



Environmental Council of Zambia

**National Solid Waste Management Strategy
for Zambia**

September 2004

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Abbreviations

BATNEEC	Best Available Techniques Not Exceeding Excessive Costs
BAT	Best Available Technology
CBoH	Central Board of Health
CP	Cleaner Production
CIDA	Canadian International Development Agency
DISS	Department of Infrastructure and Support Services
ECZ	Environmental Council of Zambia
EIA	Environmental Impact Assessment
EMS	Environmental Management System
EPPCA	Environmental Protection and Pollution Control Act
ERM	Environmental Resource Management
GRZ	Government of the Republic of Zambia
HIV	Human Immuno-deficiency Virus
HWMWG	Hazardous Waste Management Working Group
IPPP	Industrial Pollution Prevention Programme
LCC	Lusaka City Council
MLGH	Ministry of Local Government and Housing
MTENR	Ministry of Tourism Environment and Natural Resources
NSWMS	National Solid Waste Management Strategy
NEAP	National Environment Action Plan
NCS	National Conservation Strategy
NGOs	Non-Governmental Organisations
NISIR	National Institute for Industrial and Scientific Research
NORAD	Norwegian Agency for International Development
NSTC	National Science and Technology Council
PCBs	Polychlorinated Biphenyls
PCNs	Polychlorinated Naphthalenes
PCTs	Polychlorinated Terphenyls
PI	Public Involvement
UN	United Nations
UNEP	United Nations Environment Programme
UNDP	United Nations Development Programme
UNITAR	United Nations Institute for Training and Research
SMEs	Small and Medium Enterprises
SW	Solid Waste
TDAU	Technology Development and Advisory Unit
TDRC	Tropical Diseases and Research Centre
ZACCI	Zambia Association of Chambers of Commerce and Industry
ZAWA	Zambia Wildlife Authority
ZRA	Zambia Revenue Authority

Foreword

The inappropriate and often careless handling of both municipal and industrial wastes including those that are hazardous has all too often created problems for human health and the environment. It is also a known fact that, sustainable environmental and natural resource management plays a vital role in the socio-economic development of a country. Therefore the Government of the Republic of Zambia initiated the formulation of the National Conservation Strategy (NCS) in 1985 and subsequently the National Environmental Action Plan (NEAP) in 1994. In both these documents waste management among others was identified as one of the major environmental problems faced by the nation.

This National Solid Waste Management Strategy (NSWMS) is a vital document that proposes integrated approaches to addressing the problem of poor solid waste management, which has had over the years far reaching effects on both human health and also the environment.

It is important to note that this strategy will focus on solid waste management but it will however include such wastes as used oils and sewer sludge which may not necessarily be solid. Consistent with the Agenda 21 and the World Summit on Sustainable Development, the NSWMS is formulated to achieve:

- Enhanced protection of the environment and control of pollution;
- Promotion of sustainable waste management practices;
- Protection and preservation of human health; and
- Rational utilisation of natural resources so as not to disadvantage future generations.

This strategy was developed on the premise that if systematic improvements were introduced at the various stages in the waste cycle (from generation to disposal), the quantity of waste generated at each of the subsequent stages would be considerably reduced. Employing a multi-sectoral integrated and holistic approach involving all the key stakeholders, the problem of poor solid waste management would be resolved.

It is important to note that the development of this strategy was through a consultative process involving all the major stakeholders. Through the consultative process the following objectives were formulated:

- To minimise the generation of waste
- To maximise waste collection efficiency.
- To reduce the volume of waste requiring disposal and maximise the economic value of waste.
- To develop and adopt environmentally sound treatment and disposal facilities/practices.

In order to achieve the objectives outlined above the strategy as earlier alluded to will employ an integrated approach, which will encompass cleaner production technologies. To this effect the strategy will utilise the internationally accepted waste management hierarchy. Further, the strategy will utilise the following principles: *Polluter pays principle*, *integrated life cycle principle*, *Source reduction principle*, *precautionary principle* and the *principle of co-operation*. The Government is cognisant of the importance of the private sector in achieving the objectives of the strategy. This point can not be overemphasised only to state that the

achievement of a clean and quality environment that would promote economic, social and cultural development requires concerted efforts from the Government, the general public and the private sector.

It goes without saying that a clean country promotes good health, attracts tourists and is environmentally friendly. This is to say that, the achievement of the goals and objectives of this strategy will be very significant to the enhancement of tourism in the country and thereby bring in foreign exchange. Furthermore this will lead to the creation of employment not only in the tourism industry but also in the waste management field and other related industries. This strategy should be viewed as a contribution to poverty reduction and job creation.

Finally, this strategy would not have been developed if it were not for the valuable contributions from the stakeholders. These include the local authorities, industries, NGOs, other line ministries who extended their help through the consultative process and last but most importantly, the Government of Norway who funded this project. To all of you I say thank you for sharing in our motto, *“a clean and green Zambia begins with you”*

Professor Francis D. Yamba

Board Chairman- Environmental Council of Zambia
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1.0 Introduction to the strategy

1.1 Background

The management of various types of waste has over the years been a very difficult and challenging issue. This difficulty has manifested itself in the perennial outbreak of diseases such as cholera, dysentery and pollution of water resources, air, soil or land contamination, proliferation of pests and vermin, and the loss of aesthetic beauty. Improvements are desired in waste management covering aspects of minimisation of waste generation, collection, re-use, recycling, treatment and disposal.

In this regard, the Government of the Republic of Zambia (GRZ) enacted legislation such as the Environmental Protection and Pollution Control Act (EPPCA) amended in 1999, Cap 204 of the Laws of Zambia, which established the Environmental Council of Zambia to provide for the control of activities related to environmental protection. In 1993, regulations for the licensing of transporters of waste and operators of waste disposal sites came into effect whilst the regulations governing the control of hazardous waste were signed in 2001.

Solid waste is defined under the EPPCA as garbage, refuse, sludges, and other discarded substances resulting from industrial and commercial operations and from domestic and community activities. This includes such classes of waste as hazardous including waste oils, and wastes arising from mining activities excluding gaseous waste and wastewater.

Before the enactment of the EPPCA, there have been initiatives through the National Conservation Strategy (NCS) of 1985, to identify measures for improving waste management. Furthermore, the National Environmental Action Plan (NEAP) (1994) also identifies waste as a key environmental problem. The NCS and NEAP are the precursor of the overall policy on environment. The main objective of the NEAP is to integrate environmental concerns into social and economic development planning processes.

- In order to meet the challenges of environment and development, GRZ with technical assistance from the Government of Norway, through the Norwegian Agency for International Development (NORAD) initiated a six-year Industrial Pollution Prevention Programme (IPPP) in 1997. The main objective of the IPPP was to increase capacity for pollution prevention and monitoring in industry and the Environmental Council of Zambia (ECZ). During the second phase of the IPPP, which started in 2000, it became imperative that to improve the waste management situation, a strategy had to be developed and put in place. In addition the IPPP provided support to an emerging speciality of Cleaner Production (CP). CP emphasises on reducing the amounts of waste arising from an industrial process so that resources are conserved, and thereby reduce the amounts that end up in the environment as waste. The waste management hierarchy, mainly implementing waste minimisation/reduction before reuse and recycling, treatment and disposal, is vital to the success of the strategy.

The country is faced with a critical waste management problem, which is threatening the health of the people of Zambia, socio-economic development as well as the environment.

Major concerns include:

- Littering, uncollected garbage, and indiscriminate dumping of waste;
- Improper handling of hazardous wastes;
- Health hazards due to indiscriminate disposal of waste
- Low standards of operational disposal sites; and
- Potential for contamination of soils and underground/surface water from operations of disposal sites and the indiscriminate disposal of wastes.

1.2 The Operational Legal and Regulatory framework of the strategy

Zambia has recognised the need for a strengthened legal framework to the management of waste. In this regard the EPPCA, which is a result of the recommendation of the NCS to have legislation that encompasses all environmental aspects, forms the basis of the framework. Within this framework, all the stakeholders will have a role to play, with local authorities playing a key role in the formulation of by-laws and regulations in their areas of jurisdiction. The ‘polluter-pays-principle’ and similar such principles shall guide this process.

This framework reflects the NEAP’s fundamental principles of:

- 1) The right of the citizens to a clean environment;
- 2) The participation of Local communities and the private sector in natural resources management; and
- 3) Obligatory Environmental Impact Assessment (EIA) of major development projects in all sectors.

The Environmental Protection and Pollution Control Act no. 12 of 1990, amended in 1999, is the principal law on environment and came into effect in 1992. This provides for the requirements for handling waste such as the licensing or permitting process for collection, transportation, treatment and disposal of waste. Other supporting pieces of legislation with regard to waste management include the Local Government Act of 1991, Public Health Act of 1930, Mines and Minerals Act of 1995, National Health Services Act of 1996, and Ionising Radiation Act of 1975.

1.2.1 Waste management Regulations

The Waste Management Regulations Statutory Instrument No. 71 of 1993 provides for the control of transportation of waste and management of waste disposal sites. All persons transporting waste or operating waste disposal sites including Local Authorities are required to obtain licenses and have to adhere to conditions and standards set by ECZ.

1.2.2 Hazardous Waste Management Regulations

The Hazardous Waste Management Regulations Statutory Instrument No. 125 of 2001 provide for the control of hazardous waste so that the waste is managed in an environmentally sound manner through waste prevention, reduction, recycling, incineration and land filling. The regulations further provide for control of generation, collection, storage, transportation, treatment, import, export and final disposal of hazardous waste. The management of hazardous waste will be done in accordance with the provisions of the Basel and Bamako Conventions.

1.2.3 Other Supporting pieces of legislation

Table 1 below gives a summary of other supporting pieces of legislation in the field of waste management in Zambia.

Table 1: Other pieces of Legislation Associated with Waste Management in Zambia

Name of legislation	Area of coverage
Public Health Act of 1978	Prevention and suppression of diseases
Local Government Act of 1991	Establishment of local authorities and local government administrative system
Ionizing Radiation Act of 1975	Protection of public from dangers of ionizing radiation
Mines and Minerals Act of 1995	Granting of, renewal and termination of mining rights

1.2.4 International Conventions related to Waste Management

The Basel convention was originally established to address the global problem of uncontrolled movement and dumping of hazardous wastes, including incidents of illegal dumping in developing countries by companies from developed countries. This was of great concern as indiscriminately disposed, accidental spillage or improper management of hazardous waste can pose severe health problems, even death and can poison water and land for decades. The Basel convention is therefore a global agreement, ratified by many member countries including Zambia, for addressing the problems and challenges posed by hazardous waste.

The Bamako Convention is the convention on the ban of the import into Africa and Control of Transboundary Movements and Management of Hazardous wastes within Africa, which was adopted by the members of the African Union in 1991 and came into force in 1998.

2.0 An overview of the current status of waste management

This section highlights the current situation and gives an analysis of the various streams of waste. Generally the current waste management situation leaves much to be desired. Wastes generated from all the sectors of the economy are currently not well managed. Disposal sites in almost all the districts are either not there or they are poorly managed. Taking the Lusaka situation as a reference point, less than 14 % of the waste generated in the urban centres finds its way to the disposal sites. The following waste streams include domestic, commercial, industrial and hazardous wastes. Currently, there is no available data on radioactive, agricultural and chemical wastes. In addition, there is generally inadequate data for other waste streams especially for areas outside Lusaka and the Copperbelt.

2.1 Domestic Waste

This category of waste comprises mainly of wastes that are generated from household activities. This normally includes such materials as waste paper, plastics, and wood off cuts, kitchen waste and yard waste. Currently there is no separation of the various types that constitute this category. The waste components are usually mixed and dumped in places that are not designated for disposal. Much of this type of waste is generated from residential areas and at the moment less than 10% on average of residential areas in the country are serviced as regards waste management. The percentage could be a little higher on the Copperbelt especially the mining townships. Most of the mining townships have a defined waste management system. This is mainly due to the presence of programmes driven by AHC-MMS. Refer to appendix 2 E & F for information on composition of waste from trade and domestic sources and an indication of quantities of waste generated in some mine townships on the Copperbelt.

The waste management situation on the Copperbelt mining towns as alluded to above, is well defined as compared to other towns in the country. There is however need to streamline the system to ensure that there is increased coverage.

2.2 Commercial Waste

This is the waste stream that is generated from commercial and business houses and will normally compose of such materials as discarded office paper, cardboard, plastic and general packaging waste.

The management of this type of waste like for domestic waste is also not well defined. This is exhibited by the presence of piles of uncollected waste in most of the town centres.

2.3 Industrial Waste

This is waste that is generated from industrial production processes. Types in this category include such wastes as industrial sludge from factories, manufacturing facilities, and refineries. It also includes food processing waste, and water treatment filter cake sludge. Other types would include ash from industrial combustion processes. This waste stream also covers wastes from mining activities.

2.3.1 Mine Waste

The subtypes associated with mine waste as briefly discussed below are overburden, waste rock, tailings and slag. Appendix 4 gives details of the status of mine waste in Zambia.

1. **Overburden:** The overburden comprises near-surface soils and rock from open pit stripping operations. Overburden material is normally stockpiled above ground close to the open cast mine or used for in pit backfilling as is currently practiced at Nchanga Open Pit. There are approximately 32 overburden dumps in Zambia's mining industry. The dumps contain approximately 1,899 Million Tonnes of overburden and cover an area of approximately 20,6465ha.
2. **Waste rock:** Waste rock is generated in underground shaft mining. Waste rocks are normally stockpiled above ground close to the open cast or underground mine. There are approximately 21 waste rock dumps in Zambia's mining industry. The dumps contain approximately 77 Million Tonnes of waste rock and cover an area of approximately 388 ha.
3. **Tailings:** These are waste materials that are produced from concentration of copper-to-copper concentrates with copper content of less than 1%. As a result, large quantities are generated every year. Tailings are transported as slurry in a pipeline to a disposal site called tailings dump/dam. There are approximately 11 engineered and 34 paddock dumps/dams in Zambia's mining industry. The tailings dump/dams contain approximately 791 Million Tonnes of tailings and cover an area of approximately 9125ha. Active tailings dams and the amounts being deposited are shown in Table 4.
4. **Slag:** Slag is waste material that is produced from smelting of metal concentrates. Slag is generally delivered for disposal in molten or granulated state. There are 9 slag dumps in Zambia's mining industry. The dumps contain approximately 40 Million Tonnes of slag and cover an area of approximately 279ha.

2.4 Hazardous Waste

This is the type of waste with such characteristics as flammability, irritability, ignitability, corrosivity and toxicity. Examples include; industrial hazardous waste products such as wastes containing heavy metals such lead and chromium, polychlorinated biphenyls (PCBs), asbestos and ink sludges. Other types include, lead acid batteries, clinical waste and waste oils. This category also includes wastes from hospitals and other healthcare facilities. It is characterised by such types as sharps, swabs, and pathological and cytotoxic wastes. An inventory on hazardous waste was conducted in 1997 by ECZ (see Table 2 below) whose objective was to gather data so as to establish quantities and types of hazardous waste in the country.

Table 2: Hazardous Waste Generation for 1997 in the Country

Waste Categories	Quantities (tonnes)
Wood preserving chemicals	70
Waste oils	10,000
Petroleum refining	500
Explosives	750
Hexavalent chromium compounds	200
Lead	240
Lead, zinc, cadmium compounds	5,400
Bases in solid form (lime)	30,000
PCBs*	200
Asbestos	890
Healthcare waste	No data

Source: Inventory of Hazardous Waste, 1997, ECZ

* Stored quantities, not expected to recur each year

2.4.1 Health Care Waste

Healthcare waste is one stream that is becoming one of the major concerns in the area of waste management. Given the rising number of private clinics, the amount of waste generated from this sector is exceptionally high. However, it is important to note that there are currently no adequate facilities for treatment and disposal of healthcare waste. The urgency to implement measures to manage healthcare waste emanates from the potential of infection from objects contaminated with Human Immuno-deficiency Virus (HIV) and Hepatitis viruses B and C.

The study conducted by Mundia and Mbewe 2002, shows that there is no defined way of managing waste from government owned healthcare facilities. The study gives a synopsis of the current situation in as far as the size, capacity of hospital and generation of waste is concerned (for details on size types and quantities of waste in health care facilities visited under the study, refer to appendix 2 C).

Incineration can be done for various types of waste, either to reduce its volume or to render it less harmful. In Zambia much of the clinical/pathological waste is incinerated using burning chambers (traditional incinerators). There is need therefore to put in place a system to address healthcare waste.

2.4.2 Agricultural Waste

This category of waste basically consists of discarded materials from agricultural activities. The major component of this type is the organic portion. Examples of this type include remains from vegetables. Other wastes from agricultural activities are pesticide-containing wastes which are classed as hazardous. Data for both non-hazardous and hazardous agricultural waste is not readily available

2.4.3 Other Hazardous Waste Streams

As alluded to above, other streams of hazardous waste such as sewer sludge, radioactive, agrochemical and other chemical wastes do not have available data. There is therefore need to address this lack of available data in the implementation of the strategy

At the time of compiling this strategy, ECZ had commenced on carrying out inventories on Persistent Organic Pollutants as part of the implementation of the Stockholm Convention.

3.0 The National Solid Waste Management Strategy

3.1 The need for the strategy

The strategy is necessary to ensure that Zambia develops and establishes a coordinated approach to sound solid waste management. A strategy which will lead to improvements in the management of waste encompassing all streams is therefore desired. A lot of domestic and industrial waste lies uncollected especially in the major urban and peri-urban areas. Limited financial capacity and lack of trained manpower have made it almost impossible for the local authorities to fulfil their obligations concerning solid waste management.

Various industries including Small and Medium Enterprises (SMEs) in Zambia produce a variety of wastes that are both hazardous and non-hazardous. Lack of skilled manpower, inadequate infrastructure, and recycling facilities has exacerbated the problem of waste management.

Given the above, solutions to deal with the current problem of poor waste management need to be formulated. However, whilst the government is advocating for environmentally sound waste management, the solutions should also be cost effective.

3.2 Vision of the Strategy

The implementation of the strategy must meet the needs of the citizens of Zambia by way of it being incorporated in the national socio-economic development plans. Changes will be made in the way waste is managed, so that the amount of waste disposed of in landfills is reduced so as to safeguard public health and the environment.

The National Waste Management Strategy (NSWMS) will meet the following:

- Legal and regulatory framework to deal with producer responsibility among industry;
- Waste minimisation and recycling;
- Well coordinated institutional arrangements;
- Establishment of waste database and classification system;
- Waste treatment and disposal facilities across the country;
- Promotion of cost effectiveness in waste management and
- Public awareness, education and communication

The framework provided by NSWMS will improve significantly the provision of waste management services, through increased investment in equipment, infrastructure and capacity building.

It is envisaged that various instruments, including bans, restrictions, and taxations will be employed to deal with specific waste problems.

3.3 Objectives of the National Solid Waste Management Strategy

The overall goal of the National Waste Management Strategy is to improve the environmental quality of the Zambian environs through the development and implementation of an efficient and sustainable waste management system.

The objectives of the national waste management strategy are to:

- i) Minimise generation of waste ;
- ii) Maximise the collection efficiency of waste;
- iii) Reduce the volume of waste requiring disposal and maximise the economic value of waste; and
- iv) Develop and adopt environmentally sound treatment and disposal methods/practices.

3.4 Scope

The NSWMS document is envisaged to address all the sectors of the economy that lead to the generation of waste. Being a national document the NSWMS will provide guidance on waste management for all stakeholders in government, industry and business, private sector, non-governmental organisations, learning and research institutions, and the community.

The strategy outlines the principles to be adopted in the management of all streams of waste whether domestic, mining or agricultural through waste minimisation, re-use, recycling, treatment and disposal.

4.0 Components of the Strategy

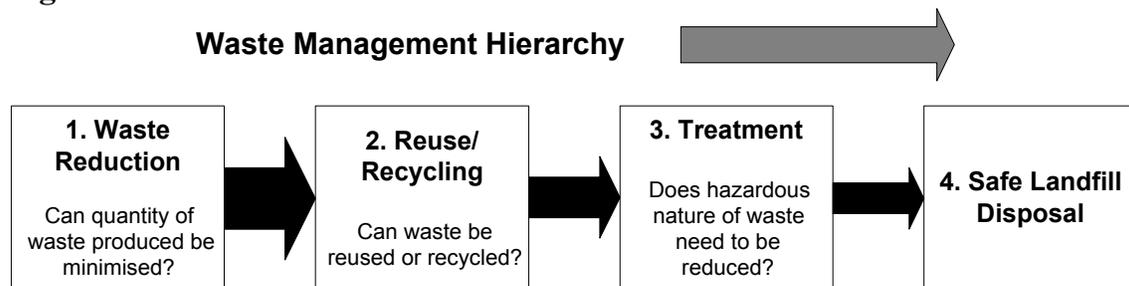
The NWMS is developed with the following components; minimisation/reduction, re-use and recycling, pre-treatment/treatment and disposal of waste..

4.1 Waste Management systems

A waste management system should ideally consist of environmentally acceptable waste management practices that are aimed at minimising waste generation from both domestic and industrial/commercial activities. Further, the system must provide for the protection of human health and the environment. All stakeholders shall follow the waste management hierarchy system.

Figure 1 illustrates the components of an ideal waste management system, which involves minimisation/reduction, re-use and recycling, pre-treatment/treatment and disposal of waste in an environmentally sound manner.

Figure 1



(Source: Botswana Waste Management Strategy 1998)

4.2 Principles for the strategy

This strategy aims to introduce and promote environmentally sound waste management practices in Zambia. The following principles are cardinal in the implementation of the strategy.

- **Polluter pays principle**: This principle entails that costs of preventing, abating pollution i.e. potential polluter acts to prevent pollution, and pays for remedying the eliminating and/or compensating for damage to the environment must be borne by the party responsible.
- **Integrated life-cycle principle**: The substances and products should be designed and managed in such a way that environmental impacts are minimised during generation, use, recovery and disposal.
- **Source reduction principle**: This implies any practice that reduces the amount or toxicity of waste materials generated. The focus is on how to generate less waste rather than what to do with waste. Source reduction practices may include the following:
 - ❖ Reduce material use in product manufacture
 - ❖ Increase production efficiency resulting in less production waste
 - ❖ Decrease toxicity
 - ❖ Material reuse or more efficient consumer use of materials (e.g. reusable shopping bags)

This may be achieved by using appropriate plant and process designs.

- **Precautionary principle**: This implies that where there is uncertainty over the consequences of an activity or project, no action should be taken. A risk assessment exercise is undertaken before proceeding with a project that is likely to have negative impacts.

Principle of Co-operation: This principle emphasises that co-operation among all social groups is vital to solving environmental problems

4.3 General Actions and Measures

4.3.1 Waste minimisation

Ensuring that waste generation is minimised is a very cardinal component in the attainment of a sound waste management system. Waste minimisation can be achieved through ensuring that Cleaner Production (CP) techniques are employed. This would include such activities as good house keeping, process change, and use of environmentally safe raw materials and sound raw materials management. The poor management of these materials results in generation of large quantities of waste. In the widely accepted hierarchy of waste management, minimisation of waste generation is the most important aspect. If waste

generation is minimised in the first place, few resources will be allocated for its management. Waste minimisation is an attitude of mind and requires commitment from all sectors of society, particularly decision makers.

Environmental Management System (EMS) and CP are techniques that have been developed to address issues of waste minimisation with underlying environmental and financial benefits when implemented. According to (UNEP 2000), 70% of current wastes and emissions from industrial processes can be prevented at source by use of technologically sound and economically profitable procedures. There is therefore need for industry to employ technologies that reduce the generation of waste and that all new industries should employ the technologies within the country that ensures the minimisation of waste generation.

Given the above, the following will done to ensure reduction of waste at source:

- Supporting programmes to enhance cleaner production among industry including the mining sector. This will involve building capacity through the cleaner production programme.
- Encouraging industry to adopt non-regulatory tools such as ISO 14001.
- Development of a cleaner production centre in the country that is self-sustaining with support from industry.
- Promotion of source separation at household level.
- Development of anti-litter programmes
- Supporting and promoting investment in recycling activities as a means for waste reduction or minimisation.

4.3.2 Waste generation

Households, industry, trade and commercial enterprises and service institutions generate various types of waste as shown in appendix 2 E. All commercial and public facilities, industries and mines should develop a policy to minimise the generation of waste. Generators should further put in place mechanisms to treat all hazardous waste generated. Considering the fact that there is currently a lot of packaging waste (e.g. plastic bottles) as a result of the proliferation of the drink and beverage industry, legislation to this effect will be very imperative in order to compel producers of products that ultimately end up in the environment as waste to take back such kind of waste or altogether change the packaging regime.

The following actions and measures will be employed to deal with generation patterns:

The most important aspect of addressing waste generation among industry is enactment of specific regulations to address producer responsibility. Therefore Government through ECZ will develop legislation to that effect. In addition to legislation, industry will be encouraged to adopt non-regulatory environmental management tools such as EMS and CP.

4.3.3 Storage

Since waste may not necessarily have to be disposed of as soon as it is generated, its storage becomes imperative. The storage of waste at an appropriate site provides for the planning of the frequency of collection. It also provides the opportunity to sort the waste and recover any useful materials for recycling, and a classical example is the recovery of copper and other

metals from slag dumps and mine tailings dams. Actions and measures to improve storage of waste will be to:

- Mobilise financial resources for procurement of storage equipment such as skips;
- Encourage separate storage of wastes of a different nature and composition to enhance recovery of useful materials and prevent cross contamination
- Introduce transfer stations as part of the storage system especially for the Peri- urban areas and communal places like markets. Waste storage will involve utilisation of home compatible bins for conventional housing
- Develop appropriate management systems for transfer stations which will not contribute to the generation of nuisances.
- Store waste according to the set conditions as provided for in the regulations governing the management of both hazardous and non-hazardous waste.

4.3.4 Collection and Transportation

Collection of waste from where it is generated or stored is one of the priority areas in the current waste management system. Waste collection should be done according to licence conditions, using the right mode of transport and proper methods of collection. However, investment in expanding the collection capacity must be accompanied by corresponding investment in safe disposal facilities, which include resource recovery and recycling plants to reduce the volume of waste to recover the value from discarded materials. It is envisaged that waste collection will improve through:

- Encouraging local authorities to involve private sector-participation;
- Mobilising and coordinating financial resources for infrastructure development;
- Developing favourable economic and legal regulations for private sector-local authority contracts;
- Developing by-laws that will obligate householders to pay for collection services;
- Mobilising community-based enterprises and rural development communities to assist in waste collection in peri- urban areas;
- Programmes aimed at preventing illegal disposal of both hazardous and non hazardous waste from commercial operations (including mining and industrial).

4.3.5 Recycling/Re-use

Recycling of waste is a very important component in the sound management of waste. Recycling involving the utilisation of discarded material to produce another product of the same grade or lower. In order to enhance and promote recycling, the following measures/strategies will have to be done.

Actions and measures/strategies to enhance recycling and reuse will include:

- Enhancing waste characterisation and separation at source;
- Introducing incentives;
- Improving environmental reporting
- Development of legislation to obligate producers on their responsibility for their products
- Need to generate a database of recyclable products
- Encourage reclaiming of mining waste

- Development of a programme and mechanism to utilise tailings and waste rock as backfill material in underground where appropriate

4.3.6 Waste pre-treatment and treatment

Strategies to improve waste pre-treatment and treatment will include:

- Encourage separation of waste at source to reduce amount of waste to be handled;
- Improve status of currently running incinerators – upgrade the existing incinerators in particular at medical Institutions.
- Open up existing central incinerators to allow smaller clinics and health centres to use facilities for incineration.
- Request research institutions to develop appropriate incinerators;
- Develop relevant regulations for healthcare waste;
- Development of treatment techniques
- Develop technical guidelines for management of different hazardous waste streams for commercial facilities
- Develop technical guidelines for treatment methods for both rural and urban setups
- Reduction of pollution from incinerators

4.3.7 Waste disposal

Engineered Landfill sites as well as properly sited and constructed dumpsites are a pivotal component in a sound waste management system. It is important to note that despite active waste prevention and recycling, a residue will always remain which requires final disposal. Waste should therefore be disposed of in such a way as not to cause harm to the environment and mankind. Therefore, the following needs to be done to address the area of final disposal of waste:

- Adoption of a mechanism of improving and upgrading public and private dumpsites
- Decommission dumpsites that are not run in a manner that is not environmentally sound.
- Whilst working towards promotion of co-mingled sites there will be promotion of creation of independent hazardous waste sites.
- Revision of guidelines on disposal site selection criteria taking into account the existing situation of towns and cities in Zambia – strengthen guidelines and implementation of guidelines
- Disposal systems shall include Material Recovery Facilities, transfer stations
- Waste picking at disposal sites will be regulated
- Develop private/public partnerships strategy
- Government to develop an enabling environment for investment in waste management.

4.3.8 Institutional Strategies

This section will highlight the institutional strategies that will form an important component of the strategy. The institutions identified to be key stakeholders are pivotal to the successful implementation of this strategy. Important to the overall implementation is the issue of cost recovery as well as financial sustainability.

4.3.8.1 Cost recovery/ financial sustainability

The recovery of costs incurred in the management of waste is key to the sustainability of waste management service provision. The provision of waste management services is a costly undertaking, which needs specialised equipment and facilities and could account for 20-50% of the operating budget of local authorities (World Bank, 1990).

Economical collection and disposal fees or taxes should be introduced for a sustainable waste management system. Cross subsidies will be introduced to cater for low-income groups. Servicing of the Peri-urban areas could be complemented by cross-subsidies from levies obtained from commercial, industrial or higher income households. The principle of cost recovery will be employed.

4.3.8.2 Public Awareness

Without public education and general awareness on the dangers of improper disposal of waste there is too often insufficient public demand for action. Public awareness plays a vital role in changing people's attitude and ensuring the success of waste management programs. The success of waste management programmes will depend to a greater extent on awareness programmes. The awareness programmes will provide for sensitisation of communities on the existing environmental laws and by-laws.

4.3.8.3 Infrastructural Development

In order to ensure that the management of waste is enhanced, development of waste management facilities such as disposal sites will be key. Government will need to:

- Promote investment in waste management infrastructural development.
- Encourage private public sector and community partnerships;
- Develop an enabling environment for investment in waste management.

4.3.8.4 Institutional Framework

The institutional framework will include Government institutions and agencies, business and industry, Non Governmental Organisations and the public.

Local authorities will have to continue executing the responsibility and/ or duty conferred on them by law of ensuring planning and provision of collection and disposal services for Municipal Solid Waste (MSW) and commercial waste.

Private industry will need to be encouraged to actively participate in the management of waste in the various municipalities.

There has to be built both financial and technical capacity for all key players in waste management. Updating and reviewing municipal laws. ECZ will have to lobby for this strategy. Fundamental principles of the National Solid Waste Management Strategy will emphasise the strict enforcement of existing laws on environment and encouraging public co-operation.

4.3.8.5 Government

The Government has a role of providing a policy and legal framework that is clearly understood and can be enforced. This guidance is provided through legislation, regulations and other forms of mandatory controls or voluntary arrangements. The framework provides for the participation of non-state actors. Government should provide incentives to support public and private initiatives in waste management.

Table 3 shows government institutions/agencies and other stakeholders that have been identified to have a role to play in the management of waste.

Table 3: Roles of Government Institutions/Agencies and Other Stakeholders in the Waste Management

Ministry /NGO/Public	Agency /Organisation	Roles
Ministry of Finance and National Planning	Zambia Revenue Authority	Responsible for the allocation of financial resources for various developmental activities throughout the country. Collection of taxes and provision of tax incentives.
Ministry of Local Government and Housing	Local Authorities	Waste management service provision and operation of dumpsites, public awareness, formulation of by-laws. Development of waste management infrastructure
Ministry of Energy and Water Development	National Water and Sanitation Council	Regulation of water and sanitation
	Energy Regulation Board	Water quality monitoring Regulation of the petroleum and energy sector
Ministry of Health	Radiation Protection Board, Pharmacy and Poisons Central Board of Health, Food and Drug	Regulate radiation matters. Role in the enhancement of sound management of clinical/healthcare waste
Ministry of Mines and Minerals Development)	Mines Safety Department, Geological Survey Department	Regulate issues of environment and safety in the mines including issues of waste management
Ministry of Home Affairs	Police Service	Enforcement of legislation as regards environment
Ministry of Science And Technology	NISIR, NSTC	Development of appropriate technologies
Ministry of Tourism, Environment and Natural Resources	Environmental Council of Zambia, Zambia wildlife Association, National Heritage Conservation Commission.	Responsible for development and articulation of policy on environment. t.
Ministry of Lands	Survey Department, Lands Commission	Helps in the provision of survey and mapping services and administration of land
Business and industry	ZACCI ZAM	Coordinating industry activities in as far as waste minimisation is concerned
Non Governmental Organisations (NGOs), NGOCC		Have role in the education of communities, advocacy for a clean environment, supporting of waste management initiatives
The Public	CBOs	Play a watch dog role, supporting the waste management system by paying for the service and getting involved in community waste management programmes

Ministry /NGO/Public	Agency /Organisation	Roles
Learning and Research Institutions	Universities, Colleges, NISIR, TDRC	Research and training. Development of appropriate technology; development of courses in waste management
Ministry of Commerce, Trade and Industry	Zambia Investment Centre, ZABS, Registrar of Companies	Development of Standards and Enforcement of Standards. Promote investments in waste management
Labour and Social Securities	Factories Inspectorate	Regulating occupational health and safety in industries
Ministry of Transport	Road Traffic Commission	Waste management in transport sector including Anti- litter enforcement in public transport
Ministry of Education	CDC	Development of curricular on waste

5.0 Targets for the strategy

5.1 General Targets of the strategy

This section discusses the targets of the NSWMS. In order to achieve the targets a number of strategic concepts need to be implored. These will include among others:

- Minimisation of waste generated,
- Waste generation and storage,
- Improved coordination among stakeholders in waste management,
- Introduction of a system of levies and incentives,
- Re-use and recycling of waste as resource materials,
- Development of a database and waste information management system and
- Establishment of a classification system for all waste types:

5.1.1 Minimise generation of waste

The NSWMS addresses the following priority targets as in the area of waste minimisation.

ECZ and local authorities will put in place a waste minimisation programme for industry and other institutions that will involve cleaner production programmes and other self-regulatory tools by December 2004

ECZ will promote waste minimisation programs in industry beginning January 2005

The Government and other relevant stakeholders will develop and implement training/awareness programmes for industry and other institutions on the need for waste minimisation strategies beginning January 2005.

Industry and other institutions will develop and implement policies to minimise waste generation by 2005

5.1.2 Waste Generation and storage

- ECZ in collaboration with other stakeholders will strengthen public awareness on generation and/or storage of wastes by December 2004
- Generators of wastes shall put in place measures to treat and pre-treat wastes generated before disposal.
- Industry shall put in place suitable infrastructure for the storage of hazardous wastes before removal by December 2005
- The public will participate in reducing waste being generated through anti-littering and sorting of waste at source by 2005.

5.1.3 Establishment and improved co-ordination among stakeholders in waste Management

- Government will promote coordination among stakeholders in a multi-sectoral and integrated manner.

5.1.4 Re-use and recycling of waste materials as a resource

- Government will vigorously promote and encourage investment in the establishment of infrastructure and technology for the reuse and recycling of waste.
- Government will support industries that are reusing and recycling waste through reducing the external costs of reuse and recycling.
- As alluded to above in section 4.3.2, government will develop packaging waste regulations to encourage recycling of problematic waste materials.

5.1.5 Introduce a system of levies and incentives

In order to minimise the use of non-biodegradable or non-recyclable materials, and promote recycling and reuse of waste, the Government will introduce a system of levies and incentives. Government will introduce a mechanism to incorporate levies, penalties and tax rebates in order to encourage industry to adopt environmentally friendly technologies.

5.1.6 Waste disposal

- Government strongly recommends that waste practitioners in the country, be they Government, local authorities or private, start to use Landfill Guidelines as a basis for selection, design and construction of any new site and for upgrading and closure of existing sites by 2005.
- Hazardous waste shall be disposed of in a Best Practicable Environmentally sound Option (BPEO) i.e. secure or lined landfills, lined lagoon and encapsulation facilities by 2010.

5.1.7 Development of database and waste information management system for all types of waste

- Government will launch a structured communication programme that will inform, educate and generate support for and feedback on the NSWMS from stakeholders.
- Local Authorities will collect data on waste, location of dumpsites and prepare waste management plans.
- Industry shall submit data on quantities and composition of waste to regulatory authorities.
- Government through ECZ will launch and execute a national wide data collection exercise for waste beginning January 2004
- Government through ECZ will develop a national waste information system by 2004.

5.1.8 Establish a classification system for all types of waste

- Government will develop through stakeholder consensus a classification system for all types of waste by December 2004
- The classification for hazardous waste in Zambia will be based on the Basel Convention system and will be controlled through the Hazardous Waste Management Regulations of 2001.

5.2 Institutional Strategic Targets

The success of this strategy will depend on how far the set targets are achieved by the various stakeholders.

5.2.1 Government agencies

The government supports and will promote the waste management principles of waste prevention, reduction, recycling and treatment before disposal. There are a lot of benefits to be gained from such a strategy.

The respective government agencies, based on their mandate, roles and responsibilities will participate in waste management, through formulating policies and legislation that assist in enhancing and improving services for waste collection, treatment and disposal; such as collection and disposal fees, siting of facilities, etc.

The Ministry of Tourism Environment and Natural Resources through ECZ in collaboration with MLGH-DISS will take the lead in the co-ordination and implementation of the strategy. The local authorities, through their Public Health Departments, will provide a framework for collection and disposal services on a cost recovery basis, including participation of the private sector.

Short term targets (24 months)

In the short term, government will implement the following:

- Source funds for local authority remedial works,
- Disseminate and actively promote information on this strategy;
- Inform the public and other stakeholders on current and new developments on legislation and regulations;
- Enforce the legislation and regulations;
- Establish an efficient coordinated framework;
- Establish an information network: maintain data on quantities of waste generated, recycled and disposed of;
- Monitor discharges of waste to the environment; and
- Formulation of environmental education and publicity programme
- National Waste Management Reforms including capacity building and institutional legal framework

Medium-term targets (up to 5years)

In the medium-term, government agencies will implement the following:

- Review legislation to provide for incentives such as tax rebates;
- Promote user charge system for waste collection service and disposal;
- Promote private sector involvement in the commercialisation of waste management;
- Construct sanitary landfill/disposal sites;
- Introduce bonding systems; and

- Review financial structures and strategies

Long-term targets (up to ten years)

In the long term, government agencies will implement the following:

- Strengthen public education and citizens participation
- Construct sanitary landfill sites
- Promote waste volume reduction

5.2.2 Local Authorities

Local authorities are the backbone of the strategy in terms of providing collection services, designating and development of waste disposal sites in their areas of jurisdiction, and establishing organisational set-up. Local authorities should involve the private sector in achieving its targets.

Short term targets

In the short term the local authorities will implement the following:

- Restructure the organisation of the local authorities to provide for the waste management department or institution
- Establish and strengthen or expand the waste collection service
- Improve and/or designate waste disposal sites
- Development of municipal by laws
- Develop waste management plans
- Introduce private sector participation
- Increase awareness and participation
- Develop and maintain a data collection system
- Enforce existing Municipal Waste by laws

Medium term targets

In the medium term the local authorities will implement the following:

- Strengthen waste management systems or institutional set-up;
- Explore the use of private sector resources;
- Construct sanitary landfill disposal sites; and
- Review and upgrade by-laws.
- Assists the government on education and awareness programmes.

Long-term targets

In the long term the local authorities will implement the following:

- Develop and enforcement of Waste Management by-laws
- Strengthen private sector participation
- Expand collection service

- Provide a sound financial base
- Expand on the service coverage of waste collection, resource recovery and recycling and treatment facilities

5.2.3 Industry

Industries are responsible for ensuring that waste generated by their processes and products is properly stored and treated and disposed of in an environmentally sound manner. Industry will have to adopt cleaner production technologies and the waste management hierarchy in dealing with their waste products.

Short term targets

In the short term, industry should implement the following:

- Maintain waste pollutants data register for waste, air and water, discharges;
- Treat the waste they generate before disposal;
- Have waste management plans developed;
- Adopt and be committed to cleaner production technologies;
- Strive towards volume reduction; and
- Comply with relevant legislation and regulations.

Medium term targets

In the medium-term, industry will implement the following:

- Contribute to research in waste management technologies;
- Involve private sector participation in waste management;
- Make use of NGOs promoting sound waste management practices, e.g. the Institute of Waste Management (IWM);
- Use alternatives to hazardous materials in processes;
- Construct storage sites; and
- Develop acceptable waste management practices and plans

Long-term targets

In the long-term, industry will implement the following:

- Increase the level of resource recovery and recycling;
- Introduce intermediate treatment facilities;
- Implement sanitary land filling;
- Promote environmentally friendly products and services; and

5.2.4 Health-care institutions

Wastes arising from health care institutions (hospitals and clinics), especially hazardous waste, that is toxic and infectious, require special consideration. At the point of generation, and along the waste cycle, hazardous waste must be segregated from the non-hazardous waste so as to reduce on the volume of the waste requiring special handling.

Short term targets

In the short term, health care institutions will implement the following:

- Develop and implement acceptable waste management plans and practices;
- Develop and maintain data on waste generated;
- Sensitise all medical health personnel on the procedures of handling waste, especially the hazardous types, emphasising segregation; and
- Incinerate all hazardous healthcare waste.

Medium term targets

In the medium term, health care institutions will implement the following:

- Implement acceptable waste management plans and practices;
- Build treatment and disposal facilities such as incinerators; and
- Comply with relevant legislation and regulations.

Long term targets

In the long term health care institutions will implement the following:

- Implement acceptable waste management plans and practices;
- Commercialise the operations of incinerators; and

5.2.5 Learning and Research Institutions

Learning institutions will provide courses in the curriculum that focus on integrated waste management. Research institutions will identify opportunities and develop appropriate technologies to be used at various stages of the waste cycle.

Short term targets

In the short term, learning and research institutions will:

- Organise training courses and seminars;

Medium term targets

In the medium term, learning and research institutions should implement the following:

- Introduction of waste management in the school curriculum
- Provide training and research related to waste management
- Introduce curricular to incorporate waste management
- Undertake research in tailor-made technologies such as, collection/transportation implements and tools for waste handling.
- Undertake research.

Long term targets

- Research on environmentally friendly packaging materials and waste treatment methods

5.2.6 Non Governmental Organisations/CBOs

Short-, medium and long term targets

In the ***short- to-long term***, NGOs will implement the following:

- Assist in the dissemination of information to increase awareness and participation;
- Promote education and training;
- Influence policy through appropriate advice; and
- Mobilise resources and expand collection service in peri-urban areas
- Advocacy on waste management

5.2.7 The Public/Community

The public must be well informed on key issues, and how they can actively participate in national waste management.

Short, medium and long term targets

In the short- to-long term, the public must participate by undertaking the following:

- Desist from littering and dumping in undesignated areas;
- Support and participate in the Anti Litter Campaign
- Co-operate with service providers by paying for services.
- Apply peer group pressure

These targets will be achieved using the SWOT analysis as shown in Appendices I.

6.0 Monitoring and Evaluation

Monitoring

Regular monitoring will be instituted to check on the progress in the implementation of the strategy.

- Industry will monitor their activities by themselves through internal audits etc.
- Government through ECZ will monitor activities of industry through EMPs and external audits.

Evaluation

The evaluation of the NSWMS will focus on assessing the progress of implementing the required improvements, and how far the objectives are being achieved through government and Public sector as well as community involvement.

These improvements will be in the areas of producer responsibility, investments, service provision, public awareness and cost recovery. This review will be undertaken periodically, every 4-5 years.

7.0 Implementation of the Strategy

MTENR through ECZ will spearhead and coordinate the implementation of the strategy in collaboration with MLGH and other relevant stakeholders such as institutions of learning and NGOs. The Launch will be done by Environmental Council of Zambia who will ensure that the strategy is implemented. The implementation will include development of specific work plans from the broader targets provided within this Strategy and also taking into consideration the time frames.

References

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- 19 UNEP (1992) Basel Convention on the Control of Transboundary Movement of Hazardous Waste
- 20 World Bank (1990), Investments in Solid Waste Management: Opportunities for Environmental Improvement
- 21 Mbewe R & Mundia Y (2002) National Study on Health Care Waste, Ministry of Health/CBoH, Lusaka

APPENDICES

Appendix 1: SWOT analysis of stakeholders in waste management

Stakeholder	Strengths	Weaknesses	Opportunities	Threats
Government*	<ul style="list-style-type: none"> • Legal framework available (make bye-laws) • Possibility for donor support • Qualified expertise at central Govt level 	<ul style="list-style-type: none"> • Duplication of responsibilities • Inadequate enforcement capacity • Inadequate revenue • Inadequate legislation • Inadequate resource infrastructure • Slow in providing information • Inadequate plans in place • Inadequate trained workers at local Govt level • Inadequate bye-laws • Poor work culture 	<ul style="list-style-type: none"> • Political support • Raise the profile of waste management • Infrastructure development • Private-public Partnership 	<ul style="list-style-type: none"> • Lack of co-ordination and consultation • Lack of political will • Inadequate re-investment and capitalisation
Commerce and Industry Private Sector	<ul style="list-style-type: none"> • Have expertise, experiences, resources • Have resources to collect and dispose 	<ul style="list-style-type: none"> • Lack of management commitment • Insufficient/lack of environmental management plans • Lack of co-ordination among themselves 	<ul style="list-style-type: none"> • Formation of industrial association on waste • Invest in waste management services • Adoption of CP 	<ul style="list-style-type: none"> • Inadequate investment • Inadequate consultation among themselves • Lack of Government Incentives • Inhibiting bank rates
Non-Government organisations.	<ul style="list-style-type: none"> • Lobbying capacity 	<ul style="list-style-type: none"> • Duplication • Competition among themselves 	<ul style="list-style-type: none"> • Able to encourage community involvement 	<ul style="list-style-type: none"> • Dictation by source of funding
Learning and research institutions.	<ul style="list-style-type: none"> • Well organised • Have expertise 	<ul style="list-style-type: none"> • Absence of waste management programmes • Lack of resources 	<ul style="list-style-type: none"> • Wide coverage • Participate in research in appropriate technology 	<ul style="list-style-type: none"> • Low participation • Lack of job opportunities

Stakeholder	Strengths	Weaknesses	Opportunities	Threats
Co-operating Partners	<ul style="list-style-type: none"> • Have resources • Able to influence Government decision 	<ul style="list-style-type: none"> • Dictation of resource use 	<ul style="list-style-type: none"> • Support capital investments 	<ul style="list-style-type: none"> • Disruption of project continuation • Change in Government and foreign policy
The Public	<ul style="list-style-type: none"> • Easily mobilised and motivated 	<ul style="list-style-type: none"> • Lack awareness • Poor Attitude 	<ul style="list-style-type: none"> • Participation in waste management programs 	<ul style="list-style-type: none"> • Politicisation of activities • Easily taken advantage of due to low education capacity and high poverty

*Health, Environment, Local Government and Housing, Commerce Trade and Industry, Labour and Social Security, Lands

Appendix 2: Tables referred to in the Document

A: Table showing Estimated Total Quantity of Waste Generated per Year (for 1996 in Lusaka)

Category of Waste	Estimated Quantities (tons/year)	As a Percentage of the Total Waste Generated
(a) Domestic:		
• High Density	169 143	69.5%
• Medium Density	36 493	15.0%
• Low Density	13 678	5.6%
(b) Trade and Industry:		
• Hotels	1 392	0.6%
• Markets	11 783	4.8%
• Industry, Commerce	5 559	2.3%
(c) Others:		
• Hospitals	5 281	2.2%
Total	243 329	100,0%

Source: Lusaka Master Plan Diagnosis Report 1997

B: Table showing Number of Licensed Transporters of Waste and Operators of Waste Disposal Sites (Hazardous and Non Hazardous) from 1994 -2003

Year	Number of licensed Solid waste transporters	Number of licensed disposal sites	Hazardous Waste Transporters	Hazardous Waste Disposal Sites/Generation /Storage/ Treatment	Total number of licences issued
1994	43	18	-	-	61
1995	78	56	-	-	134
1996	54	68	-	-	122
1997	86	100	-	-	186
1998	62	62	--	-	124
1999	88	67	-	-	155
2000	102	65	-	-	167
2001	127	103	-	-	230
2002	131	92	06	05	234
2003	111	106	06	14	237

Source: ECZ unpublished

C: Table showing Estimated daily health care waste generation levels

Name of site visited	Level of institution	Number of beds	Total waste generated in kg/patient/day		
			Healthcare waste	Household waste	Total waste
University Teaching Hospital	National reference	1,905	952.5	3,810	4,762.5
Kitwe Central Hospital	Level III	643	321.5	1,286	1,607.5
Arthur Davison General Hospital	Level II	250	125	500	625
Solwezi General Hospital	Level II	303	151.5	606	757.5
Livingstone General Hospital	Level II	501	250.5	1,002	1,252.5
Liteta Leprosarium	Level I	147	73.5	294	367.5
Mazabuka District Hospital	Level I	196	98	392	490
Yeta District Hospital	Level I	121	60.5	242	302.5
Mwandi Mission Hospital	Level I	86	43	172	2,150
Kalomo District Hospital	Level I	57	28.5	114	142.5
Chipata Clinic	Urban Health Centre	57	11.4	114	125.4
Mutanda	Rural Health Centre	40	8	80	88
Mutanda Research	Rural Health Centre	1	0.2	2	2.2
Kazungula	Rural Health Centre	4	0.8	8	8.8
Monze Clinic	Urban Health Centre	0	N/A	N/A	N/A
St. John's Medical Centre	Private Hospital	10	2	20	22
Total		4,321	2,126.9	8,642	10,768.9

Source: Mundia & Mbewe 2003

D: Table showing Active Tailings Disposal Facilities

Mine	Tailings Dam	Monthly Deposition Dry Tonnes x10 ⁶	Deposition (Dry Tonnes x10 ⁶)	Final Storage Capacity Dry Tonnes x10 ⁶	Final Dam Wall Height (metres)
Nchanga	Muntimpa	1.300	167	781	84
Konkola	Lubengele	0.180	53	500	54
Mufulira	TD11	0.260	26	100	34
Luanshya	Musi	0.230	95	150	47
Nkana	Mindola 15A	0.245	76	181	32
Chambishi	Musakashi	0.017	0.406	15	28
Bwana Mkubwa	Bwana Mkubwa	0.585	17.55	35.1	2.5
Nampundwe	Namuundwe (TD1/21)	0.16	-	-	6-10

E: Table showing Waste Categories and their Constituents

Category	Example
Paper and Cardboard	Newspaper, cardboard, tetra pack, office paper, tissues, coated paper, soap packets, etc.
Ferrous	Cans, containers, etc.
Non ferrous	Aluminium foil, beverages cans, bags, etc
Plastics	Food containers, plastic foil, bottles, plastic bags, etc.
Glass (Clear/ Coloured)	Bottles, pots, etc.
Rags	Textiles, clothes, etc.
Putrescibles	Fruit skins, vegetable peelings, miscellaneous, food refuse, bones, leaves, etc.
Toxic Waste	Pesticides, expired chemicals and infectious wastes (medical waste)
Mine waste	Tailings, waste rock, smelter slag and overburden dumps
Other Wastes	Waste oil compounds containing heavy metals, wood, rubber, soil, leather, ashes, ceramics, sewer sludge etc.

Source: ECZ/LCC 1998, Lusaka Master Plan

F: Table showing Information on waste management for some Copperbelt-mining towns

Town	No. of households	Estimated SW generation in tons per year	Annual SW in disposal site in m ³	Annual area for SW disposal in m ²
Chililabombwe	5528	5,720	15,717	5,239
Chingola	7783	10,620	29,195	9,732
Kitwe	10,572	15,140	41,621	13,874
Luanshya	9281	14,560	40,043	13,348
Mufulira	9678	18,060	49,671	16,557
Total	42,842	64,100	176,246	58,749

Source: AHC-MMS (Unpublished)

Appendix 3: Definitions and Terms

Disposal sites	Means the land or water area on which waste disposal facilities are physically located or area where waste is placed into or on the land and is designed to permanently contain the waste and prevent the release of harmful pollutants to the environment
Recycling	is a process by which materials otherwise destined for disposal are collected, reprocessed or remanufactured and reused or is defined as the process whereby recyclable material (e.g. glass, metal, plastic, paper) is diverted from the waste stream in order to be remanufactured into a new product or is used as a raw material substitute
Sanitary landfill	solid waste disposal site where waste is spread in layers, compacted and covered with soil or other cover materials each day to minimize pest, aesthetic, disease, air pollution and water pollution problems.
Source reduction	design, manufacture, acquisition and reuse of materials so as to minimize the quantity and/or toxicity of waste produced. Waste is eliminated by redesigning products or by a process by which the generation of waste should be minimized in terms of its quantity and its potential to cause pollution.
Source control	any activity classified under source reduction with the notable exception of the product substitution.
Treatment	is a process that changes the physical, chemical or biological character of a waste to make it less of an environmental threat. Treatment can neutralise the waste, recover energy or material resources from a waste, render the waste less hazardous or make the waste safer to transport, store, or dispose of
Volume reduction	the processing of waste materials so as to decrease the amount of space the materials occupy, usually by compacting or shredding (mechanical), incineration (thermal) or composting (biological)
Waste Minimisation:	the reduction, to the extent feasible of the waste generated or for the case of hazardous waste subsequently treated, stored, or disposed. It includes any source reduction or recycling activity undertaken by the generator.