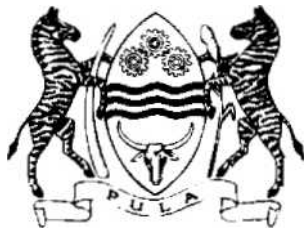

REPUBLIC OF BOTSWANA

BOTSWANA'S

STRATEGY FOR

WASTE MANAGEMENT

First Edition, 1998

Printed by the Government Printer, Gaborone

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WASTE MANAGEMENT

lost Edition, I

FOREWORD

As part of its commitment to implement the aims and objectives of Agenda 21, the Government of Botswana defined and established the strategy for managing wastes. Some of the important environmental consequences perceived and identified as key factors leading to the formulation of this strategy are associated with the increasing magnitude of waste caused by the high rate of industrialisation in Botswana, the changing lifestyles and consumer habits but most importantly the "throw away" mentality associated with the adage "out of site, out of mind." Consistent, therefore, with the Agenda 21 philosophy Government formulated this strategy to ensure the sustainable and the environmentally sound management of waste which would guarantee to a significant extent the following:

- Preservation, protection and improvement of the quality of the environment
- Contribution towards the protection of human health
- Ensuring prudent and rational utilisation of the natural resources

The strategy is proactive and will incorporate various principles which will make its implementation both feasible and achievable. The fundamental principles embodied in this strategy include the **Principle of Prevention** whose basic premise is to minimise environmental pollution by introducing appropriate management measures before damage occurs; the Polluter pays Principle which allocates the costs of preventing, eliminating or compensating for damage to the environment to the party responsible; and the Principle of Co-operation which seeks to foster neighbourliness and co-operation among all social groups in the resolution of environmental problems. In addition the strategy has adopted the internationally acceptable **Waste Management Hierarchy** predicated on Waste Reduction, Reuse and Recycling. This strategy calls, for. technology initiatives inkeeping with Botswana's economic ability to transform waste into useful bye products, or effective attenuation of hazardous forms of waste before disposal.

The objectives, therefore, of this strategy are numerous but the most important include the following:

- Minimising and reducing wastes in industry, commerce and private households
- Maximising environmentally sound waste reuse and recycling
- Promoting environmentally sound waste collection, treatment, and disposal.

In drawing up this strategy Government introduces management mechanisms and a conceptual framework considered vital for its implementation, particularly the regulatory requirements, the planning demands, the market based economic philosophy, the information and communications programmes. The Waste Management Act will strengthen and support implementation of this strategy since waste management is legislation driven and legislation is ineffective without enforcement.

This strategy reviews treatment options of various waste streams, it also considers waste as an economic good, and identifies waste as a source of raw material for other beneficial uses. Its effective implementation guarantees a conservative use of existing stocks of natural resources necessary in the economic production cycle. Most importantly the strategy consigns waste which cannot be reused or recycled to the environmentally sound and adequately engineered disposal facilities. Execution of this requirement would ensure avoidance of environmental costs and financial burden which future generations may have to carry.

Consultation on this strategy has been extremely intensive and reiterative deliberately so to expose its utility, to critique its application to Botswana, and most importantly to pre-test it. The strategy has therefore been presented before interested and affected parties, to the majority of concerned stake holders and in the main stream to those who will be responsible for its implementation. The strategy is actionable, it will, however, require an infrastructure network for the collection, storage, and transportation of waste to designated reuse and disposal sites. It introduces cleaner production concepts in its advocacy for waste minimisation. Clear evidence shows that if this strategy is effectively implemented, Botswana will maintain its pristine and healthy environmental condition to be enjoyed by future generations.

This strategy is an abridged edition of the Resource document available within the National Conservation Strategy Coordinating Agency which explains, in greater details how recommendation Within to strategy were derived and the philosophy behind resources conservation and recovery.

Finally without valuable inputs from all interested and affected parties, particularly Mr. Nick Crick of Integrated Skills Limited (United Kingdom), the Environmental Health Officers, the National Landboards, the Botswana As

sociation of Local Authorities, the Natural Resources Board of the National Conservation Strategy Co-ordinating Agency, the Environmental Science Department of the University of Botswana, Local Authorities both Urban and Rural, this strategy could not have received the national ownership it now enjoys.

Dr. M. N. Nasha
Minister of Local Government, Lands, and Housing

Gaborone
March 1998

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LIST OF ABBREVIATIONS

ACRA	Aluminium Can Recycling Association
BCL	Bangwato Concessions Limited
BDF	Botswana Defence Force
BMC	Botswana Meat Commission
BORE	Botswana Oil Recovery for Energy
BPEO	Best Practicable Environmental Option
C&D	Construction and Demolition
CTO	Central Transport Organisation
DSWM	Department of Sanitation and Waste Management
EIA	Environmental Impact Assessment
ELMS	Environmental and Land Management Sector
FAP	Financial Assistance Policy
GOB	Government of Botswana
MLGLH	Ministry of Local Government, Lands and Housing
MMEWA	Ministry of Minerals, Energy and Water Affairs
MOH	Ministry of Health
MSW	Municipal Solid Waste
MWTC	Ministry of Works, Transport and Communication
NDP 8	National Development Plan No 8 (1997/8 - 2002/3)
NGO	Non Governmental Organisation
NIMBY	Not In My Back Yard
RSA	Republic of South Africa
SADC	Southern African Development Community
SMI UB	Small and Medium Industry University of Botswana
USA	United States of America
WMF	Waste Management Facility

1. Introduction

At the 1992 Earth Summit in Rio de Janeiro, Agenda 21, an international programme of action for the next century, was agreed upon. Agenda 21 called for sustainable and environmentally sound development in all countries:

- To preserve, protect and improve the quality of the environment
- To contribute towards protecting human health
- To ensure a prudent and rational utilisation of natural resources

The way in which waste is managed is one of the key factors which can have an impact on the environment. Sustainable waste management may be defined as that which meets the needs of the present without compromising the ability of future generations to meet their own needs.

In general terms, waste management in Botswana at present is inadequate. Botswana is a semi-arid country, with scarce supplies of water. The protection of these invaluable resources is vital to the continuing health and prosperity of the country. The current practice of uncontrolled dumping of wastes will inevitably lead to the deterioration of drinking water quality and may also contribute to toxic substances entering the food chain and to the spread of infectious diseases.

For this reason, the Government of Botswana has decided to draw up a comprehensive Strategy for Waste Management. In preparing its strategy, the Government has made use of an ongoing technical co-operation project on waste management with the Federal Republic of Germany.

This document is intended to provide the reader with an overview of the principal elements of the strategy and their rationale. It explains the nature and quantities of waste, its consequences, the options for its management and the need for a strategy. It then describes in short the strategy which the Government has adopted.

2. What is waste?

Waste, in simple terms, is anything which is no longer useful and needs to be got rid of. It is defined by the type of place in which it is produced - household, industrial, mining, agricultural etc. Waste is also divided into two categories: non-hazardous and hazardous. Hazardous waste is waste which has the potential, even in low concentrations, to have a significant effect on public health or the environment because of its chemical or physical characteristics. It includes chemical wastes, clinical wastes, asbestos and other dangerous materials.

It is a well-known law of physics that matter cannot be created or destroyed. We can change its physical (solid, liquid or gas) or chemical form, but we cannot make it disappear. If we throw something away:

- It may be burned, but gases, ashes and heat are produced.
- It may be chemically or physically treated to reduce its harmfulness.
- It may be buried (landfilled) so that it is decomposed by bacteria, but that still leaves the rotted materials and produces gases.
- It may be left where it is.

In any event, it does not disappear.

In many countries, people do not distinguish between waste and litter. Litter is only a very small part of the total amount of waste. It is waste which has been unthinkingly thrown away in places other than official disposal sites and is just one example of the mismanagement of waste. It is ugly and can sometimes cause injury to people and animals, but is not generally a long term threat to health or the environment and is relatively easy, although expensive, to remove.

3. What problems does waste cause?

Waste, if incorrectly deposited, may not cause an immediate problem but, with time, may create more serious results such as water contamination, which may be extremely difficult and expensive to rectify. Its impact is long-term and may take decades to appear. This is why waste is often called an "ecological time-bomb".

Waste can be properly managed, in which case it will cause hardly any harm - to human health or to the environment - or it may be mismanaged, in which case it can cause serious problems. For example:

- Waste from hospitals can cause injury, infection and death, either by inadequate disposal at poorly controlled dump sites or by inadequate incineration or open burning, which may release dangerous compounds to the environment.
- Waste chemicals from factories can contaminate water and make it unfit for drinking or other use. There are even waste chemicals which are poisonous at a concentration of less than one part per million. Furthermore certain waste chemicals are bio-accumulative, i.e. they are concentrated through the food chain until their originally very low concentration is increased to reach harmful and even lethal proportions.
- Waste from households, if deposited in. unsuitable places, can also seriously contaminate water.
- Poorly controlled waste disposal sites present a risk of injury to those who work there or who may enter the land for any purpose - especially for uncontrolled scavenging.
- Gas generated at disposal sites can cause explosions and deaths.
- Waste oils from, for example, the transport sector can lead to serious pollution of ground and surface water, - one litre of oil can contaminate one million litres of water.
- Many household and industrial products, such as cars and consumer durables, contain harmful chemicals. These may cause contamination and little is known about their interaction with each other, especially in disposal sites.

In Botswana, many of the official disposal sites currently being used are unsuitable and are operated at low standards. Most waste is being poorly managed and therefore presents a risk. Problems of the kind mentioned above, all of which have been experienced elsewhere in the world, could occur in Botswana in the future.

4. How much waste is there in Botswana?

It is always difficult to obtain information about exactly how much waste there is. This is partly because it is human nature to want to ignore something which is no longer useful, so that very little waste is actually measured.

In Botswana, we currently have very little information on quantities of waste. The latest estimates, which are currently far from reliable, indicate that the total amount of solid waste disposed of at landfill sites is around 325,000 tonnes a year, excluding mining wastes. This amounts to about 0.67 kg per person per day (Table 1).

There is only little information about the quantity of hazardous waste in Botswana at the present time. It is known that the amounts are not large. The best estimate is around 1 560 tonnes per year of solid hazardous wastes and around 34 610 m^3 of liquid hazardous wastes.

More detailed estimates have been prepared of some important waste categories. The hazardous proportion of clinical waste is believed to amount to about 2,500 tonnes a year. Oils are used at the rate of 5.6 million litres a year and all ultimately become waste. Scrap metal from motor vehicles amounts to about 20,000 tonnes a year. From the statistics it has been estimated that 90651 tyres went to waste in 1995. Batteries can be divided into two main groups: dry cell batteries (primary and secondary) and primary lead batteries. Almost all the household dry cell batteries (just under 24 million in 1995) are disposed with the domestic waste. It is estimated that about 66000 lead acid batteries are sold in Botswana a year but only 30%, or 20000 batteries, are returned to the manufacturer. Thus, about 70% appear to be disposed to landfills, stored or are dumped indiscriminately into the environment.

5. What happens to Botswana's waste?

In the major cities and towns, such as Gaborone, Francistown and Lobatse, most waste is delivered to the local authority disposal site. It is estimated, however, that in the larger villages, about 60% of households receive a collection service, in the smaller villages, this figure falls to 7% and in rural areas there is no service. On this basis, only 38% of the 250,000 tonnes of household waste are actually delivered to disposal sites and the remainder just " disappears" into the environment.

The collection service itself is acceptable in most parts of the larger cities and towns but not in the low income areas or in the villages and rural areas. In the latter cases, the frequency is intermittent, collection points are far from in

dividual houses and there is a shortage of suitable receptacles. Furthermore, the unreliability of the service leads to it nor being used by the public.

Table 1: Waste Collection Statistics in Botswana *(estimates based on data at May 1996)*

District/Town/City Council	No. of official landfill sites	Estimated population (CSO 1991)	Estimated Waste Disposed (m^3/a)	m^3/ p/ ann.	Estimated Waste Disposed (t/a)	kg/ p/ d
Gaborone**	1	133 468	756 750	5.7	151 383	3.1
Lobatse	1	26 052	92 080	3.5	11 160	1.2
Francistown	1	65 244	66 750	1.0	20 025	0.8
Selebi-Phikwe	1	39 772	101 400	2.5	8 055	0.6
Orapa***	1	12 000	20 620	1.7	12 038	1.0
Jwaneng	1	11 188	2 610 ?	0.2	652	0.2
Sowa***	1	2 228	10 400	4.7	1 337	1.6
Central District*	±70	412 695	111 428	0.27	24 761	0.2
Ghanzi District*	3	24 191	20 714	0.9	5 178	0.6
Kgalagadi District*	16	30 946	7 336	0.24	1 856	0.2
Kgatleng District*	2	56 770	45 812	0.8	3 120	0.2
Kweneng District*	4	166 901	83 451	0.5	10 014	0.2
North East District*	2	43 354	14 000	0.3	3 500	0.2
North West District*	8	109 362	23 000	0.2	5 750	0.1
South East District*	3	43 584	14 242	0.3	3 560	0.2
Southern*	12	146 779	14 376	0.1	8 036	0.15
Total	**±127**	**1 321 361**	**1 384 969**	**1.05**	**323 091**	**0.67**

Note: * The figures are lower in the districts and rural areas because the percentage of the population receiving a refuse collection service is often very low

** Gaborone statistics are not fully comparable as 67% of the incoming refuse is rubble and soil cover. If this was excluded the waste figures would appear as:

631 456 m^3/a (= 4.7 m^3/p/a), and 41 167 t/a (= 0.85 kg/p/d)

*** Orapa and Sowa include amounts of industrial waste from the mines thus distorting the figures

Collected wastes are currently dumped at Local Authority disposal sites. These are generally poorly controlled, not managed to an adequate standard and require to be rehabilitated at the end of their life to ensure protection of the environment. The sites are often not fenced and uncontrolled burning is common, as is informal scavenging.

Clinical wastes are not safely segregated or stored and are either burnt in poorly operated incinerators, which produce unacceptable smoke and fumes or are dumped or burnt in completely uncontrolled conditions.

Although there are few examples of companies undertaking the physical process of recycling a material to produce a new product in Botswana, there are a number of sorting and salvaging operations to collect waste which can be sold to recycling companies in neighbouring countries.

Some recovery initiatives have been observed, notably the "Collect-a-can" scheme. It is estimated that of the 200 million beverage cans imported annually, up to 50% were collected and transported to the Republic of South Africa (RSA) in 1995. "Collect-a-can" hopes to collect 80% by the end of 1996 which would mean that a substantial amount of beverage and food packaging would be recycled. Returnable bottles have recently been reintroduced for beverages. Experience to date shows that about 70% are actually returned with the remainder getting lost. Scrap metal is collected but high transport costs to processing facilities in Zimbabwe or the RSA limit this activity. Some oil companies are reported to be considering an initiative for the return of waste oil but at present most "simply

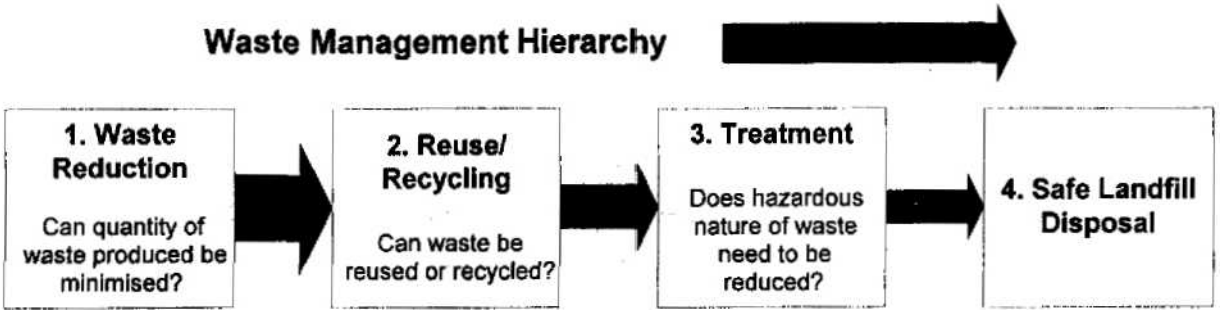
disappears". Waste paper and small amounts of plastic is collected in some towns, notably in Gaborone, Selebi Phikwe and Francistown. More waste paper could be transported to Zimbabwe and the RSA for recycling if it is more effectively sorted at source and if transport costs, especially with the Botswana Railways, were more affordable.

6. What can we do about waste?

6.1 The Waste **management Hierarchy**

Whilst we know of no way of eliminating waste production entirely, we can certainly make our waste production and management more sustainable. To do this, we must first reduce the amount of waste we produce. Secondly, we must make the best use of the waste that is produced and finally we must choose waste management practices which minimise the risks of harm to the environment and human health. This has frequently been expressed in terms of the Waste Management Hierarchy, which is shown in Figure 1.

Figure 1



The Government is convinced that this hierarchy is a valid basis for waste management in the long term. But, with the currently limited human and financial resources, first steps to improve the waste management situation must consider the specific risks and weigh them against the costs, which are often high, in order to establish a set of priorities.

6.2 Prevention and minimisation

Preventing waste from being produced is clearly the first goal. Waste minimisation, however, is not a simple technique which can be applied universally. It is an attitude of mind and requires commitment from all sectors of society.

Waste minimisation is first of all a technique for industry. Much can be achieved by good housekeeping and materials management within the factory - with little or no investment and probable cost savings. The other techniques which may be used involve more fundamental change - in input materials, product design and process changes. The success of any such waste minimisation scheme will depend, however, on the commitment of management, particularly senior management, to the goals set.

In the household, there are also some opportunities. For example, care should be taken, when purchasing goods, that appropriate amounts and sizes are chosen. Buying large tins of paint to do a small decorating job, or buying larger amounts of food than can be consumed while fresh, are two examples of unnecessary waste creation. Individuals can reduce the amount of waste they create by buying less, by buying longer-life products, and by re-using items: empty tins and jars make good storage, yoghurt pots are ideal for seedlings, magazines once read can be passed to neighbours and friends. Mending broken or worn items of clothing or equipment has a further important contribution to make. It is wasteful to demand new clothes and new furnishings simply to follow fashion trends when the current articles still have useful life left in them.

6.3 Recycling and reuse

The important thing to recognise about recycling is that materials can be collected, but they are only recycled when they are actually reused - with or without some form of processing. There have been many examples throughout the world of materials being collected for recycling but never finding a use because no demand exists for them.

Recycling of industrial wastes is generally easier than from household waste. The materials are less diverse, often less contaminated and their composition is more predictable. Separation of materials at source, whether in industry or the home, also makes the process of recovery and recycling easier.

Recycling is a function of the economy. It is founded on the basic law of supply and demand. Recycled materials are of great economic importance. They are frequently less costly and more readily available than primary materials, and play a competitive role in keeping the price of those primary materials within manageable limits. They conserve world resources of both finite and renewable materials. They often reduce pollution and divert materials that would increase the burden of disposal from the waste stream. Furthermore, there are some costs incurred if recycling is not undertaken such as litter control, medical costs of personal injury and the impact on the tourist industry.
In the case of Botswana, it is unlikely that there will be sufficient quantities of most types of waste for recycling to be economic, but the RSA market is likely to be able to absorb Botswana's reclaimed material, provided that it is not produced excessively and also that the RSA does not embark on a massive reclamation programme of its own.

6.4 Life Cycle Management

Life Cycle Management is a wider concept than both waste minimisation and recycling, although it incorporates both of these issues. It is based on the principle that, in order to minimise the adverse environmental impact of the manufacture and use of manufactured products, it is necessary to manage what happens to the physical resources (i.e. materials and energy) of which such goods are made throughout the life of the product and beyond, i.e. over the five stages in the product's life - manufacture, distribution, use, reuse and final discard.

6.5 Legislation

Whilst public awareness programmes can improve the attitude to responsible waste management, economic factors will always have a strong influence on the processes and practices that are selected, particularly by the waste management industry - in both the public and private sectors. Producers of waste simply want their waste taken away - "out of sight, out of mind". Managing waste properly, however, costs money. Despite the dangers, which have been described, so long as the waste producer, whether householder or factory owner, does not see that his waste has a direct impact on his own health or lifestyle, he will have little incentive to spend significant amounts of money on its proper management.

Environmental standards can therefore only be achieved through legislation. Without legislation, the more environmentally responsible industries will find themselves at an economic disadvantage as a result of the additional costs incurred. Legislation by itself, however, is not enough. It must be enforced, which requires sufficient administrative resources being made available.

6.6 Economic incentives

In addition to legislation, some economic incentives can be used to improve the management of wastes. These include voluntary self-commitments by industry, deposit refund schemes on packaging, subsidy schemes, "eco-labelling" - in which the environmental characteristics of consumer products are described or given a `seal of approval' - and waste charges, whereby waste producers are charged or taxed on the basis of their waste production.

The most important economic incentive, however, is the introduction of user charges, whereby the user of a waste management service pays the appropriate cost. This enables the Polluter Pays Principle - an important concept which is internationally accepted - to be adopted. The costs, of course, must be known if this is to be implemented. At present, the costs of waste management are not well understood, because the local authorities that provide the service do not operate a "transparent" accounting system, whereby all the costs are actually identified and allocated.

6.7 Waste management facilities

This section has so far discussed ways of preventing, recycling and controlling waste. If waste is produced, something must be done with it - it must be treated and disposed of.

6.7.1 Treatment for hazardous wastes

Hazardous wastes should be treated, chemically, physically or biologically, to prepare them so that they may be deposited or discharged without harm to the environment. There are a range of processes available, which depend on the nature of the particular waste stream. The technologies are relatively complex and need specific expertise.

6.7.2 Incineration

Incineration is one process which can be used for many hazardous wastes and also for some non-hazardous wastes, such as household waste. It is, however, very expensive, if it is done properly and, if it is not, it can produce harmful substances which may cause air pollution. With the exception of clinical wastes, incineration is not a sensible or affordable solution for waste management in Botswana at the present time and the small quantities of hazardous waste for which it is the only solution will be best exported to a country with a larger industrial base which can afford to provide such facilities. For clinical wastes, the existing incinerators are poorly managed and may require upgrading.

6.7.3 Final disposal - landfill

Landfill sites are a central and essential component of any waste management concept. Despite active waste prevention and recycling, a residue will always remain which requires final disposal.

Furthermore landfill, if carried out properly, is an environmentally acceptable and low cost solution for the disposal of a wide range of wastes, including household waste which makes up the largest part of the waste produced in Botswana. Some countries oppose landfill because land availability is at a premium. Botswana has a low population density and, in relative terms, this is not a problem. Landfill will therefore be the most widely employed method of waste disposal for the foreseeable future.

The important objective is to ensure that landfill is carried out in such a manner that it does not cause harm to the environment. This can be done by ensuring that landfills are located, designed, constructed, operated and rehabilitated so as to ensure that ground and surface waters are not contaminated.

7. Why do we need a strategy?

It can be seen that the current waste management situation in Botswana is far from perfect and that the solutions which need to be introduced are complex. There are a wide range of options, of varying economic cost, which cannot be allowed to develop in a piecemeal fashion. Furthermore, the environmental costs of bad waste management practice are not "internalised", that is to say they are borne by society as a whole, rather than by those who create the environmental damage. Botswana needs a solution which is at the same time environmentally acceptable and also affordable - against the constraints of limited financial and trained manpower resources.

For these reasons, as many other countries have already decided, Botswana needs a national waste management strategy, so that the maximum impact can be achieved at minimum cost.

8. What are the elements of a strategy?

Many people think that a waste management strategy consist of simply presenting proposals for the construction and operation of waste management facilities. In *fact,* it is much more than this. It needs to consider the entire process of gathering and assessing information on wastes and their management, setting objectives, determining legislative, economic and organisational requirements and communicating the appropriate information to the public. An integrated strategy should include the following topics:

- Nature of wastes, waste arising and current treatment and disposal methods
- Determination of priorities for improvement
- Legislation and regulation
- Organisational arrangements
- Waste minimisation and recycling
- Waste treatment and disposal techniques
- Economic and financing considerations
- Public awareness, education and communication

9. The key action points of the strategy

This section describes the key action points of Botswana's waste management strategy.

9.1 Strategic Statement

The Strategy is based on three cardinal objectives:

- Protection of **human health**
- Protection of the environment (water, air, soil, biodiversity)
- Protection of natural **resources -** land, raw materials and energy

In addition, a fundamental tenet is the internationally accepted Waste Management Hierarchy. **9.2**

Measures to be taken

The most important **measures,** according to their order of priority, are:

- **Training** of waste managers
- Provision and control of **landfills** to acceptable standards
- Control of litter
- Control of waste storage, **collection and transportation** to acceptable standards
- Control of **industrial** wastes and their disposal
- Control of private sector waste management activities
- **Recycling** of selected waste streams
- Enforcing the **Basel Convention**

Lower priority measures (to be addressed in the near future) are:

- Waste **minimisation**
- Control of **packaging**
- **Return of goods** to manufacturers
- **Energy** recovery

The above listed measures will be achieved through

- Development and provision of training courses
- Enactment of appropriate legislation
- Creation of a **Department of Sanitation and** Waste Management (DSWM) within the Ministry of Local Government, Lands and Housing
- Necessary **financing** through the national budget and user charges
- Assistance to **local authorities** to strengthen and restructure their waste management function
- Implementing public awareness campaigns
- **Education**

9.3 General Measures

9.3.1 Implementation of the Strategy

This Strategy was subject of extensive consultation before approval by Government and will continue so during its time of implementation. The DSWM (see section 9.3.3) will have overall responsibility for its co-ordination. A timetable of activities will be produced.

The Strategy is broadly defined as follows:

Waste management in Botswana will be undertaken in a manner which adequately protects human health and the environment consistent with the affordability and available expertise of the country. It will incorporate the following principles:

=> The **Principle** of Prevention (environmental pollution must be minimised as far as possible and measures should be taken before damage occurs).

'The Polluter **pays Principle** (costs of preventing, eliminating, or compensating for damage to the environment must be borne by the party responsible).

= The **Principle of Co-operation** (Co-operation among all social groups is necessary in order to solve environmental problems).

In addition:

=> The internationally accepted Waste **Management Hierarchy** will be adopted.

=> For any particular type of waste the **Best Practicable Environmental Option (BPEO)** should be established, taking into account the **environmental and eco**nomic costs and benefits of the different waste management options, for which the Hierarchy provides a checklist.

Botswana's waste management objectives therefore consist of:

- Minimising **and reducing wastes in industry,** commerce and private households
- Maximising environmentally sound Waste Reuse/Recycling
- Promoting environmentally sound Waste Collection, Treatment and Disposal

Action:

- The Government of Botswana **(GOB) will, through the DSWM, prepare a timetable of activities and re-**port annually **on progress** made against the timetable.

9.3.2 Waste Legislation

The Government of Botswana will introduce a **Waste Management Act** which will control and regulate waste management.

Action:

- Regulations and Guidelines for the control of wastes will be introduced under the new Waste Management Act and the Government will **ensure** that:

=> **The need for them is generally recognised, understood and supported by the public at large,** z **They**

are capable of being implemented and enforced by a responsible agency, =.-,, **Those subject to them**

have the ability to comply with their requirements.

- **In order to ease the burden and cost, both to producers and regulators, of complying, GOB will phase in the regulations over a reasonable period of time.**

9.3.3 Organisation of Waste Management

There is no one Ministry with overall control of environmental issues. This leads to an uncoordinated approach, with the various departments taking piecemeal actions. The two organisations and ministries responsible for planning, and enforcement of the existing laws (such as they are) are the Ministry of Health (MOH) and Ministry of Minerals, Energy and Water Affairs (MMEWA) together with the environmental health departments at local government level. None of these bodies devote any significant effort to waste management issues.

Execution of the waste management function is carried out by Local Authorities, under the supervision of the Ministry of Local Government, Lands and Housing (MLGLH), together, in certain cases, with the Ministry of Works, Transport and Communication (MWTC) and MOH. Such supervision is, however, minimal at the present time and the local authorities are effectively left to their own devices. Many of them are aware of the problems they face but are constrained by a shortage of funds and expertise. In some cases, they need **additional resources and assistance with the restructuring** of their organisations.

Having established a system of legislation, the clear priority is to ensure that such legislation is adequately and effectively policed and enforced. The GOB has therefore decided to establish **a centrally located Department of Sanitation and Waste Management** (DSWM) within the MLGLH, making the Ministry of Local Government, Lands and Housing the responsible ministry.

The **local authorities** should continue to have **executive responsibility** (indeed a duty) to ensure the **planning and provision** of collection and disposal services for Municipal Solid Waste (MSW) and commercial waste.

Private industry should be encouraged to develop and strengthen its own direct contacts with recycling businesses to improve the reuse and recycling of wastes. GOB believes that it should not intervene in the organisational set up of these links.

Non Governmental Organisations (NGOs) have already contributed to the collection and recycling of wastes. This is a good example of how the increasing awareness of the public can be mobilised into concrete action.

Action:

- **GOB will establish a centralised DSWM to control the overall waste management functions, accompanied by the appropriate organisation at local level to undertake specific work.**
- **Local Authorities will continue to have responsibility - in the form of a duty - to manage MSW. They will be provided with sufficient resources and be assisted to restructure through the DLGSM.**
- **GOB will encourage traditional social self-help structures and private initiatives under the supervision of communal decision-makers to act as an additional important resource specifically for the management of domestic wastes.**
- **GOB believes that waste management should be dealt with in a multi-sectoral and interdisciplinary way. It will harmonise its actions with aspects of health, urban development, watershed management, promotion of industries etc. and therefore request the responsible authorities to liaise and cooperate closely.**

9.3.4 Waste Statistics and Waste Plans

It has been stated many times that improving waste management in Botswana without reliable data is extremely difficult. GOB will therefore require **Local Authorities** to collect waste data and prepare waste management plans on a local basis which will be compiled by the DSWM into a National Waste Management plan. This plan will be updated at regular intervals.

In addition, major commercial, industrial and government establishments as well as clinics, universities and other producers of non-domestic wastes will be approached to collect information about quantities and composition of their non domestic wastes.

Action:

- **GOB will, through the anticipated waste management legislation, require sound planning from local authorities, based on which it will submit a National Waste Management Plan. Such a plan should be available for the first time in 1999, covering the period 2000 to 2005. It will be updated at regular intervals.**
- **GOB will encourage regional planning wherever appropriate. Without compromising the reasonable wishes of the community, the NIMBY (Not In My Back Yard) syndrome should hot be allowed to hamper sensitive solutions.**

9.3.5 Prevention and Minimisation of Wastes

The GOB **will appoint specialists to advise individual** companies on waste minimisation and to provide training courses for company employees. The advice would mainly be required for small and medium-sized enterprises. The large international companies possess their own waste minimisation technology and experience.

Action:

- **GOB will put pressure on international companies to ensure that they operate on similar standards as they do in e.g. the RSA, Western Europe or the United States of America** (USA).
- **GOB will build up links to existing networks in order to provide the necessary information to Botswana Industries, especially Small and Medium Industries (SMIs). Government will set up a fund for corresponding research and technology specifically to assist SMIs.**
- **GOB will appoint and train specialist advisers in waste minimisation and provide regular training courses concentrating mainly on the smaller enterprises.**

Waste minimisation in Botswana is not expected to achieve miracles. Indeed, it is unlikely that waste volumes will be reduced by more than 5%- 10% over the next 10 years and this could easily be offset by increased economic activity.

9.3.6 Recycling and Reuse of Wastes

The Botswana Government **will encourage the development of markets for recycled materials** by ensuring that its procurement policies provide for their maximum economic use. There is also a range of economic incentives and legal instruments that can be applied, although these will need careful investigation to ensure that they are appropriate for the situation in Botswana.

Action:

- **GOB will vigorously promote and encourage the re-use or recycling of waste through:**

  Research and development on re-use and recycling technologies, especially tailored and applicable to Botswana.

  Creating outlets for the products of re-use and recycling, by enforcing the use of recycled products within Government and state-owned companies.

  Optimising collection and sorting systems (selective collection, separation at source).

  Reducing the external costs of re-use and recycling.
- **The resources and instruments for improving the re-use and recycling of waste, together with their respective merits and drawbacks, should be the subject of comparative studies.**
- **This campaign should be accompanied by economic incentives such as deposits on returnable items and taxes.**

- **Studies of other instruments to improve the reuse and recycling of selected waste streams such as waste exchanges, data bases, etc. will also be undertaken**

9.3.7 Life Cycle Management

The concept of Life Cycle Management is a very far reaching concept. Although it seems to be too ambitious and too early to be discussed in Botswana in comparison with other more pressing problems it is worth mentioning in order to create awareness as to which direction our industrial development should move in order to maintain sus**tainability.**

Action:

- **GOB will through its Ministry of Commerce and Industry keep industry informed of the new policies and changes occurring with respect to "ecolabelling" and other environmentally related requirements** in the developed countries. Industry will **be encouraged** to conform **to these requirements.**

9.3.8 Creation and Improvement of Waste Management Facilities (WMFs)

Government of Botswana believes that the technologies for hazardous waste treatment need specific expertise which should be available at the source: the corresponding industries themselves. Smaller industries may need to rely on centralised plants. In some cases wastes may require export when expensive, high technology processes are needed for small volumes of waste.

GOB have already taken the first step towards establishing waste management standards by the introduction of **Guidelines for the Disposal of Waste by Landfill,** which is and will continue to be the major methodology for waste management in Botswana. The Landfill Guidelines are relevant, affordable and specific to Botswana. They are the first in a proposed series of technical guidelines for waste management in Botswana.

To provide the degree of flexibility that is needed, graded standards have been incorporated into the Landfill Guidelines - based on the types and volumes of waste. This effectively categorises the landfill according to its risk of pollution. In this way the standards for landfilling of waste can be improved without incurring excessive costs.

The WMFs that are needed will require substantial capital investment and an increase in operating costs. Whilst every effort will be made to ensure affordability, an adequate budget must be allocated to ensure that these facilities can be provided and sustained.

Action:

- **Government's** role will **be to set the minimum technical standards for necessary treatment of hazardous wastes and closely monitor the facilities, especially their discharges to the sewerage system.**
- **With increasing industrialisation GOB will investigate the necessity for providing centralised treatment plants in Botswana, preferably on a regionalised basis. The latter will require close scrutiny in the import and export data of (hazardous) wastes.**
- **GOB believes that a cement manufacturing plant could provide an opportunity to dispose of certain, mainly hazardous, wastes. Further planning for this plant should therefore incorporate the adaptations and devices required for waste incineration.**
- **GOB strongly recommends that waste practitioners in the country, be they Government, Council or private, start to use the Landfill Guidelines as a basis for the selection, design and construction of any new site and for the upgrading and closure of existing sites until they become legally binding under the new Waste Act.**
- **GOB will identify in the National Development Plan No 8 (NDP 8) a specific budget for waste management which reflects the financial needs of the country to improve the standard of landfilling over the next** ten years (until 2006) in **a** way **that at least 80 % of all landfills meet the minimum requirements and can thus be licensed.**
- **GOB invites the local authorities to plan ahead carefully for their landfill activities and request the necessary funding in good time.**

9.3.9 Environmental Impact Assessment

The main objective of Environmental Impact Assessment (EIA) is to provide decision-makers with informed opinions regarding the environmental consequences of a project, programme or policy prior to its implementation. Legislation requiring MIAs for environmentally sensitive projects is *in* the course of preparation. Waste Management Facilities should be included.

Action:

- **GOB will provide for major WMFs** to be subject to an EIA under the new EIA legislation. In the interim **period GOB will require an EIA to be carried out with any new landfill site or major change of an** existing one when considering its financing.

9.3. 10 Training

As in most countries of the region, there is an extreme shortage of specialists in Botswana with sufficient training and experience in the various disciplines necessary for effective waste management.

Action:

- **GOB** is of the opinion that the importance and image of the waste sector must be enhanced, to attract motivated and experienced staff. Human resources development must therefore receive high priority.
- **GOB** will encourage University **of Botswana (UB), in Co-operation with neighbouring countries, to develop and offer appropriate training courses.**
- ***GOB welcomes*** **the efforts of** the ongoing Waste Management Project to organise additional training dealing with specialised items.
- **GOB** supports the establishment of a standing committee comprising waste management officers from Local Authorities and from Central Government to exchange experience of the implementation of the forthcoming Waste Act and the actions described in this strategy.
- **GOB** will critically review its system ***of*** **transferring the trained officers from one discipline to the other in order to make maximum use of their knowledge and experience, and of transferring** officers to different locations in the country very often, thus preventing continuity.
- **GOB** welcomes the formation of the Botswana Institute of Waste Management as the representation of waste management professionals and will work with **and consult** it **on future developments and strategies.**

9.3.11 Information, Communication and Creation of Public Awareness

Hand-in-hand with the need for training is the need to communicate a range *of* issues and the need for change to the general public and to certain groups with special interests or requirements. The problem is that the objectives of different groups of individuals, be they formal such as organisations or informal such as neighbours or special interest groups, do not always coincide. As a consequence, it *is* usually necessary to cross many human barriers if goals are to be achieved. The purpose of a communications programme is to ease the bridging of these barriers.

Action:

- **GOB** will **launch a structured** communications programme which will inform, educate and generate support for and feedback on the Waste Management Strategy from the general public, especially the young, who will be the opinion formers of the future, together with specific target audiences, **including central and local government departments, environmental interest groups, industrial and** commercial waste producers and local private waste **management companies.**
- **GOB will thereby establish permanent channels for communication and dialogue with key *interest* groups.**

9.3.12 Research and Development

The GOB assigns key importance to research and development of environmental technologies in general and waste reduction and treatment technologies in particular.

Action:

- **GOB** will establish a small programme for research and development projects in waste management and will allocate it a sufficient budget in NDP8. This money will be offered to SMIs, the University and other members of the research community to adapt foreign technologies to Botswana conditions and to develop new ones where necessary.
- **GOB** will invite foreign donor countries to help in this process with their knowledge and expertise.
- In parallel Botswana will willingly share its knowledge with neighbouring (Southern African Development Community (SADC) countries and become a centre for appropriate technology exchange in the region.

9.3.13 Economic Incentives

Economic incentives have an important part to play in developing a system of sustainable waste management. The most important is the implementation of the Polluter Pays Principle, which is addressed in the next section on Cost Recovery.

Action:

- **GOB** will encourage voluntary self-commitment from industry and negotiate targets with respect to quotas for returnable glass beverage containers, recycling quotas for metal cans and other selected wastes, acceptance of returned products and guaranteed recycling and/or disposal of certain products (batteries, waste oil etc.).
- **GOB** will adopt a deposit refund scheme for all types of beverage containers, including imported ones.
- **GOB** will carefully investigate subsidy options in relation to the existing Financial Assistance Policy (FAP). Additional subsidies will only be given for specific improvements in waste management and only for a limited time range.
- **GOB** will offer its Co-operation in developing proposals for the introduction of a SADC eco-labelling scheme. If the RSA, as the most important trading partner, goes ahead with such a scheme, GOB will evaluate methods of extending this scheme into Botswana. GOB will take permits trading into consideration at a later stage.
- **GOB** understands that it will often be difficult or even impossible to evaluate or to predict the effects of economic instruments, but will consider their application on a case-by-case basis.

9.3.14 Requirements for Cost Recovery

Whilst experiencing a growing economy, Botswana cannot be described as an affluent nation. The issue of affordability is therefore an important one. Botswana also has a low population, which results in overall quantities of waste generated being relatively small - leading to limited potential for economies of scale in waste processing. This will have a negative impact on the issue of affordability by resulting in higher unit costs compared with other, more populous countries.

Funding local authorities for waste management projects will be accorded reasonable priority by GOB. These are projects whose social benefits do not deserve to be questioned.

Action:

- **GOB** will request Local Authorities to set up a transparent accounting system for waste management expenditures which will show all the attributable costs, including depreciation of capital.
- **GOB** will encourage Local Authorities to improve the cost-effectiveness of their waste management operations.
- **GOB** will encourage Local Authorities to develop a cost recovery system over time which will enable them to collect at least 50 % of the actual costs during the period of NDP 9.
- **GOB** will link its delegation of authority (to decide on investment in waste management facilities to Local Authorities) to the degree of cost recovery: the higher the cost recovery rate on local level the more independent their decisions.

9.3.15 Abandoned. Sites

Abandoned contaminated sites are former dumps or production sites which are considered, after undertaking an assessment, to present a risk to people, the environment or public safety. There are no uniform criteria for the identification of suspected sites at the present time, nor for determining the objectives and priorities for reclamation measures.

Action:

- **Until such criteria have been developed GOB will carefully follow up any Information about abandoned sites and will deal with their clean-up procedure on a case-by-case basis.**
- **Under the new Waste Act, it will be the responsibility of the Local Authorities to identify such abandoned sites. In future, when enough expertise is available, Local Authorities will have to supervise/carry out the clean-up procedures, whereas the Central Government will decide on the necessary action to be taken.**

9.3.16 Regional and international Co-operation

The Basel Convention

World-wide concern about the transboundary movement and disposal of hazardous wastes was heightened in the late 1970s and early 1980s. The major concern was that wastes were being exported from the industrialised nations for " cheap" disposal in inadequately designed sites in developing countries.

This concern led to the development and implementation of international controls. The outcome was the **Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal,** administered by the United Nations, which came into force in 1992.

Botswana concurs with the aims and objectives of the Basel convention and will apply to become a member of the Convention as soon as the required regulations and measures for implementing the articles of the convention have been instituted.

An essential part of enforcing the Basel Convention is **training.** The Basel Convention has identified regions without-adequate training capacity in order to establish regional/sub-regional centres for training and technology transfer in such regions.

Action:

- **GOB intends to become a signatory to this convention after having instituted the obligatory regulations and measures to implement the articles of the Convention.**
- **GOB will support training initiatives established by the Secretariat of the Basel Convention in the SADC region.**

SADC

It is important to have a generally common regional approach to waste management within SADC member states. GOB foresees the need to pursue the aim of harmonising requirements for waste management within SADC.

Action:

- **GOB will approach SADC to address the waste issue specifically by extending or even reorganising the SADC Environment and Land Management Sector's (ELMS) responsibility.**
- **GOB furthermore suggests adding a fourth distinct programme "Waste Management" to the existing three programmes of "Land Management", "Environment Management" and "Water Resources Management", and volunteers to organise and chair the corresponding technical committee.**

9.4 Strategy for the Management of individual Waste Streams 9.

4.1 Household Waste in General

Public Co-operation is vital if household waste is to be **managed in an** environmentally acceptable manner and the necessary action is taken to minimise and recycle wastes. It is important, however, that the steps which are taken are economically viable.

Action:

- **GOB** will increase public awareness with respect to changing consumer behaviour.
- **GOB** will foster clean-up campaigns and competitions on national level.
- **GOB** in conjunction with the Local Authorities will concentrate on developing and promoting those methods of recovery that do not provide municipalities with additional expense. Initially the feasibility of pilot recycling centres will be investigated.
- **GOB** will encourage controlled scavenging on landfills. 9.

4.2 Packaging

Providing for the disposal of a steadily increasing volume of packaging-based waste is a poor way of conserving scarce resources. Public policy needs to be oriented towards minimising growth in disposable packaging materials.

Legislation and industry self-commitment will be required to ensure the protection of returnable packaging systems and also to maximise the amount of recycling that may be carried out. It is likely that this will also have a significant impact on the enormous litter problem in Botswana.

Action:

- **GOB** will negotiate commitments for recycling ratios for various types of packaging wastes with industry.

9.4.3 Glass

The issue of returnable bottles is one of the easiest to address in the field of ensuring the re-use of packaging.

Action:

- Under the new Waste Act GOB will regulate the deposit for returnable bottles to increase their use wherever viable.
- If the production and import industries do not sufficiently support the concept, GOB will assess the possibility of using legislative tools to enforce it.
- For glass wastes which cannot be re-used GOB will encourage private collectors to set up bottle banks in central areas, as was done in the past, and will intensify its public awareness campaigns to encourage the public to use them.
- Governmental organisations will be asked to order their beverages in returnable bottles wherever possible. They will be required to separate remaining glass wastes at source and dispose of these in bottle banks.

9.4.4 Paper

Despite the lack of a national paper industry, Botswana can derive environmental benefit from paper recycling, Government, as one of the biggest purchasers, can do much to stimulate the market for recycled paper.

Action:

- **GOB** will encourage waste paper collection by private industry and charity organisations.
- **GOB** will introduce waste paper separation at source in Government establishments wherever major amounts of waste paper occur. Confidential papers will not be burned at landfill sites but shredded and recycled.
- A major effort should be undertaken in order to create a market for recycled paper in Botswana. Government will phase in the use of 100 % recycled paper for all types of paper over the next 5 years. Government reports will be printed on recycled paper as well.
- **GOB** will require its parastatals and government-owned companies to do the same and report biannually about the progress they have made.

9.4.5 Plastics

The recycling of plastics is more difficult than for most of the other materials which have been discussed.

Action:

- **GOB will carry out a study to collect information about the amounts of recyclable plastics available, the appropriate recycling technologies for the country and the products which could be produced at reasonable costs.**
- **Based on the findings of this study GOB will encourage** SMIs to enter into this field by **providing them with technical expertise. Furthermore it will evaluate opportunities to purchase recycled plastic products for its own general use.**

9.4.6 Cans

GOB welcomes the private initiatives by Collect-a-Can and the Aluminium Can Recycling Association (ACRA). It should be recognised, however, that the driving forces behind these activities are to secure the steel (or aluminium) industry's market shares in the packaging industry. Without such initiatives, consumers might turn against cans or Government might be forced to restrict or ban the cans. It is possible that Collect-a-Can's targets are unachievable without increasing the price paid.

GOB considers the use of returnable bottles for beverages as a favourable alternative over cans. Nevertheless, cans may have some advantages in certain circumstances.

Action:

- **GOB** will invite the can recycling industry **voluntarily to commit** themselves to **a** certain can recovery rate in order to stabilise can recycling **at a high level** in the **country.**
- **GOB will encourage SMIs to provide for the collection and recycling of non-beverage cans.**
- **The issue of subsidising the price paid for recovered cans will be investigated, in terms of cost and** likely benefits.

9.4.7 Hazardous Wastes

Oil containing Wastes

The major problem is to obtain used oil before it gets lost to the environment. An oil recovery rate of 50% of oil sales should be the short term target increasing to more than 60% in the medium to long term. To this end the oil industry should set up the BORE Scheme **(Botswana** Oil Recovery for Energy) in order to raise funds, manage and promote collection, transport and reclamation of used oil.

Action:

- **GOB** will **negotiate with the oil industry for the setting up of** a **BORE scheme.**
- **GOB will require major oil users to collect their used oils in proper depots.**
- As **a short term measure, GOB will require that major oil users and councils should empty their used oil tanks via existing outlets (send them to the RSA for combustion/treatment) before they overflow.**
- **GOB will encourage major fuel consuming industries in Botswana to substitute part of their fuel with used oil. In parallel GOB will carry out a research programme in order to minimise the environmental impact associated with this change of fuel.**
- **GOB will include the oil issue in its public awareness campaigns.**
- **GOB will encourage garages to accept waste oil from private individuals.**

Waste Solvents

Although not handled in an environmentally sound manner, solvents are not high on the GOB's priority list because of their comparatively small quantities. GOB therefore favours approaching this problem at a later point in time.

Action:

- **GOB will consider including the incineration of spent solvents at the planned cement kiln.**
- **GOB will encourage the solvents importing industry to consider the establishment of solvent recovery facilities inside or outside Botswana.**

Laboratory Wastes, Pesticides and Herbicides

No data is available about the generation of these types of wastes, partly because there is no precise definition of them. What is known is that, potentially, they can present a major environmental hazard.

Action:

- **GOB will request laboratory, pesticide and herbicide waste generators to collect data about the wastes produced to enable the DSWM to assess the situation**
- **GOB will initiate a small project to procure these wastes, especially major amounts of pesticides and herbicides, and store them in temporary facilities.**
- **GOB will either provide for their safe disposal in a specially designed hazardous waste landfill site within the country, or will negotiate with other countries for treatment in hazardous waste incinerators before final disposal, depending on the size of the problem.**
- **GOB will minimise the risk of using empty pesticide containers for transporting and storing beverages and water by educating the public.**

Clinical Wastes (Health Care Wastes)

A Code of Practice for the management of health care wastes, including handling and segregation within the health care facility has already been prepared.

Action:

- **Before changing any hospital practices, communication and training will be required. As already done at present GOB will run further training courses around the country to introduce and explain the Code of Practice**
- **GOB will implement this Code of Practice through the Waste Management Act**
- **GOB will develop a pilot centralisation project based on the new incinerator at Lobatse**
- **GOB will plan for the construction of a centralised incinerator for the Greater Gaborone area as a medium term solution**
- **GOB will provide the necessary funds to enable clinics and hospitals to improve their waste management**
- **GOB will carefully evaluate the offer of a private company to manage Clinical Wastes in parts if not all of Botswana.**

9.4.8 Other Wastes

Scrap Metals

There is potential for recycling of scrap metal, especially from cars, households and electric/electronic devices.

Action:

- **GOB will encourage the setting up of model operations for the recycling of selected types of metal scrap in areas where most of metal waste is generated. These will be recycling centres for scrap from motor vehicles and a recycling operation for scrap from electronic devices.**

Waste Tyres

Waste tyres cause a problem at landfills. They also have potential for energy recovery in cement manufacturing plants. There are still many options that are available to the country that can decrease the environmental impact of these wastes, offer the potential for job creation and can offer potential savings on import of materials.

Action:

- **Use of Retreaded Tyres can minimise waste and lead to considerable cost savings since they are traditionally cheaper than new tyres and perform just as well. GOB will encourage major consumers such as the Central Transport Organisation (CTO) and Botswana Defence Force (BDF) to take the lead and use retreaded tyres since this will assist to change the public perception**
- **GOB will look into the possibility of legislation to define and legalise a Minimum Tread Depth which not only saves lives but decreases the number of tyres rejected for retreading.**
- **A Tyre Levy should be imposed on every new tyre sold. This is a good way of discouraging misuse of tyres and conversely encouraging wise use of tyres. The funds raised can be used for tyre recycling, the subsidising of the collection and transport of tyres from rural areas, and for other waste management activities. The levy should be enough to encourage people to sell their old tyres. This levy should be an initiative of the tyre industry through an association of tyre dealers. GOB will encourage the formation of the association.**
- **Education in proper use and maintenance of tyres can prolong the lives of tyres and therefore lead to use of fewer tyres over a given period of time. The education should be an industry initiative with GOB playing a facilitating role.**
- **Recycling and Use of Tyres as a Raw Material is being practised on a limited scale in Botswana, e.g. by the Prisons department where prisoners are making mats for vehicles and other applications. This low tech type of operation offers considerable opportunities throughout Botswana and should be encouraged.**
- **GOB will consider including the incineration of waste tyres at the planned cement kiln.**

Batteries

***Lead Acid Batteries offer* opportunities for recovery and recycling whereas the numbers of Dry *Cell Batteries* used in Botswana is relatively small and therefore the recovery for recycling purposes is not financially viable.**

Action:

- **GOB will encourage the setting up of an economically viable lead recovery plant that would meet all recognised international environmental and health standards. It will further evaluate the possible support for such a project to gain financial assistance via the Financial Assistance Programme.**
- **The proper management of dry cell batteries is important and GOB will encourage disposal to proper landfill facilities where, if correctly disposed the dry cells will have minimal impact on the environment.**

Vegetable Wastes from Agriculture

Little information is available about agricultural waste production.

Action:

- **GOB through the Ministry of Agriculture will begin collecting reliable data about the types and amounts of agricultural wastes generated and their use or disposal before determining its policy for them.**

Wastes from the Food Industry

The main problem associated with food industry wastes is associated with the meat industry. Botswana Meat Commission (BMC) is currently undertaking studies into processes to convert its wastes into valuable by-products.

Action:

- GOB will encourage BMC to proceed with the studies and implement the recommendations as soon as possible.
- **GOB** will request BMC to improve the_ situation with respect to the tannery effluents because they cause a major threat to the ground water. Appropriate technologies are available and possible.
- **GOB** will request BMC to develop a waste management plan covering the period from 2000 to 2005.
- **GOB** will invite BMC to cooperate closely in **demonstration projects** applying its waste recycling methods to smaller abattoirs.

Mining Wastes

Mining wastes have a number of significant environmental impacts and the industry is the largest in Botswana. Consequently, mining wastes should be controlled in the same way as other wastes such as MSW. Currently a conflict of interest exists in that the MMEWA has responsibility for economic success of mining operations and also their environmental impact, including waste management.

Action:

- **GOB** will encourage the mining industry, especially the diamond mines, to realise the economic and environmental gains that can be obtained from improved housekeeping.
- **GOB** will request those mining companies that have not already done so, together with Bangwata Concessions Ltd. (BCL) and Soda Ash Botswana Ltd. to develop a waste management plan covering the period from 2000 to 2005.
- Mining wastes will in parts be subject to the new Waste Management Act and the DSWM will have licensing and enforcement powers over the management of these mining wastes.

  GOB will encourage mining companies to produce decommissioning plans for their existing mines and to set aside sufficient funds for the purpose. Decommissioning of new mines will be covered in the EIA.
- **GOB** will invite the diamond mines to cooperate closely in demonstration projects with respect to household waste recycling in Orapa and Jwaneng because of their unique settlement setup, **which simplifies the evaluation of such projects.**

Sewage Sludge

Sludge from pit latrines and septic tanks present the greatest environmental hazard. Nevertheless, the oxidation ponds and sewage treatment works also produce sludge, for which a disposal strategy has not yet been properly prepared.

Action:

- GOB will concentrate its efforts to improve the situation by setting up the already mentioned Department of Sanitation and Waste Management on central level and will support the appropriate organisation at local level.
- **GOB** will initiate research into the development of adequate solutions for the disposal of sludge from pit latrines and septic tanks in areas not equipped with oxidation ponds.
- **GOB** will advise oxidation pond designers to consider the extra organic load from latrine and septic tank sludge in the respective planning area when designing the ponds. It will furthermore assist local authorities in organising a regular emptying service (preferably undertaken by private contractors).
- **GOB** will initiate research into the development of technical alternatives for the collection and transport of latrine and septic tank sludge in rural areas with poorly developed roads.
- **GOB** will initiate research into the composition of sludge from oxidation ponds in order to encourage their use in agriculture.
- GOB has agreed to extend the existing waste management project (carried out together with the Federal Republic of Germany) into a sanitation and waste management project and will vigorously support this technical co-operation project.

Construction and Demolition (C&D) Wastes

C&D wastes have potential value for use in landfill engineering and for filling borrow pits.

Action:

- GOB will request construction companies and landfill operators to use as much C&D wastes as possible for landfill engineering or to fill up quarries and borrow pits which are appropriately licensed to receive such wastes.

- **GOB will request construction business in its tendering procedures for construction works to plan for the re-use of C&D wastes in landscaping and landfill engineering.**

- GOB will request Local Authorities to plan for inert waste landfill sites where appropriate to keep inert waste out of general waste sites.

10. Conclusion

The strategy which has been outlined above is intended to enable Botswana to achieve a state of sustainable waste management within the next few years. The strategy will need to be updated at regular intervals, to take account of changes in Botswana's situation and also of international developments in technology.

This strategy has been presented, discussed, commented upon and modified *through* inputs from various interest groups particularly the Environmental Health Officers, the Landboards, *the* Local Authorities both District find Urban *the* Botswana Association of Local Authorities, the Natural Resources Board of the National Conservation Strategy Co-ordinating Agency, and the Environmental NGOs *who* have given overwhelming support for *the* novel concepts the document proposes.

Commitment to ensure compliance with this strategy will be obtained through continuous mass education campaigns until adequacy in its execution has been achieved. Interested and affected parties will periodically be addressed particularly householders, industrial waste producers, central and local government and environmental NGOs to promote interaction and continuous evaluation in its implementation All these groups need to take appropriate responsible action in order for the strategy to stand the test *of times.*

The strategy has proposed a series of actions embodied in the text which will be monitored and supported by the Department of Sanitation and Waste Management throughout the execution phase. The Government of Botswana is committed to the success of the strategy in order too achieve four cardinal goals: Employment Creation, Resources Conservation, Regional Integration and Sustainable Economic Diversification.