

**DEPARTMENT OF ENVIRONMENTAL  
AFFAIRS AND TOURISM**

**PROGRAMME FOR THE IMPLEMENTATION OF THE  
NATIONAL WASTE MANAGEMENT STRATEGY**

**Starter Document for General Waste Collection**

**Reference Document for  
Waste Collection in High Density Unserviced Areas**

**Final Draft**

**May 2000**

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### **Reference Document for Waste Collection in High Density Unserviced Areas**

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## EXECUTIVE SUMMARY

As part of the Department of Environmental Affairs and Tourism's National Waste Management Strategy Implementation Programme, an investigation into **waste collection systems in high-density unserved areas** was carried out; to identify and analyse the various problems associated with waste collection in these areas. In addition, a number of international and local initiatives that have taken place in the provision of waste collection services in high-density low-income areas were studied. This was done in order to evaluate the different initiatives and identify the key success factors in providing sustainable waste collection systems. Based on the success factors, a framework of key principles for waste collection systems in high-density unserved areas was established. These principles form the basis for developing a draft set of guidelines for the practical implementation of waste collection systems in high-density unserved areas.

The communal skip system that has been used for waste collection in high-density low-income areas has numerous problems associated with it, which has resulted in a breakdown of waste collection services in these areas.

From the case studies, the following key principles sustainable waste collection services in high-density unserved areas were established:

- Community education and awareness programmes are necessary.
- There must be sufficient political will at both government and local authority level.
- The community must be actively involved in the decision making process.
- Ultimate responsibility for collection services remains with the local authority/
- Technology needs to be appropriate for the local situation.
- Primary collection services are ideally suited to "one person" type contracts.
- Secondary collection services are better suited to slightly larger contractors.
- Street sweeping and litter clearing are an integral part of the waste collection.
- Secondary collection points must be strategically located.
- Appropriate training and capacity building for all parties is essential.
- Private sector participation can result in more cost effective and efficient services.
- There needs to be adequate cost recovery; i.e. payment for services rendered.
- Capital funding in the form of donor grants or soft loans is necessary to set up.
- Guidelines need to be sufficiently flexible to account for diversity of local factors

From the above, the five most important conclusions are:

- The waste collection system must be community driven, so that the community takes “ownership” of the system.
- Education and awareness programmes are necessary to sensitise the communities in environmental issues and the importance of waste management.
- Community based contracting is the most appropriate means of private sector participation in waste collection for high-density low-income areas.
- Appropriate technology to suit the local conditions must be used.
- Community-based contractors must be contracted directly to the local authority.

Based on the conclusions, it is recommended that:

- A practical guideline document for the implementation of waste collection services in high-density unserved areas should be developed. A draft starter document has been produced as part of this project.
- This draft Background Reference document and the draft Guideline document should be used as a basis for a programme of wide consultation with all stakeholders.
- A generic environmental training and awareness programme should be developed for use in the implementation of waste management services in low-income areas.
- The DEAT should liaise with other organisations involved in pilot projects for the provision of waste collection services for high-density unserved areas.

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# 1. INTRODUCTION

## 1.1 *Project Background*

Historically, waste management in South Africa was not afforded the priority it warranted, as an essential function required to prevent pollution and protect the environment and human health. Consequently, insufficient funds and human resources were allocated to this function. In many instances this neglect resulted in a lack of long term planning, a lack of information, a lack of appropriate legislation and a lack of capacity to manage the waste stream.

Section 24 of the Constitution of the Republic of South Africa (Act 108 of 1996) states that the people of South Africa have a right to an environment that is not detrimental to human health, and imposes a duty on the state to promulgate legislation and to implement policies to ensure that this right is upheld. To date, a number of steps have been taken to ensure this environmental right, including the publication of the Environmental Management Policy for South Africa (1998), the publication of the Draft White Paper on Integrated Pollution and Waste Management (IP&WM) (Notice 1686 1998), the promulgation of the National Water Act (NWA) (Act 36 of 1998) and National Environmental Management Act (NEMA) (Act 107 of 1998), and the development of a National Waste Management Strategy (NWMS) (1999).

The IP&WM process identified waste as a key issue, and subsequently the development of a National Waste Management Strategy for South Africa was undertaken over the period 1997 to 1999 by the Department of Water Affairs and Forestry (DWAF) and the Department of Environmental Affairs and Tourism (DEAT), with financial support from the Danish Co-operation for Environment and Development (DANCED). The final NWMS, Version D, was issued on 15 October 1999. The overall objective of the NWMS is to reduce the generation and environmental impact of all forms of waste, to ensure that the health of the people and the quality of the environmental resources are no longer adversely affected by uncontrolled and uncoordinated waste management. In line with the IP&WM approach, the NWMS addresses all elements in the waste management hierarchy.

During 1999, Action Plans were developed to implement the short-term priority strategic initiatives identified in the draft NWMS. The Action Plans addressed Integrated Waste Management Planning, General Waste Collection, the development of a Waste Information System, Waste Minimisation and Recycling, Waste Treatment and Disposal, and Capacity Building. In addition, a Project Plan on Implementing Instruments was prepared. The Action Plans are intended to assist the relevant spheres of government by detailing the main activities that will have to be undertaken, in order to successfully implement the priority initiatives of the NWMS, and are thus procedural in nature. The Action Plans define targets, activities, tasks, responsibilities, timing, control procedures and the results/outputs expected.

The long-term objective of the general waste collection component of the NWMS is to provide an appropriate, affordable and sustainable waste collection service to all the people of South Africa by 2012. The immediate short term objective is to initiate and

implement appropriate, sustainable and environmentally acceptable waste collection services by local government, for at least 300 000 households in high-density, unserved areas by 2004. The activities necessary to successfully implement these objectives are detailed in the Action Plan for General Waste Collection.

DEAT has recently launched Phase 1 of the *DEAT NWMS Implementation Programme*, which comprises a number of activities necessary to fast track the implementation of the NWMS, and enable DEAT to meet its obligations in terms of the NWMS. These activities relate to:

- Integrated waste management planning
- A waste information system
- **Waste collection services for high-density unserved areas**
- Waste recycling
- Safe management of health care wastes

The overall objective of Phase 1 of the DEAT NWMS Implementation Programme is to produce **draft starter documents** for the above five high priority activity areas over the period January to March 2000. Consultants have been appointed to compile these documents, with the assistance of DEAT staff members and additional technical input from specialist individuals and/or organisations, where appropriate. After completion of the draft starter documents, DEAT may consult wider stakeholders as part of the implementation process.

This document constitutes the draft starter document for **Waste Collection Services for High-density Unserved Areas**.

## **1.2 Scope of Project**

The scope of the project entails an investigation into appropriate waste collection services for high-density unserved areas in South Africa, with a view to developing guidelines for the implementation of successful waste collection systems in these areas. The investigation includes:

- An analysis of existing experiences in South Africa with regard to affordable and sustainable waste collection systems.
- Drafting guidelines for appropriate waste collection services.
- Analysis and identification of areas for pilot implementation studies.
- Drafting a community education and awareness programme.
- Developing a legal framework for implementation.

## **1.3 Terms of Reference**

The bases for this study on waste collection for high-density unserved areas are the Principles contained in the National Environmental Management Act and the

Departments of Environmental Affairs and Tourism and Water Affairs and Forestry's National Waste Management Strategy: Action Plan for General Waste Collection (Version C, Oct 1999). A draft starter document is to be produced that includes:

- The definition and identification of high-density unserved areas.
- A description of the different systems that are currently operating successfully in Southern Africa.
- The duties and responsibilities of the Government, NGOs, communities, and industry with respect to waste collection services.
- A review of the potential benefits of public/private partnerships.
- The aspects of each appropriate waste collection system that ensure its successful implementation.
- Problem areas in the implementation of waste collection services that may need further investigation.
- An overview of relevant legislation that has been implemented nationally and internationally that supports waste collection services, and the identification of deficiencies in the South African legislation.
- Examples of waste collection services in South Africa that have been unsuccessful and the reasons for their failure.
- A review of some waste collection services in countries such as Namibia, Ghana, Burkina Faso and Bangladesh. The review should also have included the countries of Botswana, Kenya, Zimbabwe, India and Malaysia. Unfortunately, in the time available, insufficient suitable case studies from these countries could be obtained.
- Consideration of job creation in the development of waste collection systems for high-density unserved areas.
- Economic instruments that have been implemented internationally to support waste collection systems. (Note that this is being addressed in the Implementing Instruments Programme of the NWMS).
- Draft public awareness and educational and training programmes to promote and support sustainable waste collection services.

#### **1.4 Limitations of Project**

The major limitation for the project was the very short time frame – from the 18<sup>th</sup> January to the 24<sup>th</sup> March 2000. This considerably restricted the opportunity to discuss the project with a wide range of interested and affected parties. Meetings, interviews and site visits were generally confined to the Gauteng area, with only two visits being made further afield, viz. East London and Stinkwater (North West Province).

The review of international initiatives in waste collection for high-density areas has been limited to a literature review, as well as personal communication with two of the countries considered, viz. Ghana and Namibia. Not all the countries listed in the Terms of Reference were considered.

As directed by DEAT, the development of a generic community education and awareness programme for all five components of the NWMS Implementation Programme (Phase 1) is being handled by an independent specialist consultant. This report therefore mainly makes reference to the need and importance of community education and awareness in relation to the provision of waste collection systems in high-density unserved areas. Nevertheless, based on the various case studies considered, some key aspects have been identified, that should be included in any community education and awareness programme related to the provision of waste collection services for high-density unserved areas.

## **1.5 Methodology**

The methodology employed in the execution of this project involved the following activities:

- The NWMS Action Plan for General Waste Collection (Version C) was studied to gain an understanding of the background to the project.
- The common components of waste collection systems were identified and “high-density unserved areas” were defined for the purposes of this project.
- A list of criteria for evaluating existing waste collection systems was drawn up.
- A desk study of existing literature relating to waste management in developing countries, and particularly waste collection systems, was carried out. This included international books and technical guidelines, as well as relevant conference proceedings. A list of the documentation studied is included in Appendix 1.
- Interviews and, where possible, site visits were conducted with a selected number of local authorities and private contractors. This was done to obtain first hand exposure and experience of the various existing waste collection initiatives. Although some consideration was given to unsuccessful systems that have failed, the emphasis was placed on understanding the mechanisms of successful waste collection systems that have been operating for some time.
- The different systems were then analysed and evaluated to identify the key success factors and failure mechanisms.
- Based on the above findings, a framework of principles for waste collection systems in high-density unserved areas was developed, which incorporates the identified success factors and eliminates the failures.
- Using the above principles, draft guidelines for the practical implementation of the recommended waste collection systems were documented.

## 1.6 **The South African Legislative and Policy Context**

There are a number of laws and policies administered by different spheres of government, which relate to general waste collection; the most important of these are discussed briefly below.

### 1.6.1 **Constitution of South Africa (Act 108 of 1996)**

In terms of the Constitution, a number of functional areas relating to integrated pollution and waste management are a *concurrent national and provincial legislative competence*. These include environment, health services and pollution control. In the event of a conflict between national and provincial legislation, the national legislation will prevail.

Provincial planning and abattoirs fall within the functional area of *exclusive provincial legislative competence*, as does the regulation of certain local government matters, including **cleansing; control of public nuisances; refuse removal**, refuse dumps and solid waste disposal; cemeteries, funeral parlours and crematoria; facilities for the burial of animals; and municipal abattoirs.

The local sphere of government consists of municipalities. Municipalities have *legislative and executive authority* over the following matters relating to the management of waste: air pollution; cemeteries; **control of public nuisances**; municipal planning; **refuse removal**, refuse dumps and solid waste disposal; and sanitation services limited to domestic waste water and sewage disposal systems.

### 1.6.2 **Environment Conservation Act (Act 73 of 1989)**

The Environmental Conservation Act (Act 73 of 1989) is the only Act that deals specifically with waste management. Sections 19, 19A, 24, 24A, and 31 of the Act have an impact on waste collection.

- Section 19 deals primarily with the prohibition of littering – (1) No person shall discard, dump or leave any litter on land or water surface, street, road or site in or on any place to which the public has access, except in a container or at a place which has been specially indicated, provided or set apart for such purpose. (2) The authority in control should provide the containers.
- Section 19A requires that, notwithstanding the provisions of Section 19(2), any person or authority in control of any place to which the public has access shall, within a reasonable time after any litter has been discarded, remove such litter or cause it to be removed.
- Section 24 makes provision for the Minister to make regulations with regard to waste management, concerning a wide range of topics and in Section 24(k) makes provision for “any other matter which he may deem necessary or expedient in connection with the effective disposal of waste for the protection of the environment”.
- Section 24A deals with regulations regarding littering – “The Administrator may make regulations with regard to the control of the dumping of litter”.

- Section 31 describes the powers of the Minister and Administrator in case of default by local authority.

### 1.6.3 Health Act (Act 63 of 1977)

Since the absence of waste collection services can give rise to health hazards, certain provisions of the Health Act (Act 63 of 1977) are important. The objective of the Health Act is “to provide for measures for promotion of the health of the inhabitants of the Republic”.

In terms of Section 20 of the Health Act, every local authority has a responsibility to “take lawful, necessary and reasonable practicable measures to maintain its district at all times in a hygienic and clean condition”. These powers and authority were assigned to the Provinces in a Government Gazette Notice No R 152, 1994.

In terms of Section 34, regulations relating to “any condition, which is likely to constitute a danger to health, or to remedying or removing any such condition” may be made.

Section 38(1)(a&g) grants the Minister of Health power to make regulations to control a number of health-related solid or liquid waste aspects. *Proposed Regulations for the Control of Environmental Conditions constituting a Danger to Health or a Nuisance* were published in the Government Gazette on 4 February 2000, for comment. The proposed regulations would place requirements relating to the removal of household refuse on the owner of land or property on which accommodation is situated, if promulgated in their present form.

### 1.6.4 Draft IP&WM Policy

The over-arching goal of the IP&WM policy is to move from a previously fragmented situation of uncoordinated waste management to that of integrated waste management. The Draft White Paper on Integrated Pollution and Waste Management for South Africa defines government’s approach to the management of waste (i.e. an holistic and integrated management approach extending over the entire waste cycle from cradle to grave including the generation, storage, collection, transportation, treatment and final disposal of waste).

The *IP&WM policy* represents a paradigm shift in South Africa’s approach to waste management. Historically, pollution control focused primarily on impact management and remediation of pollution. However, to ensure sustainable development, the focus has moved to pollution prevention.

The National Waste Management Strategy process was undertaken to ensure that the IP&WM policy is translated into practice. Central to the development of the strategy for integrated waste management has been:

- The pollution avoidance/prevention and waste minimisation approach that focuses on the source of waste and moves away from “end-of-pipe” solutions.

- The need to extend waste collection, waste transportation, waste treatment and disposal services to an acceptable level in all communities and provide waste management services for the country as a whole.

The NWMS established a framework for the collection of waste in South Africa. It aimed to clarify government policy and presented government's approach to establishing waste collection services in the country. In particular, its purpose was to clarify roles, to define functions and to provide the basic framework within which waste collection regulatory functions could be allocated to the three tiers of government.

## 2. OVERVIEW OF ISSUES

### 2.1 *Definition of Activity under Investigation*

The project relates to the collection of waste in high-density unserviced areas.

In the context of this project, **waste** refers to general domestic waste generated by dwellings in low-income areas, as well as street sweepings and litter generated in these areas.

**Collection** refers to the gathering and loading up of this waste from storage containers located close to the dwellings that generate the waste. This and the transport to the transfer point are termed primary collection. Thereafter, transfer to secondary collection vehicles and the subsequent transport of the waste to the disposal site is termed secondary collection. Primary collection may also include the sweeping of streets and the clearing of litter on the streets and open places within the area.

In the NWMS Action Plan for General Waste Collection, **high-density** areas have been defined as areas having more than 5000 households and more than 10 dwellings per hectare.

**Unserviced** areas are areas, which have either inadequate collection services, failed collection services, or have never had any form of waste collection. Typically, high-density unserviced areas would include informal settlements as well as formal high-density housing developments. Both areas would be regarded as low-income areas with relatively high rates of unemployment.

The **objectives** of providing waste collection services in high-density unserviced areas are:

- To protect the health of the population
- To promote the quality of the urban environment in a sustainable way
- To support economic productivity
- To generate employment and income.

### 2.2 *Review of the waste streams*

Generally, the waste stream generated in high-density low-income areas and informal settlements has a high ash content (60-70%), particularly in winter, as well as a high organic residue content. There are also a relatively low percentage of recyclable materials in the waste stream. Consequently, the waste tends to have a higher density (approximately 400 to 500kg/m<sup>3</sup>) than that generated in the more affluent areas (approximately 150kg/m<sup>3</sup>).

Based on various surveys recorded in the literature, the average waste generation rate for high-density low-income areas varies between 0.15 and 0.5kg per person per day. For an average household of 5.5 people, with a waste density of 400 to 500kg/m<sup>3</sup>,

between 12l and 50l of waste per dwelling would require to be collected per week. This would easily be possible with one 85l plastic bag per dwelling per week.

### **2.3 Economic and Social Issues**

In the NWMS Action Plan for General Waste Collection (Version C), a number of socio-economic problems were identified. During the investigations conducted as part of this project, the existence of these socio-economic problems was confirmed.

- In the low-income communities, there is a lack of awareness of environmental issues in general, and of the need for effective waste management in particular.
- Whilst local authorities are obliged to provide acceptable waste collection services to all communities within their respective areas of jurisdiction, most local authorities are currently experiencing financial problems. This has resulted in a lack of adequate funding for waste collection services.
- The above problem is exacerbated by the low levels of payment for services in the low-income areas, as a result of both historical political reasons and real economic hardship.
- There is a very high level of unemployment in the low-income areas, which results in a large number of indigent people who cannot afford to pay for basic services.
- Where public-private partnership initiatives for waste collection have been embarked upon using small emerging contractors, these contractors often experience problems obtaining finance for the funding of capital equipment.

The above problems all have a synergistic effect on one another. Because of a lack of environmental awareness, the community places insufficient importance on effective waste management services. The low levels of payment for services contribute towards the local authorities' financial problems, which in turn make it difficult for them to provide adequate collection services. The communities are then reluctant to pay for sub-standard collection services, and so a "vicious circle" of contributing issues is formed.

Based on the foregoing, it is clearly evident that any waste collection system that is developed for high-density low-income areas must cost as little as possible, in order for it to be affordable to the majority of residents. Similarly, in order for the system to be sustainable, there must be a reasonable level of cost recovery through services payments, to minimise the need for cross-subsidisation.

### **2.4 Stakeholders**

As stated in the NWMS Action Plan for General Waste Collection (Version C), waste collection services cannot be implemented and sustained without co-operation between all the stakeholders, particularly the community, the local authority and the service provider. This conclusion has been confirmed as part of this project through the investigation of current collection systems.

The following stakeholders will therefore need to be consulted regarding the implementation of waste collection systems for high-density unserved areas:

- Local residents who would benefit and be directly affected by the system.
- Community Based Organisations (CBOs), including ratepayers associations, to mobilise community assistance and support for the system.
- Non Governmental Organisations (NGOs) to assist in community education and environmental awareness.
- Service providers e.g. waste contractors (both large, established waste removal contractors and small emerging contractors).
- The local authorities, particularly the relevant departments responsible for waste management.
- The South African Local Governments Association (SALGA), who will assist with the implementation of capacity building programmes for local government.
- National and provincial environmental departments, who directly and indirectly have an influence on waste collection e.g. DEAT, DWAF, Constitutional Development, Health, Labour, etc.

## **2.5 Design and Implementation of an Effective and Sustainable Programme**

### **2.5.1 The Programme**

As stated in the NWMS Action Plan, the DEAT is to establish a Task Team to identify 300 000 households in high-density unserved areas, and draw up Terms of Reference for this team. A map will be developed specifying areas of waste collection servicing and classifying areas into unserved, partly or poorly serviced, or fully serviced. In addition, the map/text will clearly define those areas under development that should implement a waste collection system. Using the map of identified high-density, unserved areas the team will initially select approximately 500 000 households. Following evaluation and consultation with the relevant provincial and local governments and affected communities, the selection of 300 000 households in high-density unserved areas will be finalised. Extensive consultation with other government departments and stakeholders will take place through appropriate forums at local level.

The following selection criteria for the households will be used:

- The project areas should be distributed over all nine provinces.
- The number of project areas should not exceed eighteen.
- Areas selected should involve an entire community.
- The local authority must be willing to co-operate, be committed and must have an appropriate level of resources (both human and financial) to support the initiative.

- The recipient communities should be willing to co-operate and make a commitment to the project.
- The areas selected should be accessible by road.
- A landfill site should be available for disposal of the collected waste.
- Success criteria (quality of services provided and quantity of waste collected) should be measurable.
- Sustainability of the collection services should be achievable.
- A wide range of residential areas, i.e. rural, peri-urban, urban, formal, informal, new residential areas under development and established residential areas, should be represented.

To ensure the sustainability of the waste collection services provided to the 300 000 previously unserved households in high-density areas, an implementing team and a Waste Management Task Team (WMTT) is to be established in each affected local government. The WMTT will be responsible for ensuring participation of all relevant stakeholders. Local government, together with the key stakeholders, will agree on the goals before implementation of the waste collection services.

The DEAT will develop an awareness campaign for implementation by the local government, in collaboration with provincial environmental departments and local government.

The local government will develop a detailed implementation plan, including a budget. The requisite resources e.g. manpower, money, equipment and time will be identified and accessed. Responsibilities will be assigned and the projects will be planned in accordance with the documented experience and guidelines. Partnerships, particularly public-private, and other appropriate partnerships between local government, the community and service providers will be promoted.

Waste collection for the initial 300 000 households will be established in parallel with the implementation of a system, for payment for services. Once the waste collection services are operating, monitoring of the effectiveness should identify a reduction in illegal dumping, waste accumulation and littering in the project area. An associated reduction in health problems and environmental impacts resulting from waste, as well as an increase in the quantity of waste arriving at landfills and/or recycling centres should also be observed.

The implementing team in local government will review the performance of the waste collection service and the level of payment, and prepare evaluation reports, including recommendations. These reports will be submitted to the WMTT, provincial environmental departments (responsible for enforcement of regulations) and DEAT for review and comment. DEAT will evaluate all implemented collection systems as a basis for the future Action Plans and Implementation Programmes for general waste collection.

## 2.5.2 Implementation

To ensure the successful and sustainable implementation of the programme for waste collection services in high-density unserved areas, full commitment and dedication from the relevant governmental personnel will be required, as well as support from management, both politically and in the allocation of staff members.

The implementing instruments developed by DEAT and DWAF consist of an Institutional Framework, Legislation, Funding Mechanisms, Partnerships and Public Participation, and Waste Management Education and Public Awareness Campaigns.

Local government will be responsible for:

- The initiation and implementation of appropriate, affordable, sustainable and environmentally acceptable waste collection services for at least 300 000 households in high-density unserved areas.
- The implementation of awareness campaigns to raise awareness regarding waste management issues.
- The implementation of a system for payment for collection services.
- Monitoring the implementation and operation of the waste collection services and reporting progress half-yearly to provincial and national government. The evaluation reports based on monitoring will be submitted to the Waste Management Task Team for comment before the report is finalised and submitted to provincial and national government.

The provincial environmental departments will be responsible for:

- Compiling waste collection regulations that are focused on the local authorities in the specific province.
- Supporting local government in the implementation of the waste collection services.
- Enforcement of regulations.
- Auditing the performance of collection systems implemented by local government.

The DEAT will be responsible for:

- Compiling national guidelines and standards for appropriate waste collection services, in consultation with all stakeholders, for distribution to provincial and local governments.
- The development of the awareness campaign material, in co-ordination with provincial and local government.

A factor that will play a critical role in the successful implementation of the programme for waste collection in high-density unserved areas is acquiring the commitment, support and input from all the stakeholders, including the receiving communities. The investigations carried out emphasised that the most important factor in establishing

sustainable waste collection systems in high-density low-income areas is the support and commitment of the receiving communities. Also, the systems should be community based.

### **3. CURRENT STATUS IN SOUTH AFRICA**

#### **3.1 Status Quo**

Existing waste collection services in the high-density low-income areas in South Africa range from full kerbside collection with Rear-end Loader (REL) compactor trucks, through to no collection at all. It must be stressed however, that the former is very much the exception rather than the rule.

In some formal high-density areas such as Sebokeng, kerbside collection using compactor vehicles has successfully been reintroduced. This could only be achieved however, through an extensive community awareness campaign (see Section 5.2.1).

Another collection system being used extensively in high-density areas is the tractor-trailer system. Tractor-trailer combinations are particularly well suited to areas with poor quality roads, although the haul distance to the disposal site cannot be too far (5km maximum). Waste is collected from the kerbside in various forms of containers (bins or bags), or from communal collection points, and loaded manually into the trailers. Trailers range from simple open trailers, through to customised waste trailers with covers and gravity compacting systems.

The most common form of waste collection employed in the informal high-density areas, is the communal skip system. The local authority places bulk containers (skips) in strategic positions within the township, and residents are expected to place their waste in the skips. For various reasons, as stated below, this system of waste collection has not been successful, and needs to be replaced with an appropriate system that is acceptable to the communities.

Because of the problems associated with the communal skip system, and also because of the high cost of the skips, often the communal skip system is downgraded to the clearing of communal tips. Residents dump their waste, either loose or in plastic bags, on communal tips located on vacant stands or street corners. The local authority then clears the waste from the communal tips by means of front-end loader and tipper trucks, and transports the waste to the nearest disposal site. Clearing of communal tips should be done on a regular basis; however, because of financial constraints and a lack of sufficient equipment, clearing tends to be done erratically, resulting in associated problems (see 3.2).

With the high rate of urbanisation in South Africa, informal settlements are developing at a far greater rate than the relevant local authorities can provide services. In addition, where services are being provided, waste collection tends to be last in order of precedence, behind water, sanitation and even electricity sometimes. Consequently there are numerous high-density informal settlements that have no waste collection service at all. In such areas, waste is dumped on street corners and open pieces of ground, and accumulates with time. To reduce the size of these communal tips, and to reduce the negative impacts of the decomposing waste, the tips are often set alight, creating further problems. On the odd occasion, the local authority will arrange to have these communal tips cleared, although in some cases this might only happen once per year.

### **3.2 Current problems**

Because of the poor quality of the roads in the high-density low-income areas and because of the associated high costs, kerbside collection using REL's is hardly carried out. Kerbside collection using tractor-trailer systems is feasible in high-density areas, although it is costly.

The communal skip system has a number of problems associated with it. Many of these problems are also associated with the communal tip (no collection system):

- There is often public resistance to the system on account its connection with the old "apartheid" era.
- In some cases, the communities will not allow the local authorities' collection vehicles to enter their areas unless the collection team has been recruited from their area.
- Often the distances between the skips are too far for people to carry their waste, which results in waste being dumped illegally on open ground.
- Waste removal is often the task of the children, who have to carry the waste by hand or in wheelbarrows to the nearest skip. Because of the difficulty of lifting the waste into the high-sided skips, the waste tends to be dumped next to rather than in the skip.
- Because the skips (and the waste accumulated around them) are not removed on a regular basis, the decomposing waste attracts flies and vermin, and promotes the breeding of maggots and disease. Unpleasant odours are also generated, causing adjacent residents to set fire to the waste in the skips. The waste sometimes smoulders for days on end, resulting in smoke problems for adjacent residents.
- When the skips are removed for transfer of the waste to the disposal site, the load luggers are not equipped to load up the waste that has been dumped next to the skips, and so this waste continues to accumulate, with further associated problems.
- Because there is no formal cleansing service, no one takes responsibility for street cleaning, which results in extensive litter on the streets.
- When the communal tips are cleared by means of front-end loader and tipper trucks, often the front-end loader loads up more than just the waste, by scraping up a substantial amount of soil below the waste. This soil then ends up on the landfill site ("recycling the townships"). Further waste is deposited in the resulting depression that also attracts ponded water because of the lack of drainage. This results in leachate generation with its associated water pollution potential and odour problems.

All of the above mentioned problems have negative environmental impacts and pose health hazards for the surrounding communities. They also negatively affect the quality of life of the communities.

### **3.3 Issues to be addressed**

The NWMS Action Plan for General Waste Collection identified a number of issues that will need to be addressed in the development of National Guidelines for waste collection. Of these issues the following are specifically applicable for collection systems for high-density unserved areas:

- The role of local government and other stakeholders.
- Establishment of partnerships for service delivery. Providing guidance on contracting work out, e.g. how to initiate this, how to deal with contractors, the nature of public-private partnerships, etc.
- Tender procedures, including terms of reference, contract documentation, tender adjudication and contract administration.
- How to calculate the cost of collection and set the fees.
- The range of collection service models available that is appropriate for high-density unserved areas.
- Implementation and integration of the waste management hierarchy.
- The most appropriate vehicles for use in different areas.
- The size and number of receptacles required for the collection of the volumes of waste generated.
- Occupational health and safety requirements and hygiene issues.
- Appropriate recycling to reduce the waste stream.
- The availability of disposal sites for the collected waste.
- The handling and transportation of the different types of waste.
- Public participation and community involvement.
- The different approaches to raise public awareness of waste management issues.
- Suggested penalties for non-compliance with national standards and provincial regulations.

## **4. REVIEW OF INTERNATIONAL INITIATIVES**

### **4.1 Introduction**

Considerable work has been done internationally in the field of waste management for economically developing countries. Whilst South Africa might be considered as a combination of an emerging economy and a developing country, in the context of this project, high-density unserviced areas definitely fall within the definition of developing countries, and much of the work carried out is therefore relevant to the project under consideration.

Organisations that have carried out work in the above mentioned field include, but are not limited to:

- The World Bank
- Urban Management Programme (UMP)
- Swiss Agency for Development and Co-operation (SDC)
- Swiss Centre for Development Co-operation in Technology and Management (SKAT)
- German Agency for Technical Co-operation (GTZ)
- International Solid Waste Association (ISWA)
- Danish Co-operation for Environment and Development (DANCED)

Because of the work done by the above organisations regarding waste management and waste collection in particular in developing countries, it is important to take cognisance of these international initiatives, so as not to “re-invent the wheel”. A complete list of international references reviewed is given in the References Section (Section 7).

### **4.2 Key Issues Identified**

From the literature review carried out, a numerous “Key issues” relevant to waste collection in high-density low-income areas were identified. These issues are listed and discussed briefly below.

#### **4.2.1 Political Issues**

- Society’s goals and priorities regarding environmental protection and equitable service access in general, and waste management in particular, must be clearly articulated; i.e. a strategic plan is required.
- A clear definition of jurisdiction and roles is essential to the political sustainability of waste management systems.

These above issues are already being addressed through the NWMS project.

- Local by-laws, ordinances and regulations must be few in number, transparent, unambiguous and equitable.

- Local governments are motivated by political interests as well as legal obligations. The political will at local government level determines the priority given to implementation of waste management systems.

#### **4.2.2 Institutional Issues**

- Capacity building measures for waste management services should give primary attention to strategic planning and financial management.
- Private sector involvement in waste management services implies a shift in the role of local government from service provision to regulation. Essential conditions for successful private sector involvement include competitive bidding, technical and organisational capacity, regulatory instruments, and monitoring and control systems.
- Responsibility for managing local waste collection may be decentralised to the user communities through community based partnerships.

#### **4.2.3 Social Issues**

- Attitudes towards waste management need to be positively influenced through community environmental awareness and education campaigns. Such campaigns, however, must be based on sound understanding of the social and cultural characteristics of the user communities.
- In many low-income areas, community-based waste collection is the only feasible solution.
- The effectiveness and sustainability of the waste collection system depends on the degree to which the served community identifies with and takes “ownership” of the system.
- Any waste collection system should aim to improve the working conditions, earnings and access to social services of waste collection workers.

#### **4.2.4 Financial Issues**

- Financial management skills should be actively promoted within institutional development programmes.
- While central financing of capital investment for waste management systems is often needed, investment authority should be devolved to local governments.
- To achieve equitable service access for low-income areas, some degree of cross-subsidisation and/or financing out of general revenues is often needed.
- To improve waste collection cost recovery, fees should be attached to billing for other services, such as water supply.
- Separate accounting procedures are required for waste management service revenues, to ensure that such revenues are used for the intended purpose.
- The best way to ensure financial sustainability is through cost reduction; “doing more with less”. Community-based waste management systems can reduce costs.

- The competition aspect of public-private partnerships in waste management services is the most promising avenue for cost reduction.

#### **4.2.5 Economic Issues**

- The effective demand for waste management services, and the willingness and ability to pay for a particular level of service, is influenced by the economic context of an area. High-density low-income areas generally cannot afford to pay for waste management services.
- There is normally a trade-off between low cost collection services and environmental protection.
- Measures should be introduced to encourage waste minimisation and recycling, so as to reduce the cost of waste collection and disposal.
- Private sector involvement may initially reduce the number of jobs in waste management. However, by increasing effectiveness and labour productivity, service coverage can be expanded with resulting job creation opportunities.

#### **4.2.6 Technical Issues**

- Waste collection facilities and equipment must be designed and selected with careful regard to operating characteristics, performance, maintenance requirements and expected life-cycle costs.
- Collection systems should be designed with active participation of the communities concerned. Low cost, community managed primary collection systems should be considered.
- The physical characteristics of a settlement, including factors such as population/dwelling density, width and condition of roads, topography, etc., need to be considered when selecting and/or designing waste collection procedures and equipment. Appropriate, standardised and locally available equipment should be selected.

### **4.3 Selected International Case Studies**

In this section, a number of international case studies are discussed, with a view to identifying the international trends in the provision of waste collection services for high-density low-income areas. These case studies have been taken from the literature, as well as from direct exposure, through contact with the organisations involved.

It is noted that, in most developing countries, the modern trend is to move towards progressively increased private sector participation in the provision of waste management services, particularly waste collection.

#### **4.3.1 Walvis Bay, Namibia (direct observation)**

Kuisebmond is the high-density low-income suburb of Walvis Bay and has a population of 28 000 to 30 000. There are 2 600 residential stands with an average of 14 people living on each stand.

After integration of Walvis Bay into Namibia, Walvis Bay Municipality implemented a “one person contracting” (OPC) scheme for the primary collection of waste in Kuisebmond. The suburb was divided into 23 collection zones and one contractor was appointed for each zone of between 100 and 120 stands. Criteria for the appointment of the OPCs were:

- The person must reside within his/her zone.
- The person must be unemployed.
- Preference was given to homeowners.

Each contractor is responsible for the primary collection of waste from all the stands in his/her zone, as well for the cleanliness of the streets in his/her zone. The contractor is responsible for the cleanliness of his entire zone and, as such, he must educate his residents about waste management, including advising them if their stands are dirty. He must also address all the residents’ problems regarding waste collection.

Initially, the contractors distributed plastic bags for household storage of waste. Full bags were collected and stacked at a collection point within each zone for removal by the Municipality. The contractors were paid N\$1.00 (=R1.00) for each full bag collected. Because of this method of payment, the entire suburb was extremely clean. Even the adjacent beaches and open spaces were cleaned to obtain more waste to fill the bags.

The system has since been upgraded with each resident being issued with a 240 ℓ plastic trolley bin, to replace the bags. Each contractor pulls the bins to a centrally placed “scow-back” container in his zone and empties the bins into the container. Bins are cleared on a daily basis. The Municipality removes the containers on a daily basis and empties them at the landfill site. Each contractor is currently paid N\$80.00 for the first eight full containers removed per month and N\$100.00 for each container thereafter, as an incentive.

Each contractor earns approximately N\$2 500.00 per month, from which he must pay his labourers and provide protective clothing.

The system has been widely accepted by the community and Kuisebmond is an extremely clean high-density suburb. Residents are charged the same rates for cleansing as the rest of Walvis Bay (N\$41.36 per month) and there is currently an 86% level of services payment in Kuisebmond.

Problems associated with the system are:

- No one wants a “scow-back” container close to his/her residence on account of the odours, flies, etc.
- The “scow-back” containers still attract the illegal dumping of waste next to them. This waste is not always loaded up and removed with the containers.
- Containers are currently not washed out; however, this problem is to be addressed in the near future.

#### **4.3.2 Kumasi, Ghana (direct observation)**

A number of cities in Ghana are moving towards private sector involvement for the provision of waste management services. One such contract is currently in operation in a high-density area of Kumasi.

The Kumasi Metropolitan Assembly (KMA) has contracted out waste collection, in this area, to a contractor on a Franchise agreement. The contractor is responsible for the collection of waste from households and for disposing of the collected waste into bulk containers at a purpose built transfer station. The KMA then removes the bulk containers for disposal of the waste at the landfill site. The contractor pays a Franchise fee to the KMA to cover this service. The contractor is also responsible for the collection of fees directly from each resident whose waste is removed.

Because of the high-density of dwellings and the absence of proper roads, the contractor has appointed “one person contractors” (OPCs), who carry out the primary collection using purpose-designed donkey carts. The transfer station has been purposely designed to enable the donkey carts to tip into the containers from an elevated level.

As with the Walvis Bay case study, the OPCs are resident in the communities, which they serve.

A disadvantage of the system is that the contractor collects fees directly from residents who want their waste removed. It is therefore only their waste that is removed.

Non-participating residents (including the indigent) therefore either have to take their waste directly to the transfer station, or the waste gets dumped illegally. Another problem is that there is no responsibility for street cleaning, which results in extensive litter lying in the streets.

#### **4.3.3 Ouagadougou, Burkina Faso (Haan, H.C. *et al*, 1998)**

Ouagadougou, the capital of Burkina Faso, has a population of 900 000. Two types of private sector contractors are operating in this city – private contractors and community-based. Both are working successfully.

The city of Ouagadougou is divided into 30 sectors and 16 of these are served by community based enterprises that collect waste from households in high-density areas and divert it to transfer points. There are also private contractors operating in similar areas and in higher income residential areas. Domestic waste from the more prosperous areas is collected by the municipality using compactor trucks.

##### ***Community based enterprises***

The first community-based enterprise in Sector 10 (named Wogodogo) was set up in April 1993 as a pilot project.

The pilot project of Wogodogo was funded by the founding organisations for the first six months. The others were only supplied at the beginning with equipment such as

carts and donkeys. Now they are financially self sufficient, except for some donations for capital items.

In the 16 areas with community schemes, households pay about US\$0.85 per month for the primary collection service. Not all the households in the area served are part of these schemes – about 50% have joined in one sector and in other parts the proportion is lower. Waste is collected only from households that pay. Others are obliged to take their own wastes to large bulk containers that are removed by the municipality, or to authorised transfer points.

These enterprises use donkey carts, though consideration is being given to upgrading to a different method of transport, especially where long distances are involved. The enterprises negotiated a transfer arrangement with the municipality. The enterprise pays the municipality about \$3.40 to take away 7m<sup>3</sup> of refuse that has been collected in donkey carts.

The local communities are involved in the setting of priorities, in planning, evaluation, and in paying for the service.

The community-based enterprises are supported in terms of technical advice by outside consultants and their activities include raising community awareness. In general the enterprises have a president and financial agent, a secretary, awareness builders, donkey cart drivers and waste collectors. Sometimes the administrative members are also collectors (in which case the administrative work is done in the afternoon). Sometimes there is a council board, which includes elders, traditional leaders and local administrative workers. All the team members (including the president) receive a salary but the advisory functions are not paid.

The household fee of US\$0.85 was set on the basis of a willingness to pay survey conducted in 1993 when the pilot project was to be started. This fee was later adopted everywhere. Fees are collected monthly by the waste collectors of each sub-zone or by someone in the team who is partly responsible for fee collection. Sometimes subscribers come to the office of the enterprise to pay their fees.

These enterprises have joined together to form an association that negotiates on their behalf with the municipality.

### ***Private Contractors***

There are six private contractors that collect solid waste in Ouagadougou. ECONFA is the biggest. It was created in 1990 by a group of Ouagadougou University graduates, who were looking for a way to earn money. The contractor started by collecting waste from 24 clients, using a small hired van. At first the operation was dependent on contributions from a number of institutions, and the promoters (the graduates) worked without pay.

This enterprise received help in a number of forms, including advice about its administrative structure, assistance with the acquisition of equipment, financial contributions and training. By 1996 it was operating with five tractors, pulling trailers

of capacity 3m<sup>3</sup>, each making an average of four trips per day. Customers include households, companies, commercial establishments and embassies.

The following lessons can be drawn from the experience of ECONFA:

- Collection of household waste constitutes a viable employment opportunity in African cities.
- A small-scale solid waste enterprise can be created with modest means.
- The promoters must be highly motivated to ensure their success.
- The enterprises need technical and material support (including training and political and administrative backing).

### ***Unauthorised Dumping***

In spite of these schemes and perhaps because they do not cover all of the residents in any particular sector, small unauthorised piles of waste can still be found in certain places within the city.

### ***Secondary Collection***

The waste, which is collected by the enterprises and contractors or brought by the residents, is placed in the large arm-roll containers or dumped onto an area of open ground that serves as a transfer point. The municipality faces real difficulties in removing all this waste because it does not have sufficient equipment. There are 115 of the 7m<sup>3</sup> containers, but only six trucks that can carry them and three additional compactor trucks.

#### **4.3.4 Kalabagan, Dhaka, Bangladesh (Haan, H.C. *et al*, 1998)**

This case study is taken from a presentation to the Cairo workshop in 1996.

### ***Background***

Kalabagan is a densely inhabited and unplanned housing area, with few open spaces. The roads are so narrow and tortuous that refuse collection trucks can hardly enter these areas and there are few possible locations for community waste storage. When the poor performance of the municipal sanitation workers was added to this, the inevitable result was that the streets were strewn with decomposing waste and drains were blocked with waste. However, the situation has changed because of the initiative and determination of one individual and the co-ordinated action of the residents themselves.

### ***The Scheme***

The scheme was started by a young man named Khurram Mahboob, who, after returning home from studies abroad, was dismayed at the sight and smell of the scattered waste around his home.

Khurram discussed proposals with residents. It was proposed that fees would be charged only when the success of the scheme had been demonstrated. The Dhaka City

Corporation (DCC) refused to loan some spare tricycles that could be used to carry the waste, so plans were prepared to manufacture two of them.

Residents were asked to keep their waste in containers or plastic bags within their houses or yards until they were collected during the afternoon. The waste was then taken to a municipal storage point on the main road. Unfortunately, residents, who had been accustomed to throwing their waste outside their property whenever they wanted to, were not happy to keep it until a certain time. Some residents did not like the collectors coming into their yards to collect the waste. Nevertheless, a clear improvement in the appearance and sanitation of the neighbourhood had been achieved. Modifications to the procedures were made because of the residents' complaints - plastic bags were used to store the waste so that the smell was contained and collectors announced their presence with a hooter or horn and waited for residents to bring out the waste, instead of going into their properties. These are examples of communities finding solutions to problems when there is flexibility in the approach of the service provider.

There was no charge for the service for the first month until it had been demonstrated. Khurram paid the wages of the labourers from his own pocket. From then on a monthly fee of Tk.10.00 per household was charged.

### ***Operation***

The labourers were mostly sweepers employed by the municipality and they worked in this scheme as a second job. As the scheme developed, two more labourers were hired, bringing the total to six. A further person was hired to collect fees from the households and Khurram continued to manage the work.

There were some problems at the interface with the DCC, which provided the secondary collection service, taking the waste to the disposal site. Initially the truck was scheduled to pick up the waste at 4pm, but it was often not possible for the primary collectors to deliver the waste to the storage point by that time, resulting in the waste being left lying at the storage point for almost 24 hours. The DCC therefore rescheduled the arrival of the truck to 5pm. Later, the location of this transfer point was changed because of the development of a museum nearby, so the collection labourers were obliged to transport their waste to a more distant point.

By 1996, the system had been operating smoothly for eight years. The fees had just covered wages and depreciation costs, but the demand for a wage increase and the need for new equipment required an increase in the fee to Tk. 15. There were about 600 contributing households, with about 20% to 25% of the households having their waste collected even though they paid no fee, and another 15% defaulting frequently on payments.

### ***Lessons Learned***

This experience shows that middle and low-income communities can take responsibility for the primary collection of their waste. In this case they needed the initiative and determination of an individual to take the necessary step – the community was more reactive than proactive. Such schemes must be locally (or community) driven.

### ***Sustainability***

There appear to be two main threats to the sustainability of this system. One is that the DCC might refuse to allow its employees to continue to do this work as a second job. If this happened, there is the question about whether others could be found to do this work. The second question is whether the system would continue if Khurram's input were withdrawn. Since the system has been operating for some time, it is likely that the users have become so accustomed to the improved convenience and the higher standard of cleanliness that they would take a more active role in maintaining the system than they took in setting it up.

## **4.4 Discussion**

Apart from the above case studies, there are numerous waste collection initiatives that are being implemented in developing countries. A number of these case studies have been recorded in the literature and discussed at conferences. Some of the countries identified include, *inter alia*, Brazil, Colombia, Ghana, Senegal, Kenya, India, and Malaysia.

Whilst no two waste collection systems are the same, due to different physical, social, cultural, economic and political conditions, there are certain common factors or criteria that emerge from virtually all the case studies for waste management services in low-income high-density areas. These have been included in the "Principles for Waste Collection Systems for High-density Unserviced Areas in South Africa", as described in Section 5.3.

# **5. ANALYSIS OF CURRENT INITIATIVES AND THEIR IMPLICATIONS FOR SOUTH AFRICA**

## **5.1 Introduction**

In accordance with the Terms of Reference, a number of current initiatives in South Africa for the provision of waste collection services for high-density unserviced areas were investigated. This was done with a view to identifying the key success factors and, where applicable the relevant failure mechanisms of each system. The systems/areas investigated were selected on the basis of a literature study, discussions with members of the DEAT NWMS team, as well as on the consultants' knowledge of the South African waste management industry.

Limited consideration was given to specific waste collection systems that have failed, since the problems (both historical and current) associated with waste collection in high-density low-income areas are well known (see Section 3.2). The following case studies are considered to be representative of practical solutions for waste collection in high-density unserviced areas.

In most cases, meetings were held with the relevant officials responsible for waste collection. The meetings were then followed up by visits to the areas under

consideration to obtain a first hand impression of the effectiveness of the collection system in use, and to gauge the attitudes and views of the residents on the particular system.

## **5.2 Selected South African Case Studies**

### **5.2.1 Sebokeng, Western Vaal Metropolitan Local Council (WVMLC)**

The greater Sebokeng area consists of the older zones of formal housing and hostels, as well as a number of new RDP housing developments and a conglomeration of informal settlements. In terms of the definition of “high-density” (see Section 2.1), virtually the entire area of Sebokeng would be considered as high-density residential development.

Prior to 1996, Sebokeng had an unacceptable and highly irregular “door to door” collection service, using old unreliable vehicles. The ineffectiveness of this service resulted in a large accumulation of waste in open spaces and extensive littering. In October 1996, the WVMLC resolved to restore a viable sustainable waste collection service on a weekly basis to all the residents of the greater Sebokeng area, as well as Boipatong, Bophelong and Tshepiso.

The WVMLC started off with an environmental awareness campaign. An environmental officer was appointed who worked through the local political and community structures to establish an environmental committee in each zone of Sebokeng. Workshops were held with the environmental committees to train them in environmental awareness and the importance of waste management. All issues, including waste minimisation, recycling, collection and disposal, were covered. The committees were then responsible for passing on this training to their respective communities. The details of the waste collection service were explained to the residents. Local environmental awareness education has also been introduced into the schools.

Using Metro funding, the new collection service was preceded by a massive clean up campaign involving the communities and schools. A number of unemployed people and local contractors were used for the clean up. All illegal dumps were cleared and litter was collected and removed. A weekly kerbside collection service has successfully been reintroduced using compactors and tipper trucks. Residents are encouraged to place waste in used shopping bags should they not be able to afford refuse bags. Separation of recyclable materials is also encouraged.

Through the motivation of the environmental committees, communities are keeping their areas clean. Sites of previous illegal dumps are being kept clean by placing no dumping signs at them and, in some cases, by fencing them off, all at the communities’ initiative. Some of the old dumpsites have been developed into parks and car wash sites. School children, particularly primary school children, are effective environmental “watch-dogs”.

Since the introduction of the new collection service, between 70% and 100% of waste is being removed on a weekly basis. Services payment levels have increased considerably, as the residents now know that they are getting an effective collection service. The zone environmental committees are encouraging residents to pay for the

collection service being provided. A recycling centre has also been set up in Sebokeng at the initiative of the Environmental Officer.

The WVMLC is currently extending the collection service into the informal settlements. The same process of working through community structures is being used, with environmental awareness training and an initial clean up campaign. The community dumps are being phased out, to be replaced by a “one person contract” door to door collection system. The WVMLC will then collect waste from the agreed collection points.

Important considerations forthcoming from the investigations are to:

- Set up environmental committees through the existing community structures.
- Establish community environmental awareness and waste management training.
- Involve school children from Primary school level.
- Focus on community based, low technology systems.

It is noted that people are more willing to pay for a waste collection service, once an effective service has been implemented, and if they have had a say in the establishment of the service.

### **5.2.2 Southern Metropolitan Local Council, (SMLC) Greater Johannesburg**

The SMLC Waste Management Department is responsible for waste collection from the entire southern side of Johannesburg from Heriotdale through to Soweto, including the CBD and Orange Farm. Within this area, there are numerous high-density areas, both formal and informal.

In Orange Farm, waste collection is carried out using the small entrepreneur system of the Tedcor type (see Section 5.2.6).

In the rest of the high-density areas, the standard collection system involves the use of bulk containers (skips) placed at strategic points. The SMLC supplies two plastic bags (bin liners) per dwelling per week. The SMLC workers are then responsible for collecting the filled bags and placing them in the containers for removal by SMLC vehicles. In reality, however, the communities have been refusing the SMLC workers access to their areas, because they want the SMLC to employ people for waste collection from the respective communities. The SMLC has therefore had to resort to distributing bags through the ward councillors and relying on the community to ensure that the filled bags are placed in the containers. This has not been successful.

To circumvent the above problems, the SMLC is implementing an innovative waste collection pilot project in the informal settlement of Drieziek Ext. 3. Briefly, the scheme is as follows:

Working through local councillors and existing community structures, a properly constituted local environmental forum is to be established for each community of approximately 5 000 stands. Each forum would then contract with the SMLC for the

purchase of bin liners and for the removal of full skips, both at an agreed fee. The forum would then employ local people to distribute liners and collect full bags to be placed into the skips. It would also be responsible for cleaning litter and street sweeping. In terms of equipment, the forums will be responsible for the purchase and issue of collection equipment such as carts, litter spikes, etc. and protective clothing for workers. The forum would collect service charges from the residents within its area. Within the setting of service charges, the forum would have to make provision for indigent people who cannot afford to pay.

Successful implementation of this initiative will result in:

- a positive environmental impact
- local employment opportunities
- provision of a sustainable waste collection service to the community
- the community taking responsibility for the cleanliness of its area.

Potential problems could be profiteering, corruption and nepotism within the forums. It is therefore important that the SMLC, through the elected politicians, is represented on the environmental forums. The SMLC would also provide assistance and training to the forums in project management, financial management, contract administration, environmental education and awareness, etc.

Problems associated with the use of high-sided bulk containers are being investigated by the SMLC. Consideration is being given to the use of the “Molok” below-ground plastic containers instead of the steel skips. Capital funding is, however, required for the purchase of the “Molok” system.

### **5.2.3 Independent Development Trust (IDT)**

The Independent Development Trust (IDT) is currently implementing the “Clean and Green” Programme of the Department of Public Works and South African Breweries in seven provinces of South Africa. The Clean and Green Programme is a Government initiative aimed at addressing the social development backlog in previously disadvantaged communities, particularly where profound shortages of waste collection services and a lack of environmental awareness are prevalent.

The programme requires multiple stakeholder participation to ensure its success and sustainability.

The “cleaning” aspect of the programme involves a waste collection pilot project in seven provinces, over a 12-month period. In simple terms, the project involves the use of “one person contractors” (OPCs) to each carry out the primary collection of domestic waste in zones of approximately 250 homes each. Each house will be serviced once per week. Waste will be collected and transported to a sub-zone collection site by means of a trolley or cart issued to the OPC. The OPCs will also be responsible for the distribution of refuse bags and for litter collection and street sweeping. Protective clothing and litter spikes will be issued to each OPC. Secondary collection from the sub-zone and transport to the transfer station or disposal site will be carried out by Micro- and Small Enterprises (MSEs).

The proposed system has been workshopped with the participating communities. Working through the communities, the intention is to appoint amongst others, delinquent youths (“young people in conflict with the law”) as the OPCs. Appointment of OPCs and MSEs from the participating communities will be done through pre-qualification advertisement and direct appointment.

It is intended that, after the 12-month period of the pilot project, the local authorities will take over the collection schemes. To ensure long term sustainability, a public awareness campaign is required. The system will have to be managed by community committees to control payment for services and ensure cost recovery.

#### **5.2.4 Stinkwater, Eastern District Council (EDC), North West Province (NWP)**

Stinkwater is a peri-urban rural development in the Mabopane district of the North West Province. Although it does not fall strictly within the definition of a high-density area, the waste collection project currently being implemented is considered to be relevant to the NWMS collection project.

The Risile Environmental Project is a pilot project being funded by the DEAT, for the implementation of a waste collection system and a parks development programme in Stinkwater. The project, which is aimed at social upliftment, job creation and capacity building, is for a 12-month period, whereafter the local authority must take over the systems implemented.

The waste collection project commenced with a clean up campaign involving the schools and communities in the area. For the collection system, the area has been divided into 16 zones of approximately 400 houses each. A “one person contractor” (OPC) has been appointed to carry out the primary collection in each zone. Collection is on a weekly basis. There is a supervisor for every four zones, reporting to a project manager and management committee.

Each house is issued with an 85ℓ bin, and new plastic bin liners are distributed weekly by the OPCs. Full bags are collected once per week from each house by the OPCs and are delivered to the zone collection sites using hand drawn trolleys. The OPCs are also responsible for litter clearing and street sweeping in their zones. A local contractor, using a tractor and trailer, loads up the waste bags from each zone collection site and transports them to the landfill site 10km away. The supervisors ensure that the OPCs carry out their functions correctly.

The appointment of the OPCs and the transport contractor was done through advertising the positions and interviewing suitably qualified candidates by the management committee. Waste collector OPCs must reside in their respective zones. The transport contractor must employ whatever labour he requires. The entire system has been workshopped with the community and regular report back meetings are held.

Although the scheme is being funded for the first 12 months, it must become self-funding when the local authority takes over. Cost recovery is to be achieved through a flat rate of approximately R5.00 per household per month.

It was interesting to observe some of the prototype trolley designs, which were totally unfit for the task. Where trolleys are to be used, careful consideration must be given to the design to ensure that they are fit for the purpose under the operating conditions.

### **5.2.5 Duncan Village, East London**

Duncan Village is predominantly an informal settlement, with over 17 000 shacks and 3 000 formal houses. The area was one of the towns identified in 1996 for improvement of living conditions through the Presidential Projects.

A “one person contracting” (OPC) system for primary waste collection was implemented in 1996 using a “bottom up” approach. The system was developed and implemented by Chuma Mbande of Africon Consulting Engineers.

Through the Local Authority (East London Municipality (ELM)) and the Duncan Village Development Forum (DVDF), the Duncan Village Environmental Forum was established. A three-day workshop was held with the Forum, which discussed community development, environmental and community needs in general and waste management in particular. The criteria for the proposed collection system were decided upon:

- The collection system needed to be appropriate, affordable and sustainable.
- Socio-economic problems such as unemployment, illiteracy, etc. had to be addressed.
- The process and system had to be community driven.
- Fast track implementation was necessary.
- The system was to be based on a one-person contract system for primary waste collection and street cleanliness.

The project and the posts for OPCs were advertised by means of mass meetings, radio and leaflets. Out of 3 000 applications, 81 people were selected by the DVDF to undergo training in various aspects as stated below.

After training, each contractor was required to sign a contract for a specific period for implementation of the system as follows:

- The contractor is to collect waste from 300 households and ensure the cleanliness of streets and open places in his/her area. This includes bush cleaning.
- The contractor is to distribute plastic bags to each household in his/her area.
- Collected bags of waste are to be placed at a specific collection point, for removal by the ELM to the landfill site.
- The contractor would be provided with the necessary training in waste management, environmental health, business skills, tendering and contracting.
- The contractor would receive R300 per month for servicing 300 households.
- The contractor would be issued with protective clothing and cleaning tools.

Implementation of the collection system was preceded by a clean-up campaign involving school children and the community. This clean-up campaign was necessary to publicise the project and to provide the contractors with clean areas from the start of their contracts.

The ELM provided the collection points in each contractor's area with a concrete slab, on which the collected bags are placed, for removal. Collection by the contractors is generally done manually and on foot, because of the high-density of the housing.

Apart from minor problems relating to illegal dumping, the system has been operating well for four years and is about to go out for re-tender and renewal of the contracts. Payment has increased from the original R300 to R397 per month per contractor.

The community has accepted the system and, despite the high rate of unemployment, there has been an increase in the level of service payment over the last few years. The ELM has indicated, however, that subsidisation of the system from other areas of the municipal budget is necessary. The system is therefore not entirely sustainable.

Key factors contributing towards the success of the system include:

- Community consultation, involvement and awareness training.
- Appropriate training of one-person contractors.
- Devolution of responsibility for cleanliness of the township to the community.
- Simple appropriate technology.

### **5.2.7 Sole Proprietor Contracts**

This is not a specific case study but rather represents a system of private sector contracting in waste collection for high-density areas, which has been successful in South Africa since its inception in 1992.

The system, which was started in the former Kwandebele in 1992, is based on developing local "entrepreneurs" from the community into sole proprietor waste collection contractors. It therefore represents a public private sector partnership for the provision of waste collection services. The concept was started by Billy Hattingh, but was bought out by Tedcor (Pty) Limited in 1997. In broad terms, the system involves the following:

In consultation with community structures, the management contractor would advertise for and select candidate entrepreneurs from the community, according to agreed criteria. He/she would have to be unemployed, reside in the area, be literate and have sufficient aptitude to run a business and possibly to operate equipment.

The management contractor would provide training for the selected entrepreneurs in aspects such as waste management, finance, business administration, occupational health and safety, human and industrial relations, transport management and equipment maintenance.

Each entrepreneur would then enter into a contractual agreement with the Local Authority to provide a waste collection and street cleaning service for a specified area. The contract could either be a tri-party agreement between the Local Authority, managing contractor and entrepreneur, or a sub-contract agreement between the managing contractor and entrepreneur, with the managing contractor being the main contractor with the Local Authority.

In addition to providing training to the entrepreneurs, the managing contractor would provide assistance in the purchasing of vehicles and equipment, and administrative and financial management, as well as logistical support for maintenance of the entrepreneurs' operations. The managing contractor would carry out quality control inspections either together with, or on behalf of, the Local Authority and community representatives. It would also assist with community education in environmental awareness and waste management.

Depending on the conditions of the contract, the entrepreneur would procure collection equipment such as a tractor and trailer, or perhaps trolleys/wheel barrows to execute the requirements of the contract. The entrepreneur would also employ his labour requirements from the community. The entrepreneur would be responsible for purchasing and distributing plastic bags to the residents and for collecting full bags for disposal at the landfill site.

Payment by the Local Authority is generally a fixed amount per household to the management contractor who then pays the entrepreneurs. Cost recovery for the Local Authority is through payment of rates.

A particularly important aspect of this type of collection system is the contract document, to ensure a "win-win" situation for the Local Authority, the community and the private sector (managing contractor and entrepreneurs).

The system is currently operating successfully in areas such as Thokoza, Kimberley, Orange Farm, Port Elizabeth, Ivory Park, Vlakfontein, Khayalitsha, and soon in Vosloorus.

A potential disadvantage of the system is that it might be more expensive than a Local Authority/OPC initiative.

### **5.3 *Principles for Waste Collection Systems for High-density Unserviced Areas in South Africa***

On the basis of the literature studies carried out, and the international and local case studies investigated, there are a number of important common principles that need to be considered in the drafting of Guidelines for Waste Collection Systems in High-density Unserviced Areas. These are as follows:

- Environmental awareness promoted by initial school/community driven clean-up campaigns of the area.
- For a system to succeed and be sustainable there must be sufficient political will at both government and local authority level.

- The system must either be community driven, or the community must be actively involved in the decision making process.
- Although the community should take responsibility for any community-based system, ultimate responsibility for the provision of waste collection services remains with the local authority/
- Community education and awareness programmes are necessary to sensitise the serviced communities in environmental issues in general, and the importance of waste management in particular. This can be done through the establishment of environmental committees or forums.
- The technology of the proposed collection system, including vehicles and equipment, needs to be appropriate for the local situation. Factors such as the topography of the area, quality of the roads, density of dwellings, etc, need to be considered when designing an appropriate collection system.
- Primary collection services are ideally suited to “one person” type contracts. Depending on the specific conditions of the area, these could range from the manual carrying of refuse bags, the use of trolleys or carts, through to motorised vehicles such as tractors and trailers.
- Secondary collection services are better suited to slightly larger contractors with appropriate vehicles and equipment, such as tractor-trailer systems, trucks and loaders.
- Street sweeping and litter clearing must be an integral part of any waste collection system.
- Secondary collection points must be strategically located so as not to represent a nuisance for nearby residents.
- Appropriate training and capacity building for all parties involved in the provision of waste collection services is necessary to ensure sustainability of the service.
- Private sector participation with local authorities can result in a more cost effective and efficient waste collection service.
- For any system to be financially sustainable, there needs to be adequate cost recovery. Payment for services rendered is therefore necessary, although some form of cross subsidisation for low-income areas will generally be required. “Willingness to pay” surveys should be carried out to determine how much a community can afford to pay for a collection service.
- Capital funding in the form of donor grants or soft loans is necessary to set up and implement waste collection systems in high-density unserved areas. However, there should be a gradual phasing out of operational funding as service payment levels increase, in order to make the system sustainable. A maximum period of 12 months for this phasing out is suggested.
- Because of the diversity of factors involved in the establishment of waste collection services in high-density low-income areas, there is no single model available for implementation of a successful system. There must therefore be sufficient flexibility in the guidelines to account for such diversity.

## **5.4 Public Awareness and Environmental Education Programmes**

Based on the different case studies considered as part of this project, there are a number of important issues that need to be included in a public awareness and environmental education programme associated with the provision of waste collection services for high-density unserved areas.

### **5.4.1 Institutional capacity building**

There needs to be a programme of institutional capacity building at local government level in all aspects of waste management planning, including strategic planning and financial management. This is particularly important, as local government is responsible for the provision of waste collection services.

### **5.4.2 Contractor training**

Before implementation of any waste collection system, waste collection workers or contractors must be trained in the skills needed to carry out their functions properly. Aspects of training that should be included are:

- Principles of environmental management.
- Environmental health and safety.
- Principles of waste management, including generation, storage, collection, transport and disposal, as well as the importance of the integrated waste management hierarchy of waste minimisation, treatment, resource recovery, and disposal.
- Business management.
- Contracting and tendering.
- Human resources

Training must be structured to suit the education levels and learning capabilities of the persons undergoing the training.

### **5.4.3 Community awareness and environmental education**

Instituting a culture of environmental awareness in a community is not a short-term project. It requires a dedicated prolonged approach to sensitise the community as to the importance of living in a healthy environment. Based on the case studies considered, the following issues are important for a successful environmental awareness campaign:

- An environmental committee or forum needs to be established by working through existing political and community structures.
- The environmental committee must be trained in aspects of environmental awareness and waste management. This should ideally be done by means of workshops.
- The environmental committee should then pass on this training to the members of the community, by means of public meetings and workshops.

- An environmental education programme should be implemented in the schools at primary level. By making the children aware of the need for keeping their school clean, this culture will filter back into the community.
- Environmental awareness projects initiated by the schools automatically draw in the involvement of parents and the wider community. A good example of this is a school/community driven clean-up campaign of the area.

It is important that, once a community has been sensitised in environmental awareness and the need for proper waste management systems, ongoing programmes aimed at maintaining that awareness must be implemented.

## **5.5 Role of Public Private Partnerships**

As stated in Section 4.3, **there is an increasing international trend towards the use of the private sector in the provision of waste management services, in developing countries. This is particularly for the case for waste collection**, because the local authorities have not been able to provide adequate services for the following reasons:

- A lack of adequate budgetary funds
- Low productivity from the workforce, management problems and unhelpful bureaucratic procedures
- Inappropriate equipment for the physical conditions of unplanned informal areas.

It has been shown that the private sector can effect cost savings of up to 30%, whilst at the same time providing a higher quality service. This is because the private sector has the advantage of innovative and appropriate technologies that allow for low-cost services. Private sector involvement in the provision of waste collection services could be either in an entirely free market setting, or encouraged by community-based organisations, non-governmental organisations, or the local authorities themselves.

There will always be the fear that the higher efficiency and productivity of the private sector could result in job losses and increased unemployment. It is therefore important that the private sector work in partnership with the local authority to improve the standard and coverage of the waste collection service, thereby increasing the opportunities for further employment creation and income generation. To minimise the threat to current local authority employees, it is recommended that private sector waste collection systems be utilised for new or existing unserved areas.

Based on the literature research and the case studies considered, private sector involvement in the provision of waste collection services for high-density unserved areas, would most likely be in the following roles:

- Micro- and small enterprises (MSEs) such as “one person contractors” (OPCs), are ideally suited for primary waste collection from households and for street sweeping and litter clearing services. This is because these are essentially labour-based functions. By appointing people from the serviced

community for these contracting functions, it is easier to obtain the co-operation of the community in supporting the service.

- Larger more affluent contractors would be suited for the secondary collection of waste from the primary collection sites, and for transportation to the area transfer facility, or to the landfill site itself.

The most common scenario would be a mixed system of MSEs and larger contractors working together with local authority, where the local authority would be responsible for overall supervision and management of the complete waste collection service. This is the approach being implemented in the IDT's Clean and Green Programme (see Section 5.2.3).

There are four basic types of MSE contractors that could be used in the provision of waste management services. These are:

- Private MSEs, who work mainly for profit. These private MSEs are active in waste collection in a number of developing countries, where the local authorities have very little control over the provision of waste collection services. The private MSEs therefore tend to provide their services to the more affluent residents who can afford to pay.
- Co-operatives of a number of MSEs, that collaborate together to improve their bargaining power with the local authorities regarding contract conditions and fees.
- Community-based enterprises, where the community organisations collectively contract members of the community to carry out the service. In this case, the primary objective is to deliver an effective service, rather than to operate as a profitable business. This is the type of system being planned by the Johannesburg SMLC for the Drieziek pilot collection scheme (see Section 5.2.2).
- Labour contracted by a local organisation, where labour is hired directly by a group of residents, community leaders, local authorities or other organisations. This is the type of system being used in Kuisebmond, Walvis Bay (see Section 4.3.1), and Duncan Village, East London (see Section 5.2.5).

Regarding the provision of waste collection services for high-density unserved areas, each of the above types of MSE has advantages and disadvantages. For the South African situation, it is believed that the community based type contractors would be more suitable, particularly in the informal areas.

There are also four different types of contractual arrangements that can be employed in the utilisation of the private sector for the provision of waste management services. These are:

- Direct contracting, where the local authority contracts with MSEs or contractors to provide a service. The contractor is paid directly by the local authority, and the local authority recovers these costs through the collection of rates and taxes from the residents.

- Franchise agreements, where a contractor tenders for, and is awarded a monopoly by the local authority for providing a service within a designated area. The contractor collects fees directly from the residents, and pays a franchise fee to the local authority.
- Open competition, where a number of contractors are entitled to compete for the provision of services in the same area. The contractors charge customers directly, and each pay a licence fee to the local authority.
- Concessions, which are more applicable to appointment of large contractors for the construction and operation of facilities such as large transfer stations and landfill facilities.

When considering the local situation, there is the requirement to provide a waste collection service to every household, regardless of whether or not the household can afford to pay for the service. **It is therefore believed that the only suitable contracting arrangement for private sector involvement in waste collection for high-density unserved areas is by direct contracting.**

It must be emphasised that, by involving the private sector in the provision of waste collection services, the local authority retains responsibility for the provision of this service. The local authority is therefore responsible for management of the contractors, and for monitoring their performance.

## **5.6 Opportunities for Job Creation**

Based on the foregoing, it is obvious that **there is significant opportunity for job creation, as waste collection services are implemented in unserved areas.**

Through the involvement of the private sector in the form of one person contractors, MSEs or larger contractors, entrepreneurship within the previously disadvantaged communities will be encouraged, with resulting local employment opportunities. Similarly, the training provided to the new contractors will significantly enhance their skills for other possible business developments.

## **5.7 Areas for Pilot Implementation Studies**

One of the requirements of this project was to analyse and identify suitable areas for pilot implementation studies for waste collection in high-density unserved areas. Furthermore, the NWMS Action Plan for General Waste Collection detailed the proposed programme for the initial implementation of waste collection services in high-density unserved areas for 300 000 households (see Section 2.4.1). Two of the criteria listed were that the households should be distributed over all nine provinces, and that the number of project areas should not exceed eighteen.

To avoid duplication of effort and initiative, it is recommended that the DEAT take note of the Clean and Green Programme currently being undertaken by the Independent Development Trust (IDT) (see Section 5.2.3). Although this programme is being implemented in fourteen areas over seven provinces (the Northern Cape and Mpumalanga have been excluded), it closely resembles the planned implementation

programme of DEAT. It is noted that the focus of the IDT Cleaning project is on the provision of community based waste collection services using OPCs for primary collection and MSEs for secondary collection. The DEAT should therefore liaise with the IDT regarding the possibility of its involvement in the IDT's Clean and Green Programme.

The provinces and areas being considered for the Clean and Green Programme are:

- Eastern Cape            Alice                            Mount Frere
- Free State                Mangaung
- Gauteng                    Sebokeng, Zone 7            Ratanda, Heidelberg
- KwaZulu Natal            Mtubatuba                    Inner West
- Northern Province        Nylstroom                    Thohoyandou
- North West                Jouberton                    Garankua
- Western Cape             Grabouw                        Wallacedene

It must be pointed out that the IDT project only considers one model for the provision of waste collection services. The DEAT should therefore consider different types of areas for the implementation of its pilot programme. Areas with different topographies, dwelling densities, township planning, etc, should be considered.

The DEAT should also take note of the other initiatives being undertaken in the area of waste collection in high-density low-income areas, such as the SMLC's Drieziek project, and the Duncan Village project.

## **5.8            Guidance for drafting of Waste Collection Regulations**

In terms of Schedule 5, Part B, of the Constitution (Act 108 of 1996), provincial government has *exclusive legislative competence* to the extent set out in Sections 155(6)(a) and (7) over certain local government matters, including **cleansing and refuse removal**, refuse dumps and solid waste disposal. Section 155(6) requires that "Each provincial government must establish municipalities in its province ... and, by legislative or other measures, must (a) provide for the monitoring and support of local government in the province, and (b) promote the development of local government capacity to enable municipalities to perform their functions and manage their own affairs."

Currently, however, there is no national or provincial legislation, which deals directly and explicitly with general waste collection, and the required level and standard of service to be provided by municipalities. Thus, although local government has executive authority over, *inter alia*, cleansing and refuse removal, and provincial government has exclusive legislative competence in terms of the Constitution, no legislation exists to uphold and give effect to these constitutional responsibilities.

To ensure that the constitutional responsibilities of provincial and local government relating to cleansing and refuse removal are properly executed, provincial government

must promulgate legislation on general waste collection. The provincial legislation (regulations) must:

- set standards for waste collection services within the province, according to the needs of the province (such standards may be stricter than the national waste collection guidelines, but the guidelines constitute the minimum requirements);
- apply to all service providers, irrespective of whether they are in the public or private sector;
- require the setting of performance targets and objectives, and monitoring of performance;
- encourage continuous improvement and the development of local government capacity;
- provide for monitoring and enforcement of the regulations by provincial government.

## **6. CONCLUSIONS AND RECOMMENDATIONS**

### **6.1 Conclusions**

Although a number of conclusions have been made in various sections of the report, there are five main conclusions that relate to the project objectives for providing sustainable waste collection services in high-density unserved areas in South Africa. These are the following:

- The waste collection system must be community driven, so that the serviced community “buys in” and takes “ownership” of the system. This will ensure community support for the system.
- Community education and awareness programmes are necessary to sensitise the serviced communities in environmental issues in general, and the importance of waste management in particular. This can be done through the establishment of environmental committees or forums.
- There is an increasing international trend towards the use of the private sector in the provision of waste collection services. Community based contractors are the most appropriate for high-density low-income areas, because of the opportunities for job creation.
- The waste collection system must employ simple appropriate technology to suit the local conditions in the serviced area. This is important with regard to maintenance of equipment, and the employment of locally based contractors (OPCs and MSEs).
- In employing community-based contractors for performing the waste collection services, such contractors must be contracted directly to the local

authority for payment of their fees. This is to protect the indigent who cannot afford to pay for waste collection.

## **6.2 Recommendations**

Based on the foregoing conclusions, as well as other findings contained in the report, the following recommendations are made:

- A practical guideline document for the implementation of waste collection services in high-density unserved areas should be developed. A draft starter document has been produced as part of this project.
- This draft Background Reference document and the draft Guideline document should be used as a basis for a programme of wide consultation with all stakeholders.
- A generic training and awareness programme in urban environmental issues and waste management should be developed for use in the implementation of waste management services in low-income areas.
- The DEAT should liaise with other organisations involved in pilot projects for the provision of waste collection services for high-density unserved areas, so as to co-ordinate activities and gain the benefit of their experiences. These include the Independent Development Trust's Clean and Green Programme, and the Johannesburg SMLC's Drieziek project, amongst others.

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## APPENDIX 1

### *List of Persons Contacted/Interviewed*

The following people were interviewed during the investigation of the various case studies. Their assistance and input into the project is gratefully acknowledged.

NAME	ORGANISATION	CASE STUDY
Mr Les Venter	Johannesburg SMLC	Drieziek
Mr Bertus Barnard Mr Bongani Mfeka	Independent Development Trust	Clean and Green Programme
Mr Tinus Redelinghuys Ms Regina Chibase	Western Vaal Metropolitan Local Council	Sebokeng
Mr Lucas Mahlangu Mr Oupa Makosane	DEAT Risile Project Manager	Risile Project, Stinkwater
Mr Brian Metcalfe Mr Gibson Hlungu	East London Cleansing Department	Duncan Village
Mr Chuma Mbande	FST Consulting Engineers	Duncan Village
Mr Jaco Poggenpoel	Tedcor (Pty) Ltd	Sole Proprietor Contracts
Mr Andre Brummer	Walvis Bay Municipality	Kuisebmond, Namibia
Mr Lukman Salifu	Kumasi Metropolitan Assembly	Kumasi, Ghana

## **APPENDIX 2:**

### ***Photographs of Selected Case Studies on Waste Collection in High-Density Areas***