LOW COST WASTE INCINERATOR
COUNTRY REVIEW - ZIMBABWE

REGIONAL CHARACTERISTICS

Demographic and socio-economic characteristics

Population : 11 million

GDP/capita:

Pay levels

Labourers US$ 70 per month

Junior Managers US$ 235 per month

Graduate Engineers US$ 473 per month

Unemployment

Climate

The rainfall around Harare is about 2500 mm. The dry season is between April and October.

Land use

Land is very fertile and in great demand for farming use. Political issues place even greater pressure on land availability for subsistence farming.

Water resources

Water supplies for major towns are from surface water. Boreholes are used in rural areas for farms etc.

Industry

General

Zimbabwe has a substantial industrial base, including steel, foundries, cement, chemicals and mining.

Engineering

There are a wide range of engineering businesses.

Bricks

Bricks are manufactured widely in Zimbabwe. Refractory materials are available, although not manufactured locally.

Materials availability

Mild steel - angle, channel, tube, sheet, plate

Stainless steel

Electrical motors and switchgear

Refractory materials

These materials are readily available.

Manufacture of incinerators

No local manufacturer has been identified, but there are companies supplying furnaces for foundries etc.

Technical facilities

Good facilities are available at the University of Zimbabwe

Air and water testing facilities

Facilities are available at the University and can be coordinated by the Department of Mechanical Engineering, which has expressed a particular interest in the project. They would prefer the sampling kits to brought from the UK, as they are cheaper.

STATUS OF WASTE MANAGEMENT

Waste quantities

A paper[1] published recently indicates that per capita production of solid waste is in the region of 0.311 kg/day. This would appear to be reasonably consistent with estimates of waste production in some of the towns visited.

Waste composition

The following data on waste composition is available:

Material	Range - Zimbabwe[1]	Range - Marondera[2]	Survey - Marondera3
Paper & board	10-27%	15-20%	38%
Glass & ceramics	4-15%	10-15%	<1%
Metals	4-12%		4%
Plastics	4-15%	5%	15%
Leather & rubber	5-8%	10-15%	
Textiles	4-12%	4-7%	
Food & vegetable	15-28%	20-25%	43%
Miscellaneous	10-20%	15-20%	

[1] *An overview of Solid Waste Management in Selected Urban Areas in Zimbabwe*, Admos O Chimhowu, Division of Policy and Strategic Studies, Zimbabwe Institute of Public Administration and Management, 1998

[2] *Zimbabwe Urban Solid Waste Management Study*, Tevera-Mubvani & Associates, August 1995

[3] Survey carried out on behalf of the contractors –March 1999

It should be noted, however, that in some low income areas of, for example, Harare, the proportion of food and vegetable may be as high as 57.5%. In the towns visited, however, this was not the case.

In fact, we were informed by the Ministry of Environment that all local authorities are supposed to be carrying out an analysis of MSW. None of the three visited had done so and the MLGNH was not aware of this.

Formal or informal strategies and plans

No strategy has yet been prepared.

Existing waste management projects

The World Bank/UNDP carried out a study in 1991. An Urban Solid Waste Management Study was prepared in August 1995[2]. The World Bank operates a Project Coordination and Management unit (PCMU) for local authority projects

SIDA is developing a modern landfill at Gweru. The MLGNH was not aware of this but the PCMU is vaguely aware. SIDA say that this project is being done by a small firm of consultants and will shortly come to an end. The MMET said that they were working with all local authorities. This may have been the case in the past, but the project is clearly not very high profile. SIDA do not intend to do any more work in the area..

CIDA will be helping with the implementation of the proposed Environmental Management Act

Organisational arrangements for managing wastes

Local authorities have a responsibility to collect and dispose of MSW in their area and, under the proposed Environmental Management Act, will have a responsibility for controlling and preventing pollution as well.

A visit was made to the Blair Institute, the research arm of the Ministry of Health. Urban sanitation is now the main interest of the Institute. Wate4r supply and sanitation is also a major focus for several ministries and, as a result, a National Action Committee (NAC) has been set up to coordinate the activities in several Ministries and other stakeholders. Some of these are:

- Ministry of Local Government and National Housing
- Ministry of Health
- District Development Fund (part of MLG)
- Ministry of Water resources
- Ministry of land and Agriculture
- Ministry of Mines, Environment and Tourism
- National Economic Planning Commission (under President=s Office)
- Ministry of National Affairs and Employment Creation
- Environment 2000
- UNICEF
- Christian Care

The NAC coordinates projects, donor inputs and relevant research.

Waste minimisation and recycling

Collect-a-can operate in Zimbabwe for the recycling of beverage cans. Most bottles are returnable, so few find their way into MSW. Cardboard is collected for recycling, together with some paper.

Storage and collection

In the towns visited, the quality of collection was variable. In some it was excellent, whilst in others, particularly those without councillors (see below), the quality was lower. The system used in all the towns visited was kerbside collection - on a 7 day week basis. There was some evidence of plastic 240 litre Eurobins, but no vehicles were equipped to lift them.

Disposal methods

At all the towns visited, disposal was by crude dumping. Every town was aware that this required improvement and all were enthusiastic about the possibility of incineration. Harare has particular problems, which are quite high profile. A major dump site was closed recently because it was burning and medium density housing had been developed close to it.

Harare has a 20 year old incinerator, but it has been closed for some time now.

Legislation and Enforcement

At the present time, the only relevant legislation are the Public Health Act and the Local Government Act. These laws give no powers to the Ministry of Mines Environment and Tourism.

A draft of an Environmental Management Act, however, is currently undergoing consultation and will shortly be finalised. This will introduce the licensing of waste disposal facilities, although there is currently no provision for the registration or licensing of transporters or of recycling or treatment facilities. Permits will also be required for emissions to air and water and EIAs will be required for waste management facilities.

Regulations will be required to give effect to these features, so it may be expected that some time will pass before licensing comes into effect.

SPECIFIC SITUATIONS

The Ministry of Local Government recommended visits to three towns of appropriate size, all of which has expressed interest in the project.

Marondera Municipal Council

The population of Marondera is 53-55,000. The Senior Environmental Health Officer, Peter Magundani, has recently completed an environmental health MSc at Dundee and is a member of the Institute of Waste Management, having a good understanding of the subject. He is very enthusiastic about the prospect of an incinerator and gave an assurance that he would make labour available to operate it.

The town is very clean, with no evidence of litter or fly-tipping. Water supply comes exclusively from surface water, making use of 3 or 4 dams. Collection is carried out using one (new) 12 m; compactor, one 7 m; open top tipper (similar to that used in Kanye, Botswana) and one 3.5 m; (approximately) tractor and trailer. Each vehicle is claimed to do 3 loads a day (7 days/week). Assuming payloads of 2.5, 1.0 and 0.5 tonnes respectively, this would give 12 tonnes a day. Top estimate is 15 tonnes.

Waste is dumped at an old gravel pit, which is occasionally tidied up with a tractor shovel.

The waste composition appears very suitable for incineration, with low proportions of food waste, cans and bottles. The reasons for this are that the Council encourages householders to compost food wastes, and cans and bottles are recycled or returnable. A scavenger used to pick paper (or

cardboard?) from the site and claimed to collect 10 tonnes a month. It is not clear why this activity ceased. The hospital/clinic has an incinerator, so there is no untreated clinical waste being dumped.

In addition to the household waste, there is a significant quantity of leather trimmings from a leather works. There is also a small tyre retreading plant on the industrial estate, which could provide further high CV material.

Marondera is a growing town with a significant industrial estate, which houses a major abattoir/cold store, a brickworks and a very large hardware store. This area is located well away from existing housing and none is planned. The land is in the ownership of the Council and would make an ideal location for an incinerator.

Rusape Town Council

Rusape is a smaller town of 22,000 population. It is under the supervision of a Commissioner from the Ministry of Local Government, because the elected council was dismissed for corruption. The Town Engineer has been appointed Acting Town Secretary.

Collection is inefficient, making use of tractors with 2.5 m; trailers, holding an estimated 0.3 tonnes. These are alleged to do 3 - 4 trips a day, which would give about 3 tonnes a day. The dump site, which is unsupervised, was flooded due to the wet weather and is apparently like this for some 3 months of the year. The water was black. The quantity of waste deposited recently indicated that the waste quantity estimated above may be on the high side - no doubt because of collection inefficiencies.

As a Town Council, Rusape does not have an Environment Health Department and this function is performed by the Ministry on its behalf. Waste management is the responsibility of the Town Engineer.

Bindura Municipal Council

Bindura, with a population of rather more than 30,000, has recently achieved Municipal Council status, which has greater responsibilities (including development planning) than a Town Council and an executive mayor. Unfortunately, like Rusape, the entire Council resigned - no doubt for similar reasons - and the Town is under the supervision of a Commissioner. Again the Town Engineer is the Acting Town Clerk. Elections are planned for April.

Bindura is heavily dependent on gold (Ashanti) mining and nickel (Anglo American) mining/smelting. There is little other industry.

The town uses four tractors and 3.5 m; trailers, doing about 3 loads a day, giving about 6 tonnes a day of waste. The town supplies dustbins for the kerbside collection system but these are mainly cut down oil drums and are in a very poor state of repair, many without bottoms. The dump site consists of two former opencast mine excavations. A tractor shovel was observed working on the site, but this is apparently an occasional activity. It was burying untreated clinical waste.

GOVERNMENT ATTITUDES

Importance attached to waste management standards

This is clearly an issue which the Government wishes to address.

PUBLIC PERCEPTIONS AND ATTITUDES

Level of concern about waste management

Waste management is a significant concern for the public, who regularly criticise their Councils for the quality of service.

Level of concern about incineration

There is little evidence that there would be opposition to incineration.

NGOs

The main NGO concerned with waste management in Environment 2000. They appear to be quite interested and positive about the project.

FINANCIAL ISSUES AND CONSTRAINTS

Arrangements for financing and recovering the costs of waste management

In the smaller towns, such as Rusape and Bindura, no charge is made for MSW collection and disposal, no doubt because of the poor service quality. In Marondera, however, the full cost of service provision is recovered by means of a monthly charge of $33 for households and a charge of $45 per container for industrial waste.

Role of private sector

There is currently no private sector activity, with the single exception of a liquid waste contractor in Harare (Pixley waste removals), which appears to use non-vacuum tankers.

Attitudes to increasing expenditure on waste management

We are informed by the MLGNH that expenditure in the region of Z$1 million would present no problem to Municipalities, who regularly invest sums appreciably larger than this.

COMMITMENT TO PROJECT

Central Government

The Ministry of Local Government and National Housing (MLGNH) expressed enthusiasm for the project. The Ministry of Mines, Environment and Tourism expressed also showed a positive interest, although they clearly did not see that they had a prime responsibility for solid waste management.

Local Government

Local government showed great enthusiasm for the project and, in the case of Marondera, can give some confidence that the project would be sustainable. The MLGNH informed us that the most progressive Council of all is Kariba. Unfortunately they were not available to meet us.

POTENTIAL PARTNERS

It has been suggested that the most suitable partners will be companies involved in the supply of combustion equipment to the foundry industry.

RECOMMENDED MUNICIPAL PARTNER

It is recommended that if the pilot plant is constructed in Zimbabwe, the partner municipality should be Marondera.

LOW COST WASTE INCINERATOR

COUNTRY REVIEW – THE GAMBIA

1.1.1. WASTE QUANTITIES

Initial estimates for Kinafing Municipal council are 298 tonnes per day (council records) and for Banjul, 30 – 40 tonnes per day. Both these are larger than the anticipated quantities for the prototype incinerator but a number of possibilities exist.

In Kinafing collection is broken down into zones. The prototype Incinerator could be designed to dispose of waste from a single zone. If the technology proves to be appropriate then these could be replicated in other areas of the municipality. This would reduce the environmental impact on any one site.

Some pre-sorting of waste is anticipated to remove recyclables and perhaps compostables. The remaining waste in a single zone or indeed in BCC may well then fall within the anticipated range.

1.1.2. WASTE COMPOSITION

We recommend that a simple waste analysis exercise be carried out by local consultants to give a clearer picture of the composition of Municipal Solid Waste and to determine whether incineration is an appropriate component in an overall waste disposal strategy. Initial evidence from Kinafing however seems to suggest that the waste does contain a significant combustible fraction, enough to sustain prolonged burning after spontaneous outbreak of fire.

A larger waste analysis exercise is to be carried out by NEA (funded by World Bank). This will also provide valuable information which will help in determining the most appropriate combination of waste disposal techniques.

1.1.3. FORMAL OR INFORMAL STRATEGIES AND PLANS

NEA is in possession of a Solid Waste Disposal Strategy which was a result of a study carried out in 1995 by Mouchel with funding from World Bank. This strategy is due to be reviewed in May. A major constraint to implementing certain aspects of the plan has been the absence of accurate waste composition data. Now that funding for this study has become available (World Bank), the data collected should allow the implementation of this plan to move forward.

It is clear that NEA is considering many possible components for waste handling including the use of recycling and composting programmes.

1.1.4. ORGANISATIONAL ARRANGEMENTS FOR MANAGING WASTE

In the Gambia all waste management is currently the responsibility of local authorities. Historically the Department of Public Health was responsible for waste collection and disposal. In the Greater Banjul area, this was followed by a period where the service was contracted out to a private company. Following deterioration in the level of service, responsibility was handed over to the local authorities – Banjul City Council and Kinafing Municipal Council.

1.1.5. WASTE MINIMISATION AND RECYCLING

Waste minimisation and recycling are important components of the evolving waste management strategy for the Gambia. Currently the recycling of aluminium and plastic is

taking place at an informal level only, this is possibly due to restricted access to economically viable markets and the general lack of awareness of the potential value of certain recycled waste. NEA are actively encouraging schemes by NGO's such as US Peace Corps to reuse and recycle waste as part of income generating activities for local communities and women's groups. Minimisation, recycling and composting are seen as central parts of future waste management development.

1.1.6. STORAGE AND COLLECTION

Household waste is generally stored in or near the household until collection day. In KMC this is scheduled to take place once per week although some areas do not receive a collection service for up to three weeks or more. In certain parts of Kinafing residents make use of unauthorised dumps which are periodically cleared by the cleansing department.

1.1.7. DISPOSAL METHODS

All waste is currently disposed of in crude landfills. Waste is deposited, levelled and then covered with a layer of sand. Open and uncontrolled burning is a common problem on such sites.

1.1.8. LEGISLATION AND ENFORCEMENT

Currently Municipal Councils make use of certain parts of the Public Health Act. This however does not afford them adequate powers and as a result there are very few instances that have led to prosecution of those who are instigating public health hazards though handling and dumping of waste. There are at present no appropriate municipal byelaws and no waste management legislation. A study has been carried out recently however in to all existing legislation which touches on environmental issues, and incompatibilities between individual pieces of legislation have been identified. NEA is keen to press ahead with the preparation of draft legislation that it hopes will give adequate powers to local authorities to deal with waste management issues.

Much concern has been raised by NEA and local councils about the vast increase in the quantity of LDPE waste resulting from the use of plastic bags. This waste is noticeable almost everywhere in the Greater Banjul area and is all the more problematic as it is easily borne by wind. There have been suggestions to government about the possibility of taxing the importers of this commodity to try and instil responsibility for the environmental impact at source. An licensing application by a manufacturer to produce the bags locally has also met with opposition.

1.1.9. SPECIFIC SITUATIONS

1.1.10. Kinafing

KMC cleansing department has reasonable waste collection facilities, which includes a fleet of trucks and trailers. It has made valiant efforts to collect and dispose of waste in the municipality, however difficulty in raising adequate revenue from local residents has meant that collection vehicles are poorly maintained and currently a large number are non-operational.

KMC currently disposes of its municipal waste at a land fill site in Bakoteh. The site is unfenced and is subject to frequent outbreak of uncontrolled fire due to spontaneous combustion and deliberate incineration of cable waste by scavengers. The site is situated within a heavily populated area and the fact that it is unfenced means that it is used as a thoroughfare by local residents and schoolchildren. Council supervisors are aware of the problems at the site and realise that it presents a potential health risk to local residents.

The volume of waste disposed of a the site each day is around 298 tonnes (according to council record sheets) which would suggest that this is much larger than the anticipated capacity of the incinerator. However the position of the site within such close proximity to an area of high population density suggest that the incinerator would be best sited elsewhere. A plot within the industrial area has been suggested as a potential site for a pilot plant. Permission to use the land must be sought from the relevant government office, however the chairman and town clerk of KMC see no particular obstacle to acquiring a site there.

1.1.11. Banjul

Banjul City Council (BCC) has the responsibility of dealing with waste from within the boundaries of Banjul city itself. The physical location of the city on an island surrounded by mangrove has meant that it's growth and expansion has been restricted. Equally this has led to constraints on acquiring adequate land for land fill sites. A recent study using GIS information carried out by NEA failed to identify any suitable site within practical distance from the city. The pressure to for waste amelioration here is therefore great.

BCC claim to collect virtually all of the waste generated from within the city (compared with 40% by KMC) which is disposed of using crude landfill at the * site. The composition of waste here is likely to be different to that of KMC as Banjul is the administration and business centre.

1.1.12. GOVERNMENT ATTITUDES

The government in Gambia is clearly concerned about waste management and environmental issues and representatives from both the Ministry of State (responsible for NEA) and the Ministry of Local Government have indicated that they will back any initiative that will help to improve what is seen as a growing problem. Within the National Environment Agency itself there is a clear awareness of the need to implement a National Waste Management Strategy which is balanced and appropriate to the needs of the country. The most pressing problem is seen as being in the Greater Banjul area and the nearby rapid growth areas. Officers within the NEA are very well informed about waste management issues and are committed to working with the relevant bodies both public and private to ensure an appropriate strategy is put into place.

1.1.13. PUBLIC PERCEPTIONS AND ATTITUDES

1.1.14. Level of concern about waste management

Reports from NEA and Local Councils suggest that there is a growing public awareness about waste management issues although this tends to manifest itself when residents fail to receive the services they expect from their local councils. There is also some evidence that certain householders are willing to pay for an improved service. Sensitisation through public education programmes and the use of the media is seen as being one way of raising public awareness about this important issue.

1.1.15. Level of concern about incineration

There is little evidence that there would be opposition to incineration as long as reasonable performance in terms of emissions is maintained. The NEA in its role as regulating body is keen to ensure that any plant meets it own standards as regards EI. However there is an appreciation that the "do nothing" option where waste is allowed to burn open and uncontrolled currently results in potentially hazardous levels of environmental pollution.

1.1.16. NGOs

A visit to TANGO, the independent umbrella group for NGOs in Gambia revealed the existence of 53 registered NGOs. The majorities of these are active in the areas of Agriculture, Natural resources and Health and concentrate their work with rural communities. Those NGOs with an urban focus tend to be active in the area of skills training and business support. There were no particular NGOs that were identified as having a direct interest in the issues surrounding the project. It as decided however that a close relationship with TANGO would help to keep the NGO community informed about the project and would help sensitise them to the issues involved.

1.1.17. FINANCIAL ISSUES AND CONSTRAINTS

1.1.18. Arrangements for financing and recovering the costs of waste management

Both local authorities (KMC and BCC) stated that they had difficulties in raising adequate resources through rates to pay for the level of waste management service that residents expected of them. Both councils however did operate a tariff scheme that was applied to

- households who were in possession of a wheelie bin,
- restaurants
- hotels
- residents who requested disposal of non-standard waste

Suggestions from NEA for a scheme whereby customers are charged for disposal of waste in direct relation to the volume they produce has been considered by the Department for local Government. The situation though is not straightforward and Local Authorities are understandably reluctant to implement measures that might discourage residents from using the LA waste disposal facility. There is a perceived danger that residents will instead choose to dispose of waste themselves through uncontrolled burning or dumping rather than pay a charge for LA disposal.

The Permanent Secretary for the Department of Local Government did state however that one of the goals of his department was to increase the level of efficiency of local authorities in general thereby freeing up extra revenue for cleansing services. He stated that in the last financial year he had authorised increases in the annual budgets to both councils for cleansing as a result of the importance he attached to this area of local authority responsibility.

1.1.19. ROLE OF PRIVATE SECTOR

At present all waste management and cleansing services are provided by local authorities. In 1995 cleansing and waste management in the whole of the greater Banjul area was handed over from the department of public Health to a private contractor. The initiative was deemed to have been a failure after the level of service declined substantially and responsibility for these services was eventually handed to local authorities. The experience has led many to be wary of the privatisation of these services. However both local authorities and the Ministry of Local government admit that Municipal councils do not have the resources to manage these services efficiently. There is a growing realisation amongst all players that privatisation, provided that it is handled carefully and transparently, could lead to a more efficient and cost efficient service. Suggestions such as awarding contracts on a zone to zone basis rather than on a municipal level and relating payment to performance levels are currently being considered.

1.1.20. ATTITUDES TO INCREASING EXPENDITURE ON WASTE MANAGEMENT

Statements from the permanent Secretary for Local Government suggest that his department is committed to increasing expenditure in this area providing that local authorities can improve their level of efficiency and reduce the sometimes disproportionate level of administrative overheads that they incur.

1.1.21. COMMITMENT TO PROJECT

1.1.22. Central Government

Discussions during meetings with the Permanent Secretary for the Department of State (responsible for the NEA) and the Permanent Secretary for the Department of Local Government show that the Gambian Government are clearly committed to the project provided that it can be shown to be of benefit to the people of Gambia.

1.1.23. National Environment Agency

As a result of meetings and discussions, the NEA are also clearly committed to the project and see it as a potentially important component of their own programme. It must however be demonstrated that low cost incineration is an appropriate component of the Gambia's National Waste Strategy.

1.1.24. LOCAL GOVERNMENT

Both Local Authorities visited were very keen to collaborate with the project again provided that it could be demonstrated to be an appropriate solution to some of their current waste management problems.

1.1.25. POTENTIAL PARTNERS

A number of potential partners were identified during the visit. These were;

1.1.26. National Environment Agency

NEA can operate as a co-ordinating agency as well as advising on environmental aspects of the project. The EIA department is well placed to assist in the implementation of EIA studies. They are currently undertaking a number of air quality studies in the Greater Banjul area.

1.1.27. Municipal Councils

Both councils are potential partners who could host the building and operation of the pilot plant.

1.1.28. Gambia Technical Training Institute

The GTTI is the primary institution for technical education and vocational training in the Gambia. They are well to placed to contribute to the in-country testing and performance measuring phase of the incinerator test rig should this be carried out in the Gambia.

1.1.29. Department for Community Development

DCD is a government department that is involved in the development and dissemination of appropriate technologies targeted at rural poor. Their experience with appropriate technologies means that they could provide valuable contribution at the design and development stage.

1.1.30. Gambia Association of Construction, Contractors and Consultants

GACCC act as an umbrella group for the many professionals whose services could potentially be used in the construction and commissioning of the pilot plant.

1.1.31. GCCI

The Gambia Chamber of Commerce and industry are the primary body for representing to foreign investors and to government, the interests and concerns of commercial businesses operating within the country. They are well placed to liase with government on the privatisation of local authority services and could provide valuable input on the potential for disseminating small scale incinerator technology to the private sector for replication within Gambia and the sub region.

1.1.32. GAMWORKS

GAMWORKS is a public works agency who could potentially play an important role in the construction of the pilot plant. They are funded by the World Bank and have within their programme a component for building the capacity of local councils with regard to waste handling and public sanitation.

1.1.33. TANGO

The association can provide a valuable link to the NGO community who may represent or have access to important stakeholders in the project.

1.1.34. Local Consultants

Local consultants have been identified to carry out initial waste analysis surveys and to provide background information of the socio-economic profile of the region.

1.1.35. CONCLUSIONS AND RECOMMENDATIONS

Further information is needed to determine the precise nature of the waste streams in the greater Banjul area. Once this has become known then the appropriateness of small scale incineration and its place within an overall waste disposal strategy will become more apparent. Initial evidence would seem to suggest that successful incineration of waste is certainly possible within the dry season.

Incineration of waste within the outskirts of the City of Banjul itself would seem to provide one solution to the increasing problem of access to land for landfill use. The proximity of the site the city itself must be taken into consideration when deciding whether or not to site a pilot plant in this area.

In terms of potential commitment to the project, all stakeholders showed a keen interest in collaboration and a firm commitment to waste disposal issues in general.

There are in existence in the Gambia, a wide range of potential partners who could provide valuable inputs which would help to ensure the success of the project.