aganang per annum	**Maximum**	**78 029**

8.2.2 Medical / health care waste

Data on medical or health care waste generation was collected through interviews with the environmental health officers for CDM. Further data was collected through surveys which were completed by representatives of the clinics and hospitals. Details of waste generation and management at the clinics and hospitals are included in ***Appendix P***.

- ***Domestic / General waste*** (Plastics, paper and leftover food)
  All clinics have waste pits where domestic waste is dumped and burnt.

  Organics such as food scraps are also collected from some of the clinics by members of the community. These are generally used to feed domestic animals such as dogs.

The following aspects are problems noted with the management of general waste at the clinics and hospitals:

- The only disposal facilities for waste such as paper and plastics are waste pits at the clinics.
- These waste pits are not fenced or guarded.
- Nobody accepts responsibility for the pits.
- Medical waste is often mixed with domestic waste (food leftovers).

Old bandages, swabs etc. are also treated as general waste by the clinics. This was confirmed in the waste survey responses from the clinics. This is of major concern, as such material can still carry infectious matter.

- ***Medical waste***

  There is one functional incinerator in Aganang, which is located at WF Knobel Hospital. Although some of the clinics (Schoongesicht, Rozenkrans), have gas incinerators, these are not functional. Medical waste, such as sharps, is therefore disposed of in bug bins, and collected until such time as it can be transported to WF Knobel Hospital for incineration. Bug bins are collected by hospital staff, usually in the same vehicles in which medications are delivered to the clinics. The frequency of collection therefore varies, as it is dependent on the delivery of medicines to the clinics.

  Problems associated with the handling and treatment of medical waste include:

  - None of the incinerators have permits.
  - Incinerators at the clinics are not operational.
  - Bug bins are sometimes not transported to the WF Knobe; Hospital for incineration.
  - When bug bins are transported to the hospital, hospital staff have to use the same vehicles in which medication is transported to the clinics. This cannot necessarily be considered the best practice with respect to hygiene.
  - Nobody accepts responsibility for the transportation of the medical waste.
  - No funding is available for the transportation of medical waste.
  - No removal service for the incinerator ash exists.
  - Sharps are visible in the incinerator ash.
  - The incinerator does not give full combustion.
  - Incinerator operators are not adequately trained.
  - Incinerator operators sell bug bins instead of incinerating them.
  - Incinerator operators have no protective clothing.
  - There is no education of staff or monitoring of medical waste.

  It is hoped that this condition will improve in the near future, as it is believed that a tender has been advertised for the collection and treatment of

medical waste throughout the Limpopo Province. Despite enquiring about this alleged tender at various of the provincial departments, the study team has, however, not been able to establish any further information regarding this.

- ***Human tissue***
  Human tissue is disposed of in placenta pits at five of the clinics (Schoongesicht, Ga-Kolopa, Lonsdale, Rosenkrans, Kalkspruit). For cultural reasons, some patients do, however, request to take their placentas home. Although placenta pits should effectively be "self-sustaining" in that the material in the pits will decompose rapidly, some of the staff members at the clinics have voiced concern that they experience problems with the placenta pits being full. This could occur if the rate at which the pits are filled is faster than the decomposition rate. More detailed investigations must therefore be done to determine the actual requirements for tissue disposal at the clinics and the necessary volume of the placenta pits required to ensure that there are adequate disposal facilities at all the clinics.

- ***Old or excess medication***
  It is assumed that old or excess medication is collected by the dispensing pharmacist, or returned to the WF Nkobel Hospital. Although not confirmed at this time, it is assumed that old medication is returned to the pharmaceutical companies by the dispensing agent when the medication reaches its expiry date.

- ***General problems identified***
  A few other problems at the hospital and clinics, associated with waste management, have been identified. These include:
  - Pit latrines have reached capacity at some clinics.
  - The hospital and clinics do not have a specific budget for waste management.
  - Due to lack of records, probably as a result of understaffing, hospital and clinic management and staff are not able to establish the actual costs of waste management at their institutions.
  - None of the medical health care facilities have any specific strategies, policies or education programmes relating to waste management.

8.2.3 Hazardous waste

None of the potential hazardous waste generators identified through the waste survey have records of the types and volumes of waste generated by their activities. It is therefore recommended that appropriate registers or manifests be drawn up in association with the operators / owners of these businesses, and that a system be developed whereby data on the types and volumes of hazardous waste generated can be kept. This should initially be done with no

associated punitive action for businesses that are not compliant with the *Minimum Requirements* for waste disposal. If punitive actions are implemented immediately, the municipality is likely to get little or no co-operation from the owners / operators of these businesses. It would therefore be better to establish some grace period during which the municipality will assist all waste generators in becoming compliant with the *Minimum Requirements*.

Although hazardous waste generation volumes for Aganang could not be determined at this time, the total hazardous waste generated in the Limpopo Province, as determined as part of the DWAF baseline study, is given in Table 8.5. From this table it can be seen that hazardous waste generation rates in the province are very low (5 813,5 m^3/annum in 2001). Hazardous waste should therefore be managed on a more regional or provincial level, as it would not be economically viable to manage it on a local level.

8.2.4 Agricultural waste generators

As mentioned, the main agricultural waste generators in these areas are chicken farms. Waste from these farms includes feathers and manure. Generally, though, the waste generated on these farms is sold. Chicken remains are sold at R 5-00 for 50 kg. Chicken manure is also sold for fertilizer. Actual volumes of these types of waste are, however unknown, as is the actual income generated from selling chicken remains and fertilizer. Farmers should therefore be requested to keep better records regarding these aspects. The farmers should be assisted and trained for this initiative should this be necessary.

Table 8.5 Total hazardous waste generation in the Limpopo Province (Ref. 20)

Sector	Waste stream description	Code	m^3/annum	Class
Metal products	Waste mineral oils	MP04	170,00	3
Electric and electronic manufacturing	Solvent containing waste (non-halogenic)	EP03	5,00	3
Formulation-other	Other non-solvent (contained)	CF01	1,00	3
Transport/maintenance	Mineral oil sludges	TR01	630,00	3
Electric and electronic manufacturing	Soluble oil waste	EP01	25,00	3
Metal products	Solvent containing waste (non-halogenic)	MP05	210,00	3
Paints and inks manufacturing	Liquid solvent (excluding recycled products)	PA01	240,00	3
Plastic and rubber	Solvent waste	PR04	1,50	3
Paper/pulp	Waste mineral oils	PP05	5,00	3
Printing	Solvent containing waste	PR01	15,00	3
	Sub-Total		**1 302,50**	
Food/beverage	Fermentation waste	FB03	4 300,00	6
Timber	Treatment sludge	TI01	15,50	6
Food/beverage	Liquid food rests	FB02	7,50	6
Electric and electronic manufacturing	Solvent containing waste (halogenic)	EP04	3,00	6
	Sub-Total		**4 326,00**	
Metal products	Solvent containing waste (halogenic)	MP06	70,00	9
Electric and electronic manufacturing	Inorganic sludges electro-plating/galvanised/other	EP02	55,00	9
Paints and inks manufacturing	Other non-solvent (contained)	PA02	60,00	9
	Sub-Total		**185,00**	

9 EXISTING WASTE MANAGEMENT STRUCTURES, SERVICES, FACILITIES, PRACTICES AND STRATEGIES

The Aganang Local Municipality could only provide very limited information regarding existing waste management structures, services, facilities, practices and strategies. The information contained in this section is therefore largely derived from interviews etc. conducted as part of the waste survey, and from deductions from the completed survey questionnaires.

9.1 EXISTING WASTE MANAGEMENT SERVICES AND FACILITIES

9.1.1 Existing waste collection services and refuse removal entities

Currently no formal domestic / general waste collection services exist in the Aganang municipal area.

In some of the villages, an estimated 33% has developed community initiatives whereby the community members attempt to control / manage the waste within their own communities. Despite these community initiatives, waste collection services are still, urgently needed in this villages.

As shown in Figure 9.1, the remaining 67% of households in Aganang have no waste management services at all. This finding of the waste survey is contrary to that of the 1996 and 2001 census, where it was shown that only 11% of households in Aganang had no waste disposal (see 0). As discussed in Section 6.9.3, this discrepancy is possibly due to the definition in the censuses that having “own dump” or “communal dump” is equivalent to having some form of waste disposal service. The study team is not in accordance with this definition, as these dumps are effectively illegal dumps and are not managed or controlled in any way, thus becoming a risk to the communities and the environment.

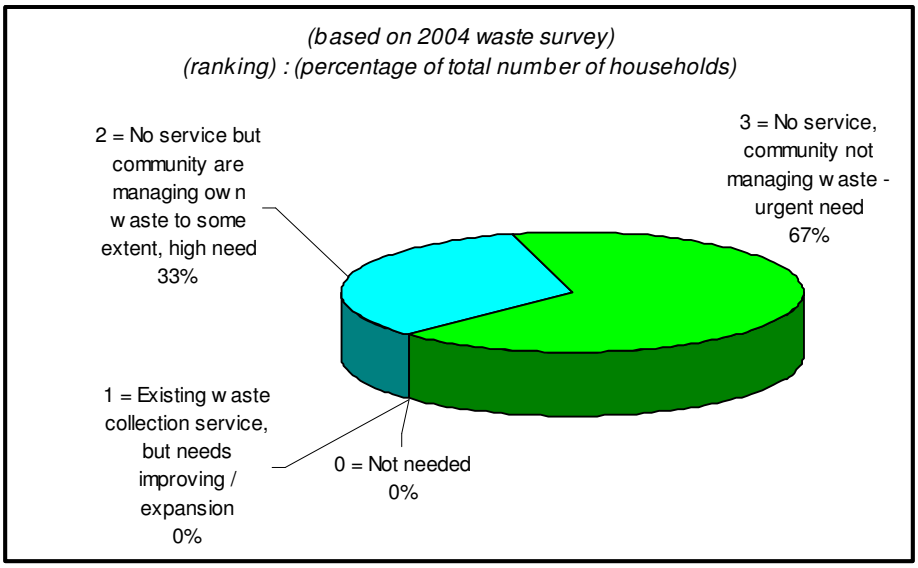


Figure 9.1 Chart: Aganang 2004 – community / surveyor assessment of need for waste collection and management services
(based on 2004 waste survey)

9.1.2 Private waste removal contractors

There are no private waste removal contractors actively operating or providing services in the Aganang municipal area.

9.1.3 Waste collection and transportation routes

As part of this assignment it was required that the collection and transportation routes of the waste collection entities be determined, mapped and provided to the CDM. The origin and characteristics of the waste being transported could also then be catalogued. Due to the fact that there are no waste collectors in Aganang this item was not further investigated.

With the exception of the transportation of medical waste from the various clinics and hospitals to WF Knobel Hospital (see 9.1.4), there is minimal transportation of waste in Aganang.

9.1.4 Waste collection and management vehicles

It was required that an inventory of all waste collection vehicles and waste management equipment be established for each of the four local municipalities. There is currently no waste management equipment such as compactors etc. being used in Aganang. The only waste collection vehicle that is used is an open van from the WF Knobel hospital.

9.1.5 Transportation and collection of medical waste

Bug bins, containing sharps and other hazardous medical waste, are transported from the other clinics in Aganang to the WF Nkobel Hospital for treatment (incineration). Details of the methods used to transport the waste from each clinic are given in ***Appendix R*** and ***Appendix P***.

Generally the bug bins are collected by the bakkie (open van) provided by the WF Knobel hospital, which is also used to deliver medication to the clinics. The frequency of collection varies, as it depends on the delivery of medicines to the clinics. It is estimated that some 4+ 5litre containers of sharps are collected from the various clinics every 2 to 3 weeks. This estimate is based on information given to the study team by representatives of the various clinics.

Placenta pits exist at all the clinics for the disposal of human tissue waste.

9.1.6 Transfer facilities

There are no waste transfer facilities in the Aganang municipal area.

9.1.7 Waste recycling facilities

There are no waste recycling facilities in the Aganang municipal area. It is noted that most of the recycling facilities in the Capricorn District are located within Polokwane. The use of these facilities, and the future development of any new waste recycling facilities, should be managed for regional (district use).

9.1.8 Waste treatment facilities

There is one waste treatment facility in Aganang. This is the waste incinerator located at the WF Knobel Hospital. Some clinics are equipped with gas incinerators(Maraba, Masheshane, Rosenkrans), but these are not functional.

The WF Knobel incinerator, (similar to that located at the Helen Franz Hospital, Blouberg – shown in Plate 9.2) is used to incinerate all sharps and other hazardous medical waste generated in the hospitals and clinics in the Aganang municipal area. Details of the incinerator are given in ***Appendix T.1***.

Operators noted that the incinerator can treat four (4) bags of medical waste at a time. The maximum capacity of the incinerator is estimated at some 8 tons of waste per annum. Actual throughput is, however not known, as there are no records of the volumes of waste treated.

A number of problems have been identified with the WF Knobel facility. These include:

- Incinerator operators are not adequately trained.
- The incinerator does not give full combustion, and often there are items such as needles in the ash that have not been properly burnt.
- It has been noted that the smoke from the incinerator is problematic to the surrounding communities and the hospital itself.
- Ash from the incinerator is not disposed of in a properly controlled hazardous waste landfill.

Plate 9.1 WF Knobel Hospital - Incinerator ash

Plate 9.2 Helen Franz Hospital - Incinerator

9.1.9 Existing waste disposal sites

A register of waste disposal sites was to be drawn up for the purpose of this assignment. Not including illegal dumping sites, there are currently no formal waste disposal sites in Aganang. The WF Knobel Hospital uses an illegal dump site to dispose of their refuse at Kgabo Park. This illegal dump site is fenced.

Plate 9.3 The WF Knobel Illegal dumping site at Kgabo Park

Plate 9.4 Illegal dumping outside the fenced Kgabo Park illegal dump site

Plate 9.5 Illegal dumping at Kgabo Park.

Plate 9.6 Illegal dumping at Kgabo Park

Plate 9.7 Illegal dumping outside WF Knobel Hospital

Plate 9.8 Illegal Dumping outside WF Knobel Hospital

Plate 9.9 Illegal dumping outside WF Knobel Hospital

Plate 9.10 Lonsdale Clinic – waste pit and littering

Plate 9.11 Lonsdale Clinic - littering

Plate 9.12 Lonsdale Clinic – Typical Placenta Pit

Plate 9.13 Lonsdale taxi rank - Illegal Dumping of Building rubble next to the taxi rank.

Plate 9.14 Lonsdale taxi rank – Illegal Dumping of Building rubble next to the taxi rank

9.2 EXISTING WASTE MANAGEMENT STRUCTURES

Management of domestic / general waste is a function of the Local Municipality. For this reason the current structure of the Aganang Local Municipality was investigated.

The general structure of all four Local Municipalities investigated in this study is shown in Figure 9.2.

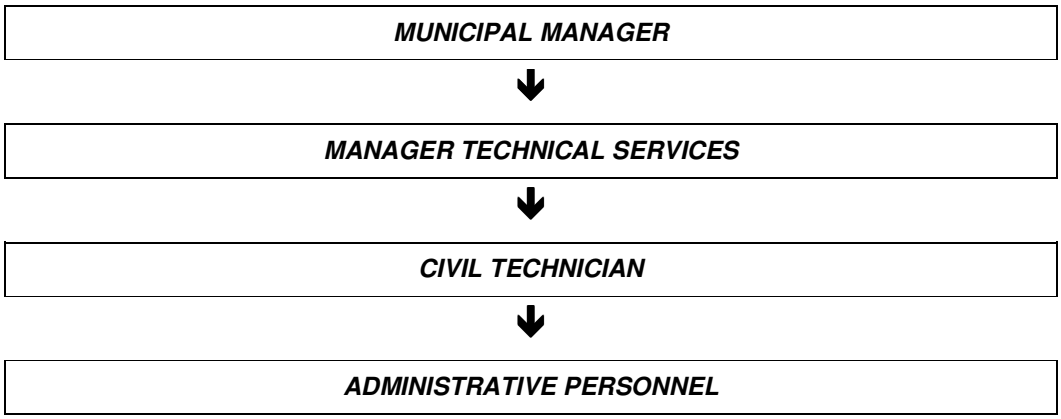


Figure 9.2 General structure of Local Municipalities in CDM

The various division of the Aganang Local Municipality (ALM) are shown in ***Appendix C***.

9.3 EXISTING WASTE MANAGEMENT, PREVENTION AND MINIMISATION STRATEGIES

There are currently no specific waste management, prevention or minimisation strategies in place, or being planned for implementation, in Aganang.

10 WASTE IMPACTS

The impacts of the lack of waste management services in the Aganang municipal area is best evidenced through photographs and comments from the community members. In Plate 10.1 to Plate 10.4 the general impact on the environment and communities of no waste management services is clearly shown. Below are a number of typical comments received from community members when the waste surveys were conducted. All comments received are included in ***Appendix H***.

- *Headman noted experienced problems e.g. children play in illegal waste dumps which results in injury to the children. The illegal dump is not fenced. Should the municipality take care of waste it will benefit the community. It was also noted that during the dry season or droughts, one of the main causes of death of livestock is complications arising from livestock having eaten plastic bags.*
- *Waste management has been a problem in the community for a long time. The community has attempted to deal with the problem but have been unsuccessful. Waste causes risks, including problem such as poisonous snakes hiding under tins and in old cars where children play. The municipality should view waste as dangerous to the community, and implement waste management practices in the community.*
- *Waste is not managed, with some streets being so severely affected that they are impassable for vehicles. At the clinic, paper etc. is burnt, while sharps are taken to the hospital for incineration. Sister Mohale recommended that waste should be taken to a recycling centre to prevent it becoming a health hazard.*
- *A senior professional nurse was ecstatic to hear of this project which is investigating the status quo of the waste management situation in the Capricorn District. She noted that patients come to the clinic suffering from food poisoning , particularly children who have eaten remains from tins of spaghetti, fish etc. that they have found, that are off. Other patients suffer from other disease that are related to waste. She has also encountered children playing with used condoms. She therefore feels it critical that the municipality consider waste management a priority.*
- *Waste causing injury & accident to community members, especially children playing with waste. Waste such as broken glass and plastics also causing death amongst livestock.*

Considering the comments from the community members, and aspects observed by the study team, the most common impacts arising from poor waste management can be summarized as:

- Illegal dumps and scattered waste pose a health risk to communities, particularly children.
  - Injuries from waste such as broken bottles and tins.
  - Infection from previously infected waste.
  - Breeding ground for vermin and pests such as rats and snakes. Community members have suffered bites from creatures living in the waste dumps.

- Breeding ground for insects that may carry diseases such as flies.

- Death of livestock through ingestion of plastic bags.
- Injury of livestock on broken bottles, tins etc.
- Problems of odours, flies etc.
- Affecting road access in some communities.
- Affecting road safety where animals are killed on roads and are not removed.
- Unsightly, affecting the general well-being of people living around such dumps.

Some specific impacts of poor waste management include:

- Illegal dumping occurs in some cemeteries. This is extremely upsetting and offensive to family members of persons who are buried in these cemeteries.

Plate 10.1 Example of Scrap metal illegally dumped– Material with potential for recycling

Plate 10.2 Lonsdale Taxi Rank – Illegal dumping

Plate 10.3 Example of an illegal dumping site next to a business

Plate 10.4 WF Knobel Hospital – illlegally dumped ash outside hospital

11 EXISTING ECONOMICS AND FINANCING OF WASTE MANAGEMENT SYSTEMS

There are currently effectively no financing systems, economic planning or financial management structures for waste management in Aganang. The general economics and costs of what little waste management is conducted within the municipal area are also effectively unknown.

11.1 EXISTING FUNDING MECHANISMS FOR WASTE MANAGEMENT

11.1.1 Local government funding

It is unknown if the Aganang Local Municipality has a designated budget for waste management.

11.1.2 Cost recovery: Levies charged

No levies are charged for the provision of refuse removal services due to the fact that there are no refuse removal services.

11.2 POTENTIAL COST RECOVERY FOR WASTE COLLECTION SERVICES

As part of the survey, communities were requested to comment on their ability, and willingness, to pay for waste collection services. Similarly, schools, crèches or nursery schools and police stations were requested to state what they would be able and willing to pay for waste collection services.

11.2.1 Household ability to pay

In response to the survey, at village level all of households indicated whether they would be willing or able to pay for waste collection services. Some 23,1% of households are willing to pay for waste collection services, at levels ranging from R 2.00 to R 11.00 per month, while 76,9% of households did not feel that they could afford to pay for services. The communities' perceived ability to pay for services is shown in Figure 11.1.

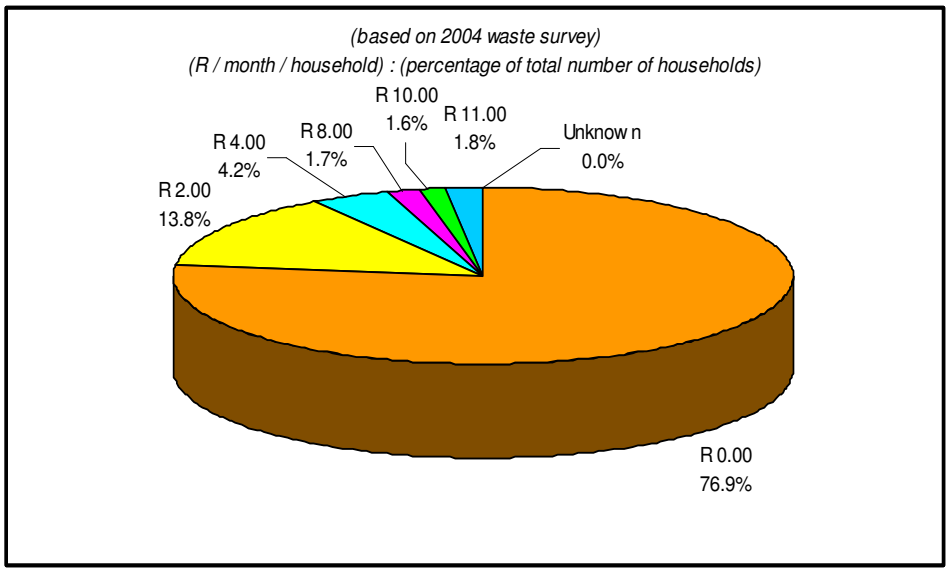


Figure 11.1 Chart: Aganang 2004 – communities' perceived ability to pay for waste management services
(based on 2004 waste survey)

The 2001 annual household income is shown in Figure 11.2, while the 2001 individual monthly income is shown in Figure 11.3 (figures for 2004 are not available, and cannot be extrapolated from census data). Considering these figures, it can be understood why 76,9% of households do not believe that they can afford to pay for waste collection services. In 2001, 26% of households had no income, while a further 16,0% had an annual income less than R 4 800 (R 400 / month). Similarly, considering individual income levels, 77% of the population of Aganang had no income at all, while 7% had an income of less than R 400 / month. With household and individual income levels this low, it cannot be expected that households will easily be able to pay for waste collection services.

This aside, considering the communities' perceived ability to pay for services, it is estimated that some R 738 480 could be collected annually from levies for waste collection. This figure would necessarily have to be adjusted if equal levies are to be charged throughout Aganang. Details of potential income per village are shown in ***Appendix H***.

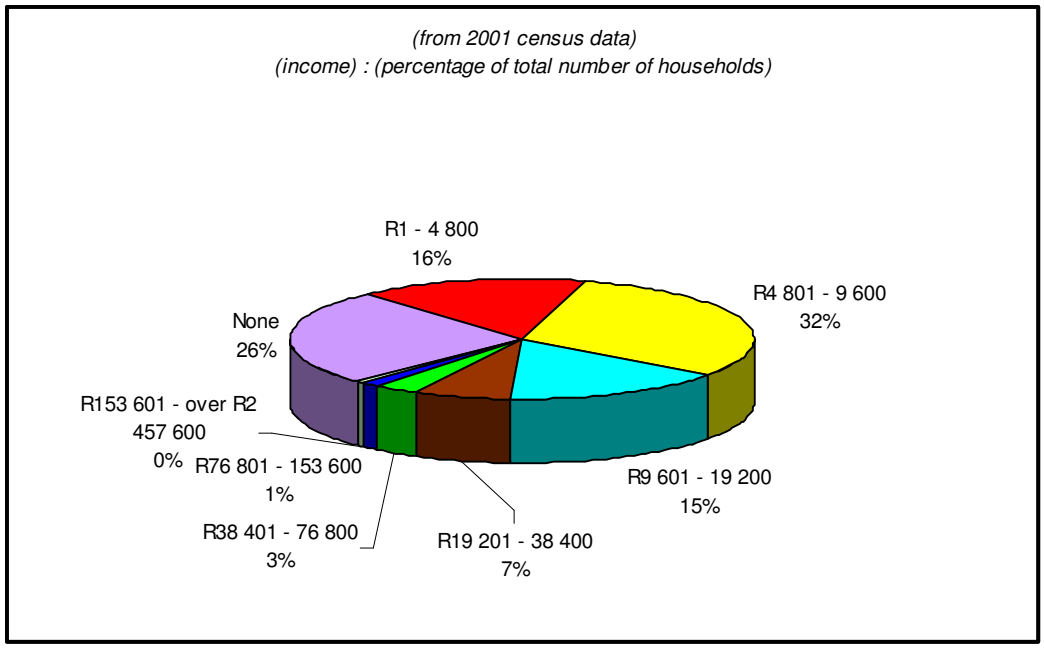


Figure 11.2 Chart: Aganang - 2001 demographics - 2001 - annual household income
(from 2001 census data)

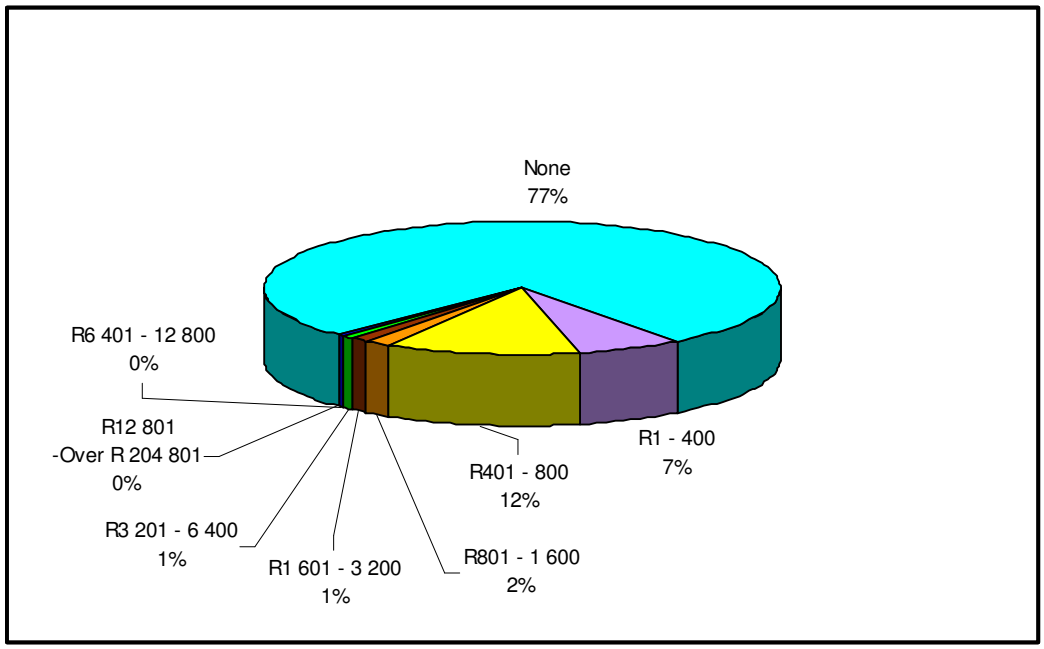


Figure 11.3 Chart: Aganang - 2001 demographics - 2001 - individual monthly income
(from 2001 census data)

11.2.2 Schools ability to pay

In response to the question as to what schools would be able and willing to pay for waste collection services, 49,1% did not respond to the question, while 49,1% of the responding schools stated that they could not afford to pay for waste collection services (see ***Appendix J*** for details per school). Of the latter schools, a number (10,5% of all responding schools) would be willing to offer manpower or community service in return for provision of waste collection services.

A total of 21,9% of the responding schools stated that they would be willing to pay "any reasonable amount" agreed with the municipality. The remaining 2,6% of the responding schools would be willing to pay charges for waste collection ranging from R 2.00 to R 50.00 / month. This could potentially generate an annual income in the order of R 504 per annum.

11.2.3 Pre-schools or crèches ability to pay

In response to the question as to what pre-schools and crèches would be able and willing to pay for waste collection services, 41,4% did not respond to the question 13,8% of the responding schools stated that they could not afford to pay for waste collection services (see ***Appendix K*** for details per school). No schools would be willing to offer manpower or community service in return for provision of waste collection services.

A further 3,4% of the responding schools would be willing to pay charges for waste collection up to R10.00 / month. This could potentially generate an annual income in the order of R 240 per annum.

12 PUBLIC AWARENESS AND COMMUNICATION

12.1 PUBLIC AWARENESS

Public awareness levels with respect to waste management and problems associated with waste vary from village to village in Aganang. Indications are that the public is relatively aware of the problems associated with lack of waste management, but generally do not know how to deal with the waste generated in their communities.

Waste management is also not of top priority to the community. This is evidenced by the fact that waste management was only identified as priority 12 of the 16 infrastructure priority issues adopted by the ALM (Ref. 36) as part of the IDP process. The IDP does identify waste management, or lack thereof as a problem, and as such specific objectives, strategies or projects related to waste management have been proposed.

12.2 PUBLIC INFORMATION

There are no public information programmes about waste management in Aganang.

In addition, little attention is paid to waste management issues in schools. Of the schools that responded to the waste survey, only 45,6% teach about waste and waste management issues in the school syllabus, while only 18,4% have special programmes in the school to make learners aware of waste and problems associated with waste and litter.

The DWAF publication, "*Waste Management and the Minimum Requirements"* (Ref. 21), simply but clearly outlines what will be required of waste management processes. The publication is designed for easy reading by the general public, and is freely available from the DWAF, Pretoria. It is therefore recommended that these publications be distributed in the community, to institutions such as schools and resource centres. This publication could also provide a basis for workshops and lectures for developing public awareness with respect to waste management issues.

12.3 COMMUNITY SELF-HELP PROGRAMMES

There were no community self-help programmes identified in Aganang that deal with waste.

The sense of community and initiative of the community is, however, evidenced by the number of Community Based Organisations that exist in Aganang. A total of 52 CBOs, ranging from school governing bodies to health committees and community policing forums, were identified through the waste survey (see ***Appendix M***). These

CBOs offer potential forums for access to community members for developing public awareness and educating the community with respect to waste management issues.

Willingness on the part of the community to learn about waste, and implement community waste management programmes, is evidenced by the responses from schools and nursery schools or crèches to the questions whether they would be interested and willing to participate in composting and / or recycling programmes.

Of the schools that responded to the questionnaires, 71,9% would be willing to participate in waste recycling programmes, while 63,2% would be willing to participate in composting programmes. In comments from the schools an enthusiasm for initiating such programmes is voiced (see ***Appendix J***).

Of the pre-schools and crèches that responded to the questionnaires, 75,9% would be willing to participate in waste recycling programmes, while 58,6% would be willing to participate in composting programmes (see ***Appendix K***).

13 MAPPING OF GEOGRAPHICAL WASTE MANAGEMENT AREAS

As a requirement of the ToR (Ref. 8) for this assignment, and in order to facilitate long term planning of waste management services and systems, various relevant data have been plotted on maps of the Aganang municipal area.

All maps that have been generated of the Aganang municipal area are included in ***Appendix W*** to this report. These include:

- ***Appendix W.1*** Aganang: Population size and distribution per village.
- ***Appendix W.2*** Aganang: Number of households per village.
- ***Appendix W.3*** Aganang: Number of businesses per village or town
- ***Appendix W.4*** Aganang: Location of hospitals and clinics.
- ***Appendix W.5*** Aganang: Number of schools and pre-schools or crèches per village or town.
- ***Appendix W.6*** Aganang: Location of existing landfill sites.
- ***Appendix W.7*** Aganang: Location and estimated volume of general waste generated.

With reference to the ToR (Ref. 8) it was required that a number of other aspects related to existing waste management services and systems be mapped. There is, however, either insufficient information available to allow for mapping of these aspects, or the services etc. that it was required be mapped either do not exist in the Aganang municipal area, or exist at such a limited level that mapping thereof is not justified. Aspects that have therefore not been mapped, although this was a requirement of the ToR, are listed below. Reasons for not mapping this information are given.

- *Number and location of waste collection points and collection routes.*
  The level of services provided is too low and does not justify mapping at this time.

- *Percentage of households covered by existing collection systems.*
  The level of services provided is also low and does not justify mapping at this time.

- *Quantities & types of waste collected and transported.*
  The level of services provided is low and does not justify mapping at this time.

- *Transportation routes of waste collection and transportation entities.*
  The level of services provided is also low and does not justify mapping at this time.

- *Location of transfer facilities.*
  There are no transfer facilities in the Aganang municipal area.

- *Location of waste treatment facilities.*
  There is in only one waste treatment facility in the Aganang municipal area. This is located at the WF Knobel Hospital. The number of existing treatment facilities does not justify mapping at this time.

- *Location of recycling facilities.*
  There are no waste recycling facilities in the Aganang municipal area.

The maps included in this report will also be provided to the Capricorn District Municipality in hard copy and in electronic format.

14 SUMMARY ANALYSIS OF PRESENT SITUATION

Put simply, to summarise the present situation with respect to waste management in Aganang there is effectively no waste management, nor any waste management services in Aganang. Waste is dumped by communities in illegal dumps around their villages (see ***Appendix U***) as well as scattered in the villages themselves.

There is currently no financial or economic planning for the provision of waste management services, and the municipality does not have the structure or staff required to implement the necessary services.

There is an urgent need to develop waste management services and systems in the municipal area.

15 RECOMMENDATIONS

The recommendations that follow have been divided into two groups, viz.

- *Specific recommendations arising from this study*
  Based on the findings of this study, specific recommendations can be made relating to waste management in the Aganang municipal area, as well as within the area of jurisdiction of the Capricorn District Municipality. These recommendations are discussed in Section 15.1.

- *General recommendations for government and the general public*
  As discussed in Section 4.5, the DWAF has established *Minimum Requirements* for waste management and handling in South Africa. The DWAF publication, "*Waste Management and the Minimum Requirements"* (Ref. 21), simply, but clearly, outlines what will be required of waste management processes. The document also outlines what will be required of government and the general public to ensure that these processes are implemented successfully.

  It is these requirements, both at government and public level, that MUST be met in any planning and implementation of waste management strategies and practices, at local, provincial or national level. The *Minimum Requirements*, and potential participation of the public in the waste management process, are discussed in this section. This discussion is drawn largely from "*Waste Management and the Minimum Requirements"* (Ref. 21). This outline, discussed in Section 15.2, presents a broad view of what will be included in the WMPs, viz. recommendations for the way forward with respect to waste management as a whole.

All recommendations made here will be incorporated in the WMPs.

15.1 SPECIFIC RECOMMENDATIONS ARISING FROM THIS STUDY

1. The set of waste management indicators, as outlined in Section 2 of this report should be adopted. Systems should therefore be set in place to collect the necessary data required to monitor these indicators.

2. Due to the lack of public transport systems in the area, should any work opportunities be created through waste management programmes or projects that are to be established, then places of work should ideally be located close to the work force's places of residence.

3. It is extremely important that local representatives check and confirm the data included in this report. Further confirmation of these figures will also be sought directly from the Department of Education.

4. It is not believed critical at this time that there is uncertainty as to the population size and growth rates, but it will become increasingly important to have a good estimate of population sizes and growth rates as long term plans are conceptualised and implemented. It is, therefore, extremely important that a system be instituted whereby population sizes and growth rates can be monitored and determined more easily, thereby facilitating long term planning for, not just waste management services, but all developments and development programmes. Such systems would include aspects such as detailed records of birth and death rates, causes of death, numbers of pupils attending schools, and numbers of households in a given community.

5. Some agreement must be reached as to what would be the best model / study findings to use when assessing the potential impact of HIV / AIDS on the waste management sector. In addition, an assessment must be made as to what level of "change scenario" (i.e. catering for the impact of HIV / AIDS intervention programmes) will be utilised when making projections for future requirements.

6. Commence a second household waste sampling programme in order to better establish household waste generation rates and the composition of the waste of the average household.

7. Appropriate equipment for the collection of waste should be acquired. Alternative operating methods i.e. methods that do not require expensive high-tech machinery, should however be sought, and appropriate equipment purchased.

8. Initiate waste collection services. This must initially be done in areas where the service would be most urgently required.

9. Clean-up programmes should be instituted to remove waste from streets and illegal dumps in the areas where collection services are provided.

10. Detailed investigations must be done to determine the actual requirements for tissue disposal at the clinics and hospital, and the necessary volume of the placenta pits required to ensure that there are adequate disposal facilities at all the clinics.

11. A system must be instituted for regular emptying of pit latrines at clinics.

12. Hospitals and clinics should identify and allocate specific budgets to waste management. They should also keep records of the actual costs associated with waste management at their institutions.

13. Develop waste management strategies for health care facilities, with associated training programmes for health care workers.

14. The transport of medical waste is the responsibility of the Department of Health, and this Department should therefore be held accountable for providing regular, safe transport for such wastes.

15. Collection services for the collection of general waste from clinics and the hospital should be instituted.

16. Train incinerator operators at WF Knobel Hospital, and provide them with the necessary protective clothing.

17. Make the necessary application for permits for the existing incinerators in Aganang.

18. Make the necessary repairs or changes to the incinerator in operation.

19. Repair the gas incinerators located at the various clinics.

20. Develop a site for safe disposal of the ash from medical waste incinerators.

21. Develop a safe disposal or treatment system e.g. incineration for medical waste such as bandages and swabs.

22. Develop appropriate registers or manifests in association with the operators / owners of potential hazardous waste generators, and develop a system whereby data on the types and volumes of hazardous waste generated can be kept. This should initially be done with no associated punitive action for businesses that are not compliant with the *Minimum Requirements* for waste disposal. If punitive actions are implemented immediately, the municipality is likely to get little or no co-operation from the owners / operators of these businesses. It would therefore be better to establish some grace period during which the municipality will assist all waste generators in becoming compliant with the *Minimum Requirements*.

23. Identify suitable landfill sites, as well as sites for waste transfer stations where these may be required. This will require an associated identification of waste collection routes.

24. Develop a low cost waste collection system that will be affordable to the communities it serves.

25. Develop waste management, minimisation and prevention strategies that will meet the specific needs of the MLM.

26. Develop an acceptable levy system for payment for waste collection and management services.

27. Develop special programmes in schools to make learners aware of waste and problems associated with waste and litter.

28. Distribute the DWAF publication "*Waste Management and the Minimum Requirements"* (Ref. 21) in the community, to institutions such as schools and resource centres. This publication could provide a basis for workshops and lectures for developing public awareness with respect to waste management issues.

29. Identify which existing CBOs could be used as forums for access to community members for developing public awareness and educating the community with respect to waste management issues.

30. In light of the emphasis of the CDM on waste reduction and recycling, as well as on employment creation, as well as considering the willingness of the community to participate in recycling and composting schemes; employ a recycling specialist to investigate the potential and economic viability of recycling and composting programmes.

31. Develop a distinctive waste management division in the Aganang municipality. This will require capacity building, and possibly augmentation of the municipal staff.

32. Develop financial plans for waste management in Aganang, allocating a fixed portion of the municipal budget for the provision of these services.

15.2 GENERAL RECOMMENDATIONS FOR GOVERNMENT AND PUBLIC

15.2.1 Integrated waste management

As discussed in Section 4.5, the four steps of Integrated Waste Management include

- ***Step 1***: Industries, businesses, agriculture and the individual should **reduce** waste generation at source.
- ***Step 2***: Ideally where possible waste items should be **reused**, and where this is not possible waste material should be **recycled**.
- ***Step 3***: Some waste can be compacted to take up less space, and treated so that it is less dangerous.
- ***Step 4***: All waste remaining after steps 1 to 3 must go to a properly designed and operated landfill (sanitary landfill).

15.2.2 The *Minimum Requirements* and how these are to be used

The *Minimum Requirements* set out waste management guidelines and the minimum standards that must be met to protect the environment. The DWAF requires that anyone dealing with waste should, at the very least, meet these standards, hence *Minimum Requirements*.

The *Minimum Requirements* are designed to ensure that waste does not cause pollution. They must be used as a guide by all persons involved in waste generation, collection, transport, treatment or disposal, and both Government and public can use them to check that standards are being maintained.

15.2.3 How do we make sure that cleaner technology is used

It is always better to reduce waste generation rather than finding solutions to deal with waste. To minimise waste generation the general public should:

- Buy only what is needed and can be used.
- Avoid extra packaging.
- Separate waste such as tins, bottles, paper and plastics for reuse and recycling.

Programmes for education of the general public regarding aspects such as these should be initiated. Such programmes could initially be established in schools and then expanded to workshops or similar that can be geared at reaching all sectors of the communities. This process could possibly be facilitated by working in co-operation with existing community based organisations.

Industries and businesses should be encouraged to produce less waste. This can be done through:

- Checking that machinery is working properly.
- Using less raw materials.
- Recovering and recycling waste where possible.
- Reducing the toxicity of any hazardous wastes.
- Using only necessary packaging.
- Training staff to avoid mistakes that cause waste, such as spilling oil or chemicals.
- Training staff in aspects of proper waste management and handling practices.

15.2.4 How can we recover and recycle waste

Useful items can be taken out of the waste stream and be reused or recycled, for example:

- Old engine oil and car batteries can be taken back to garages for recycling.
- Tins, bottles, paper, cardboard and some plastics can be separated from general waste and collected for recycling.
- Vegetable peels and other waste organics can be made into compost.
- Industry can recycle water and energy.
- Many factories can use the waste from other factories to make their own products.

This helps to reduce the amount of waste that has to be disposed of, simultaneously reducing the costs of waste disposal and treatment, and creating jobs.

15.2.5 How can waste be reduced

Waste takes up a lot of space. It is easier to manage and transport waste if it is compacted or crushed to take up less apace. Even prior to collection the general householder can assist in reducing waste volumes by crushing cartons, tins etc. Collection trucks can be used to compact waste before it reaches the landfill.

15.2.6 How can waste be made less toxic

Some waste can he treated to make it less hazardous. For example, chemicals or bacteria can be added to waste, or different types of waste can be mixed so that they neutralise each other. Another way of reducing the volume and toxicity of waste is to burn or incinerate it. This is expensive and must be done carefully or it will cause air pollution. Where the leftover ash is dangerous or hazardous, it must be properly disposed of at a hazardous waste landfill.

15.2.7 How do we make sure that waste disposal does not cause pollution?

To carry out the fourth step in waste management, waste must be properly disposed of on a landfill. It must not be accidentally spilled, or dumped illegally into a hole, a stream or in the veldt. Whoever handles, transports or disposes of waste must be qualified and trustworthy, so that the waste does indeed reach the landfill.

Different wastes need different care. Before waste is handled, we must know what it is made up of and whether it is dangerous. For this waste must be classified, as discussed in Section 7.1.

15.2.8 Different landfills for different wastes

General waste can go straight to any landfill that has a permit. If a landfill site cannot meet *Minimum Requirements*, it will NOT be given a permit to operate. If a site is already in use, and does not meet the *Minimum Requirements*, it must be rehabilitated so that a permit for the site can be obtained. Alternatively such sites must be closed.

Hazardous waste, however, must be disposed of on a special hazardous waste landfill where the utmost care is taken. In some cases, the hazardous waste must be treated before it can be disposed of at the hazardous waste landfill.

Landfills are divided into classes. The *Minimum Requirements* are strictest for landfills for hazardous wastes, for larger landfills, and for landfills that produce leachates (water that gets polluted when it seeps through waste). Leachates

can pollute the water, especially groundwater. This is of particular concern where water supplies come from wells and boreholes.

The landfill sites must be carefully selected. Site selection is the all-important first step to make sure that a landfill will not cause problems. All parties who may be affected by a landfill must have a say in the selection of the landfill site. For convenience, it must be close to where people live and work, but not so close that it causes a nuisance. The site must NOT be near water that can be polluted and there must be enough soil available to cover the waste every day. The site must be thoroughly investigated before it is developed, and an Environmental Impact Assessment must be conducted. Investigations should include Geohydrological Investigations.

The chosen site must be planned and designed, so that it can safely contain the expected type of waste. Landfills always need drains to stop water from running into the waste and to collect any leachate that runs out. Hazardous waste landfills, and landfills that produce a large amount of leachate, will also need liners underneath them. These liners can be clay or plastic, and form a barrier that prevents leachate from polluting the ground water.

The operator of a general landfill site must NOT allow hazardous waste to be off-loaded in a general landfill site. The operator must also make sure that the landfill is operated as a Sanitary Landfill, where waste is compacted and covered with soil or other substances as soon as possible. This reduces smells, flies, litter and health risks. There must always be enough staff and machines (bulldozers and special waste compactors) to control and operate the landfill such that *Minimum Requirements* and permit conditions are met.

Waste must always be compacted and properly covered. When a landfill is full, it cannot just be abandoned. It must be closed in an environmentally acceptable way. It must be ensured that the landfill does not cause pollution, and any necessary rehabilitation work must be done to prevent future pollution from the landfill. Monitoring systems must also be developed, as closed landfills could still pollute groundwater etc. The site must be monitored for up to 30 years afterwards to check pollution.

After closure the community can use a general waste landfill, for example, as an open space or sports fields. The local people must be consulted to find out what use they would prefer. Because of possible danger, the public will not be allowed onto a closed hazardous waste landfill.

15.2.9 How can we make sure that a landfill meets the minimum requirements

A landfill site whether operating or closed, must be monitored, or checked to make sure that the *Minimum Requirements* have been met and that it is not polluting the air, water or soil.

It is important that a landfill is properly monitored. The operation must be checked often, to see that only permitted types of waste are being accepted and that the waste is properly compacted and covered. The operation must not cause a nuisance such as flies, bad smells and litter. The local community can be involved in checking this.

Any water near the site and groundwater below the site must be regularly tested for pollution. Water pollution can continue long after the landfill has closed. Water monitoring must therefore continue for up to 30 years after closure.

15.2.10 The public and waste management

The public can and should be encouraged to participate in waste management. Public involvement, either on a group or individual level can include aspects such as:

- Understanding the harm that unmanaged waste does to our environment and the need for waste management and landfill sites.
- Helping reduce waste as discussed in Section 15.2.5.
- Attending landfill site selection meetings and putting forward Ideas and concerns.
- Giving input into the selection, investigation, planning and design of a landfill.
- Establishing and joining landfill-monitoring committees to make sure that landfills are properly managed and that permit requirements are met.
- Helping to make sure that landfills meet agreed end-use requirements after closure.
- Participating in any opportunity for public input to help plan a policy on waste management.

15.2.11 How will waste be controlled in the future?

In future, any industry or business that produces hazardous waste will have to be registered by the DWAF. New industries and businesses will have to know what waste they will create before they start up. They will have to demonstrate how they will reduce waste and how they will dispose of it, using the *Minimum Requirements*.

All waste transporters will have to be registered, and will only be allowed to dispose of waste in landfills that have permits.

Waste manifest systems must also be established. This will involve controlling and monitoring the waste from source to disposal. The waste generator will sign a waste manifest, which will, in turn be signed by the transporter and by the permit holder of the landfill. This manifest will be returned to the generator, who will keep it as proof that the waste has been safely disposed of and not lost along the way.

15.2.12 It costs money to manage waste efficiently

Any improvements in waste management standards will always cost more. These costs must be paid for by the person or industry that generates the waste. It is only fair that the waste generator or polluter should pay the cost of waste management and not the community. This is known as the Polluter Pays Principle. Increased disposal and clean up costs will also encourage the waste generator to use cleaner technology and to reduce the waste stream as much as possible.

The *Minimum Requirements* aim at improving standards, but keeping costs down. This is partly done by ensuring that the landfills that could pollute badly have the strictest requirements. Requirements are less strict for landfills that would cause less pollution.

16 THE WAY FORWARD

16.1 OVERVIEW OF PROJECT IMPLEMENTATION PHASES

As discussed in Section 3.1, the study consists of ten phases, of which the first three have been completed to date. These phases include:

- Phase I: Inception
- Phase II: Data collection: Field work
- Phase III: Data collation and analysis

The fourth and fifth phases, writing of the Status Quo Reports and gap identification and collection of additional data, are currently in progress.

Further phases, summarised briefly here, are discussed in detail in Sections 3.7 to 3.10. These are:

- Phase VI: Situation and strategic analysis, needs assessment and prioritisation
- Phase VII: Identify infrastructure development requirements and strategies
- Phase VIII: Costing and financial procurement strategies
- Phase IX: Development of the WMPs for the local municipalities
- Phase X: Development of the Capricorn District Master Plan for Integrated Waste Management

16.2 PHASES IV AND V: STATUS QUO REPORTS, GAP IDENTIFICATION AND COLLECTION OF ADDITIONAL DATA

As discussed in Section 3.5, having completed the first draft of the Status Quo Reports, it is essential that Client, stakeholder and IAP review and comment be obtained at this time. This review process is important for the identification of any gaps in the information collected and reported on by the study team. Any crucial information that is missing from the reports can then be collected and incorporated in the reports prior to proceeding with any decision-making processes.

As noted, Phase V, gap identification and collection of additional data, has already commenced and has been ongoing during the implementation of Phases III and IV. The process of gap identification, prioritisation and collecting of data to fill important gaps will be ongoing as the study proceeds into Phase VI and beyond.

It is, however, reiterated that not all gaps in the data can be filled as part of this study. Data collection must be an ongoing process that will, in itself, form part of the Waste Management Plans.

16.3 PHASE VI: SITUATION AND STRATEGIC ANALYSIS, NEEDS ASSESSMENT AND PRIORITISATION

Following the completion of the Status Quo Reports, and the acceptance of these by the relevant stakeholders as a true representation of the status quo regarding waste, a situation analysis and needs assessment will be conducted.

Based on the findings of the previous phases, the needs of the MLM (and other local municipalities) with regard to waste management will be identified and prioritised. This will link with the strategic goals as outlined in the Aganang IDP. A strategic analysis will also be conducted.

A first draft report outlining the needs identified, prioritisation of needs and strategic goals will be prepared for Client and stakeholder review. Again it is believed that it is essential that stakeholder comment be obtained at this time, as it is necessary that confirmation be obtained that the needs identified and prioritised are, in fact, those of the stakeholders.

16.4 PHASE VII: IDENTIFY INFRASTRUCTURE DEVELOPMENT REQUIREMENTS AND STRATEGIES

Following identification and prioritisation of the needs and strategies of the CDM and its Local Municipalities, the infrastructure, institutional and other development requirements to meet these needs will be identified. Where possible, various options will be considered, to allow for the best solution to be selected.

16.5 PHASE VIII: COSTING AND FINANCIAL PROCUREMENT STRATEGIES

The cost and financial viability of existing waste practices, and of proposed waste collection, transportation, disposal and recycling systems, will be investigated and projected over a period of 10 years. This will include:

- Cost establishment of proposed waste management systems
- Establishment of charges to be levied

16.6 PHASES IX AND X: DEVELOPMENT OF THE WMPS FOR THE LOCAL MUNICIPALITIES AND THE CAPRICORN DISTRICT MASTER PLAN FOR INTEGRATED WASTE MANAGEMENT

Based on the findings of the previous phases, Waste Management Plans will be developed for each of the Local Municipalities viz. the Aganang, Blouberg, Lepelle-Nkumpi and Aganang Local Municipalities. The Capricorn District Master Plan for Integrated Waste Management will be developed in conjunction with the development of the local plans, amalgamating and integrating them, together with the existing plans for the Polokwane Local Municipality, but at the same time incorporating all necessary

regional aspects of waste management. The development of the local and district plans will effectively be concurrent, as the local plans should meet the requirements of the district, and *vice versa*. Strategic objectives will cover short-term (5 years) and long-term (10 year) planning.

The general strategic objectives, as well as specific objectives of the CDM, that are to be considered and met by the Waste Management Plans are detailed in Section 3.10.

16.7 DELIVERABLES

As previously discussed, the deliverables for this study include the following reports:

- Aganang Local Municipality: Status Quo Report
- Blouberg Local Municipality: Status Quo Report
- Lepelle-Nkumpi Local Municipality: Status Quo Report
- Molemole Local Municipality: Status Quo Report (this report)
- Capricorn District Municipality: Status Quo Report
- Aganang Local Municipality: Needs Assessment and Strategic Analysis
- Blouberg Local Municipality: Needs Assessment and Strategic Analysis
- Lepelle-Nkumpi Local Municipality: Needs Assessment and Strategic Analysis
- Molemole Local Municipality: Needs Assessment and Strategic Analysis
- Capricorn District Municipality: Needs Assessment and Strategic Analysis
- Capricorn District Municipality: Interim Report on Infrastructure Development Options
- Capricorn District Municipality: Interim Report on Institutional Development Options
- Capricorn District Municipality: Interim Report on Financing Options
- Aganang Local Municipality: Waste Management Plan
- Blouberg Local Municipality: Waste Management Plan
- Lepelle-Nkumpi Local Municipality: Waste Management Plan
- Molemole Local Municipality: Waste Management Plan
- Capricorn District Municipality: Integrated Waste Management Plan (District Master Plan)

16.8 PROGRAMME OF WORK

A detailed programme of work for the completion of the tasks specifically pertaining to the Aganang Local Municipality, as well as those pertaining to the Capricorn District as a whole, is included in ***Appendix X***.

The programme of work includes various periods when draft reports are to be reviewed by the Client, Local Municipalities and IAPs. These review periods are indicated in the programme. Should it be deemed necessary by any of these parties that these review periods be extended, it is requested that the study team be notified in order to adjust the work programme as required.

As required by the Client, the work is scheduled such that the first draft of the various Waste Management Plans can be submitted to the Capricorn District Municipality and the Local Municipalities during December of 2004.

REMEMBER:
WE HAVE A CONSTITUTIONAL RIGHT TO A CLEAN AND HEALTHY ENVIRONMENT

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