



Waste Management Study – Chongwe, Zambia

Assessment of Opportunities for the Reduction of Open Burning Practices

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ABBREVIATIONS

AF	Alternative Fuel	Opex	Operating Expenditure
ARM	Alternative Raw Material	O/S	Opportunity Study
BATNEEC	Best Available Technology Not Entailing Excessive Cost	PAYG	Pay As You Go
BAU	Business As Usual	POA	Product Off-take Agreement
BPEO	Best Practicable Environmental Option	POPs	Persistent Organic Pollutants
Capex	Capital Expenditure	PPE	Personal Protective Equipment
CBD	Central Business District	PTY	Property(s)
CC	Collection Centre	RMs	Recyclable Materials
CMC	Chongwe Municipal Council	SADC	Southern African Development Community
CO ₂	Carbon dioxide	SI	Statutory Instrument
CSO	Central Statistical Office	SUF	Single-User Facility
EIA	Environmental Impact Assessment	TC	Town Clerk
EMA 2011	The Environmental Management Act (no. 12 of 2011)	tpd	Tons Per Day
EMS	Environmental Management System	TPY	Tons per Year
EPR	Extended Producer Responsibility	UNIDO	United Nations Industrial Development Organisation
GHG	Greenhouse Gas (emissions)	WACS	Waste Analysis and Characterisation Study
GRZ	Government of the Republic of Zambia	WM	Waste Management
HH	Household(s)	WMD	Waste Management District
ISID	Inclusive and Sustainable Industrial Development	WMG	Waste Management Grid
kt	kilo.tonnes (1000,000kg)	WMU	Waste Management Unit
KKIA	Kenneth Kaunda International Airport	WPF	Waste Processing Facility
MBI	Market-Based Incentives	ZABS	Zambia Bureau of Standards
MFEZ	Multi-Facility Economic Zone	ZCSA	Zambia Compulsory Standards Agency
MSME	Micro, Small & Medium scale Enterprises	ZEMA	Zambia Environmental Management Agency
NIMBY	Not In My Back Yard	ZESCO	Zambia Electricity Supply Corporation Ltd
OECD	Organization for Economic Cooperation and Development (a 34 member body of the most developed countries in the world)	ZRA	Zambia Revenue Authority
		ZS	Zambian Standard

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A first level assessment of waste management in Chongwe District has been completed. Some customized proposals, with viable alternatives, have been developed and costed, and some pointers have been made on how the costs could be financed. This report presents the findings and recommendations. The ultimate aim of this project is to disincentivise and reduce **open burning practices** by proposing sustainable alternatives.

1.1 Summary of Findings

On waste map and waste characterisation

- The district produces around **61tpd** of disposable waste.
- Around **34%** of this is collected and arrives at the Council dumpsite.
- The rest of the waste – approximately 40tpd – is disposed of by **burying, open burning** and **incineration**
- Waste from one Waste Management District (District B: incorporating the farming blocks of Chalimbana and Kanakantapa) is neither picked nor known in overall quantity or specific characterisation
- A basic characterisation (with heavy down-sampling due to non-availability of weighbridge or industrial scales) was carried out based on samples from 0-3 day-old waste piles at the dumpsite. It found in order of % by weight: Organics: 53, Plastics: 18, Glass: 16, Wood and Paper: 7, Rubber: 3, Metals: 1, Textiles: 1, Other: <3
- An **unusually large organics component** was noted and accepted after justification. It is expected to continue for the foreseeable future as Chongwe's economic activities (agriculture, food, international transit, and educational institutions) are the ones which give rise to the organics wastes. This component makes Chongwe a good potential host for composting and similar projects which require organic waste as key raw material.
- A planned WACS exercise with longer residence time of a study team and pre-arrangement of weighing equipment is recommended.

On recycling and recyclables

- Surprisingly, a significant amount of recycling activity happens in the district. The waste recovery rate for recycling purposes has been estimated at **6.5%**. This recovery rate involves wood chips, saw dust, textile off-cuts, plastic and metal. The rest of the waste finds itself either at the dumpsite or being disposed of in unregulated ways such as burning or burying in backyard pits.
- Greatest recycling potential on organic waste, PET bottles and, to a much lesser extent, paper.

On waste collection and fee collection systems

- By reporting time, there was still only one licensed private collector of waste operating in the district alongside the Council Department of Public Health. A process was underway to competitively select other contractors.
- Where the Council collects directly, two fee *levels* have been implemented, i.e., K20 per household per month paid monthly, and K200 per SUF per month paid monthly.

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- Where franchised contractors are operating, two fee *types* are in place, i.e., contractors can negotiate own fees with SUFs, but for households, the council places an upper limit based on the Waste Management District in question (for the most affluent area Meanwood Ibex, a fee of K135 per month paid 3 months in advance was encountered). Fees for households for other areas could not be verified as there were no licensed operators active there.
 - In common with many *Zambian* districts, the problem of *failure to aggregate sufficient numbers of households paying for waste collection* is present here too. And, in common still, the Council attempts to solve that problem by bundling it with actual waste collection and then handing off the two jobs together to contractors. This unconscious packaging of a troubling problem (*community apathy against paid-for waste collection services*) under a simple wrapper (*waste collection contracts and the promise by council to “make people pay you directly”*) may look, for a while, like a solution when in fact not. The results come back with a strongly equivocal message: with success registered in the more affluent areas, and total abandonment of work in the less affluent, higher density locations where the problem is greatest in fact. The indication from the results is that the councils involved – Chongwe inclusive – mustn’t knock off and go home yet.
 - The proposed solution from this study is to unbundle the *problem* from the *task* (perhaps even to recognize that there are two things involved here and not one).
 - The task (waste collection) can continue to be carried out by the collection companies – even door-to-door.
 - The problem (fee collection) must be solved by the Council by first re-bundling with other utility fees such as electricity (which are perceived by the service users to be indispensable, while waste collection exists as an avoidable option). The Council should seek an agency arrangement with ZESCO or other utility operator of their choice. As a utility company, ZESCO also faced heavy non-compliance and have gone very far ahead of the councils in solving the problem. The councils now have a choice of inventing their own wheel or seeking agency contract with ZESCO. A slightly weaker alternative for the agency contract would be the phone companies. Collecting waste management fees by agency in mandatory payments (rather than in voluntary contracts with waste collection companies) will increase compliance and unlock enough sustaining cash to waste management in the districts, including Chongwe.
 - The bundling of waste management fees with other utility fee and successful implementation of fee collection agency is expected to be a longer term solution. In the interim, it is proposed that the Council develop a waste management database which it runs in-house and from which it gathers useful objective data about which addresses are compliant and which ones are consistently problematic. Using this market intelligence would help the Council to take strong, targeted interventions ranging from educational campaigns to enforcement actions.
 - It is advised that separating the challenges out into their unit components like this, though it requires administrative adjustments, will actually empower the Council to take bold, effective steps whose benefits far outweigh any administrative changes which are made necessary.
 - On physical collection, the recommendation is that the door-to-door collection continues.
 - The biggest change required of the Council, in addition to the need to enact any by-laws it deems necessary to transform the waste management function, is that the financial administration has to be ready for higher cash flows (receipts and payouts) since the task of fee collection would come back from the contractors where it currently is. For its specific part, the Public Health Department needs to equip itself in both practical and soft skills as well as motivational readiness for increased surveillance works, performance supervision, troubleshooting of non-compliance, educational campaigns, enforcement actions as well as participation in preparing bankable opportunity/feasibility studies to increase *mid-grid* and *end-of-pipe* income from the waste.

On the District dumpsite

- The ownership structure of the dumpsite land means that the Council only has *lobby power* over the dumpsite. It does not have unimpeded direct control as the leasehold is still under the traditional leadership which donated the *use* of the land but not the land itself. This situation presents some significant risk to any long-term works at the dumpsite and to its licensing. It needs to be normalized.
- That the waste pickers operating at the dumpsite are already organized under a waste recycling company is a unique positive finding. It must be protected and supported. It shall be recommended for copying by other districts.

Impacts on open burning practices

- **Lower-Income Areas**

The lack of clear incentives to encourage the use of a waste collection service, particularly in the lower-income townships means that the impact of the efforts proposed here would be weakest in these areas. Effectiveness of the legal deterrent is also expected to be weak due to contagion (the non-compliant cases are the majority; if they join forces to continue being non-complaint and to actively resist change, then that resistance becomes hard to beat). Educational campaigns and active engagement with area Councilors is highly encouraged to raise the willingness of householders in these areas to cooperate with this project. It is also recommended that high-visual impact messages are posted in local clinics to highlight the proven link between open burning practices and respiratory diseases, and between unregulated waste burying, weakening of soil structure and water contamination.

- **Mid-Income Areas**

In the more up-market areas, there is potential to collect over 800tons of waste per month, significantly reducing the prevalence of open burning and allowing for the legal deterrent (penalties and their prescribed alternatives) to become effective as a second-line control measure. Educational campaigns as for the less affluent areas encouraged.

- **CBD and High-Income Areas**

For areas within and near the CBD where income levels are higher and the impact of open burning harder to conceal, the legal deterrent is encouraged together with increased awareness campaigns. It is expected that 100% of occurrence of any open burning should be removed from these areas.

- **Dumpsite**

The district Council itself indirectly benefits from the volume-reducing random fires which are caused on the various piles of dumped waste. The waste pickers benefit from the fires because, after picking out any useful combustible materials, the fires are then allowed to do their work and expose any further useful materials, to clear out some working room, and to chase away any rodents which might descend on the food scraps. To dissuade fires at the dumpsite, the waste pickers who are the first line of defense and constantly on-site must be engaged in education and formalized training sessions so that they know how to prevent the fires.

1.2 Summary of Areas of Improvement

- Production of a recognizable/official district map for waste planning and management
- Organisation and completion of a full WACS exercise,
- Base-line study of the business potential of the seven waste collection zones to enhance the feasibility of engaged contractors actually servicing the zones,

-
- Normalisation of leasehold on the dumpsite land to allow long-term development work (land still un-titled and under ownership of traditional leadership). This situation means that certain significant actions, *not limited to outright restriction of access or even closure of operations*, are effectively under the control of a third party other than the Municipal Council,
 - Procurement and installation of some waste skips, particularly in the market, to restrict waste run-off particularly in the rainy season,
 - Expansion of paid-for waste collection service to all institutional infrastructure in the district such as hospitals, schools, etc.,
 - Installation of weighbridge or simpler/lower-cost weighing system to enable the acquisition of higher quality waste data for the district,
 - Addition, at the dumpsite, of sorting for the energetic fraction (papers, wood, rubber etc.) together with a higher quality quantification so that off-takers like LafargeHolcim who seek alternative fuels and who have responded positively to first approach, can be formally engaged to collect this part of the waste,
 - Some specific and directly applicable practical training for the technical staff of Department of Public Health, including but not limited to Waste Characterisation, Landfills, Composting, Statistical Sampling & Reporting, Industrial Ecology, Business Planning, Legal Enforcements, etc.

Introduction and Methodology

This waste management study project has been carried out by direct support of the United Nations Industrial Development Organization (UNIDO). UNIDO is the specialized agency of the United Nations that promotes industrial development for poverty reduction, inclusive globalization and environmental sustainability. The mandate of UNIDO is to promote and accelerate inclusive and sustainable industrial development in the developing countries and economies in transition.

The Department of Environment under the Directorate of Program Development and Technical Cooperation is responsible and accountable for providing technical cooperation services to enhance the capabilities of developing countries and economies in transition to promote inclusive and sustainable industrial development (ISID). It does so by promoting industrial resource efficiency to strengthen green industry and improve the effective use of natural resources including water; by assisting developing countries and countries with economies in transition to achieve the objectives of and compliance with the Multilateral Environmental Agreements; and by working to reduce the release of industrial pollutants in the environment. Under the Department of Environment the Stockholm Convention Division (PTC/ENV/SCD) is responsible for supporting developing countries and countries with economies in transition to implement the Stockholm Convention (SC) on Persistent Organic Pollutants (POPs) and related industrial development aspects.

It is well documented that open burning is a major contributor of the loading of POPs in this district as in many others in Zambia. This project seeks to reduce POPs by discouraging open burning of waste. It seeks to create an alternative to open burning, in a well-planned waste management system incorporating sorting and segregation, collection, re-use, recycling, recovery and managed end-of-life disposal.

Table 3.1 is a summary of the methodology used in this study.

TABLE 2.1 STUDY METHODOLOGY

STEP	DETAIL
1	<p>Set Objectives</p> <p>Lifted from TORs for UNIDO WBS 150060-1-10-03-1700 (Zambia)</p>
2	<p>Obtain desk level data</p> <ul style="list-style-type: none"> • Interview with Director Public Health & Asst. Director WMU • Obtain District maps • Obtain dumpsite survey diagrams • Obtain WM fee structure for the District
3	<p>Verification and Validation</p> <ul style="list-style-type: none"> • Guided site surveys in CBD and SUF • Guided site surveys in townships • Sampling and assessment/characterization of actual waste • Interview with waste pickers at dumpsite • Interview with generators (textile tailors in the public marketplace) who sell directly to recyclers • Interlocutory assessment of off-take opportunities with potential off-takers of AF/ARM materials from the district

STEP		DETAIL
4	Ecological Assessment	Identification of environmental and social issues impacting the project.
5	Supply Chain Assessment	Assessment of all data against a WMG adapted to the District, including collection points, fees paid/payable, recovery rates, etc.
6	Recommendation	<ul style="list-style-type: none"> Propose possible solutions to challenges identified against the project targets Comment on sustainability risks of the proposed solutions

Table 2.2 is the project Waste Management Grid (WMG). Table 2.3 is the same WMG completed for current practice at Chongwe District.

The Waste Management Grid™ is a simple tool intended to help an assessment team to look at all parts of the waste distribution chain from point of generation to end-of-life. There are four broad stages of disposal according to the WMG, i.e., *Arm's Length*, *First Mile*, *Final Mile* and *End-of-Life*. These stages of disposal are matched to the generic activity that can occur, the key challenges, the typical costs as well as the potential income associated. These factors are commonly encountered and may easily be predicted given some case-specific data.

Some statuses and language based on the WMG:

Top-end or entry-point

These are activities or factors associated with arm's length waste disposal. They occur at or are closely associated with the physical place where waste is generated. For example, waste collection fees charged to households or other waste generators are referred to as *entry-point income*. The importance of this fact is that it makes much more clear that this is *not* the only revenue possible from this mass of waste. If managed properly, more – in fact, much more – income is possible.

Mid-grid

These are activities or factors associated with first-mile and/or final mile waste disposal. They will typically occur at a waste processing facility, but may also occur at the dumpsite/landfill site. Income generated from sale of PET bottles picked up at the dumpsite or in the streets is an example of *mid-grid income*.

Bottom-end or end-of-pipe or tail-end

These are activities or factors associated with end-of-life disposal. “End-of-pipe” is preferred over “end-of-life” because the disposal may actually not be an end-of-life for the mass of waste but simply a change of application in the same form. For example, glass crushed and embedded in cement blocks has not ended its existence as glass but merely changed application. End-of-pipe disposal normally occurs far away from the point of generation of the waste (typically at a composting yard, a landfill site, an industrial incinerator or cement kiln, etc). End-of-pipe income can be quite high compared to top-end and/or mid-grid incomes because the waste would have received a significant amount of value-adding handling such as sorting, segregation, washing, drying, compacting, shredding, bagging even some light pre-processing, and it would have been stored and aggregated into industrial volumes, effectively becoming a genuine raw material for a unique process in classic industrial ecology style. This is why much emphasis is laid on end-of-pipe activity to compliment low waste collection fees. However, the typical case encountered in many districts is the twin problem of non-recognition of industrial-scale end-of-pipe opportunities, leading to and combining with a lack of investment in end-of-life processes such as composting or use as alternative fuels or alternative raw materials.

Folding

This is where either of the two mid-grid stages are by-passed in the route from arm's length to end-of-pipe disposal. This situation is typical of many African – not just Zambian – towns and cities.

Short-stopping

This is where the waste disposal ends at burying or burning without any further active interest being taken either in the energy or products arising, other than the basic minimum environmental duty of care.

Maturity

Refers to the preparedness of a waste management authority for proposals and efforts addressing certain aspects. The grid expresses these in stages. The stage determined for any district influences the type of development proposals put forward.

Stage	Key features	Key Recommendations
1	Needs known, Few tools, Little control Major gaps in collection system (rate <40%) Little mid-grid activity (recycle rate <10%)	Collection system Aggregation & Fee Collection Dumping Area Sustaining Cash
2	Challenges known, Many tools available, Much control Major gaps in collection system (rate <70%) Appreciable mid-grid activity (recycle rate <25%)	Mid-grid & end-of-pipe efficiency Collection & Routing Efficiency Landfill Sustaining Cash
3	Development opportunities pro-actively prepared for All tools available or within easy reach, autonomous control No gaps in collection system (rate >70%) Optimised mid-grid activity (recycle rate >25%)	Ecology Grid-wide efficiency Technology & Experience Share Sustaining Cash

Tables 2.2 and 2.3 show that:

1. While Chongwe has some basic activity at the first and third stages of waste disposal (*Arm's Length* and *Final Mile*), there is no activity at the second and final stages (*First Mile* and *End-of-Life*).
2. Incidentally, the missing stages are, in fact, the stages with the highest potential for income generation via the sale of recycle materials, compost, gas (for lighting or other heating uses) or leachate (as a feedstock in composting or similar processes).
3. This **folded and short-stopped WMG** is a lot of lost revenue. However, investment would be required to increase mid-grid activity as well as to create a composting yard (lower capex demand, faster payback) and/or engineered landfill (much higher capex demand, payback 5-10 years depending on size and complexity of the waste disposal cells). But such investments would only be possible if the Council takes leading steps to ensure that high-quality data can quickly be obtained from their records to support Opportunity or Feasibility Studies.
4. While the efforts of the **Waste Pickers** to pick out recyclable materials are welcome for both the local environment and economy. However, their more than likely participation in lighting fires under the waste piles – an open burning practice – presents all the dangers which motivated the launch of this project in the first place.
5. There is yet unexploited potential for some mid-grid income. The Council appears to be present only at the highly visible stages of waste disposal (*Arm's Length* and *Final Mile*). Mid-grid (where raw materials are prepared for recyclers and by-passing re-usables are sanitised and returned to point of use) there is no activity except for some scavenger-style picking off the waste piles at dumpsite. Section 5 of this report explores some opportunities and suggested implementation models.
6. The challenge of **aggregation** (achievement of minimum volumes) at the *Arm's Length* disposal stage remains unresolved. Especially when combined with the ultra-low waste collection fee of K20, this situation makes the district unattractive for entrepreneurial projects in this space (waste management).

TABLE 2.2: THE PROJECT WASTE MANAGEMENT GRID - GENERIC

DISPOSAL STAGE	WM PROCESSES	WASTE LOCATION	VOLUME	OWNER*	KEY CHALLENGE	POSSIBLE WM ACTIVITY	OPEX DEMAND	REVENUE	ACTOR	AREAS & COMMENTS
ARM'S LENGTH	QUARANTINE BAGGING REMOVAL	On-Site Receptacle		Producer	Aggregation/ Scale	<ul style="list-style-type: none"> ▶ SEGREGATION ▶ SIZE REDUCTION Compaction Shredding ▶ BYPASS TO: Re-use Recycle 	\$	\$		
FIRST MILE	IDENTIFICATION ROUTING REMOVAL	Waste Processing Facility		Producer	(1) Separation (2) Segregation (3) Routing	<ul style="list-style-type: none"> ▶ FILTER Accept/Reject? ▶ SIZE REDUCTION Compaction Shredding ▶ BYPASS TO: Recycle AF/ARM 	\$\$	\$\$		
FINAL MILE	IDENTIFICATION REMOVAL DISPOSAL	Landfill Reception		Landfill License Holder	Environmental Impacts	<ul style="list-style-type: none"> ▶ FILTER Accept/Reject? ▶ SIZE REDUCTION Compaction Shredding ▶ WEIGHT REDUCTION Drying ▶ REMOVAL TO: Recycle AF/ARM 	\$\$\$	\$		
END OF LIFE	DECOMPOSITION	Landfill		Landfill License Holder	Environmental Impacts	<ul style="list-style-type: none"> ▶ INCINERATION ▶ HARVESTING Leachate Natural gas Compost 	\$	\$\$\$		

* After EPR Regulations 2018




Separation: Process of sorting into different locations based on pre-determined characteristics

Segregation: Prevention of different characteristics from mixing

Aggregation: Adding together of items with similar characteristics to create larger quantities

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TABLE 2.3: THE PROJECT WASTE MANAGEMENT GRID – ADAPTED TO CHONGWE

DISPOSAL STAGE	WM PROCESSES	WASTE LOCATION	VOLUME	OWNER*	KEY CHALLENGE	POSSIBLE WM ACTIVITY	OPEX DEMAND	REVENUE	ACTOR	CBD & SUFS	TOWNSHIPS
ARM'S LENGTH	QUARANTINE BAGGING REMOVAL	WASTE DUMPING FLOOR		VARIOUS	Aggregation/ Scale	<ul style="list-style-type: none"> ▶ SEGREGATION ▶ SIZE REDUCTION Shredding ▶ BYPASS TO: Re-use Recycle EOL incineration 	\$	\$	CMC & CONTRACTORS	CMC Contractor	CONTRACTORS: • Citimop • ? • ? • ? • ? • ?
FIRST MILE	IDENTIFICATION ROUTING REMOVAL				(1) Separation (2) Segregation (3) Routing	<ul style="list-style-type: none"> ▶ FILTER Accept/Reject? ▶ SIZE REDUCTION Compaction Shredding ▶ BYPASS TO: Recycle AF/ARM 	\$ \$	\$ \$		No Activity	
FINAL MILE	IDENTIFICATION REMOVAL DISPOSAL	DUMPSITE		CMC	Environmental Impacts	<ul style="list-style-type: none"> ▶ FILTER Accept/Reject? ▶ SIZE REDUCTION Compaction Shredding ▶ WEIGHT REDUCTION Drying, Open Burning ▶ REMOVAL TO: AF/ARM Recycle 	\$ \$ \$	\$	CMC	Accept/Reject based on payment of dumping fee. Weight reduction operations achieved by waste pickers, included open burning Removal to recycle achieved by waste pickers working for private company.	
END OF LIFE	DECOMPOSITION				Environmental Impacts	<ul style="list-style-type: none"> ▶ INCINERATION ▶ HARVESTING Leachate Natural gas Compost 	\$	\$ \$ \$		Currently, no value realized beyond dumping. Landfill or Composting project has potential to create additional Revenue via sale of compost or gas	

* After EPR Regulations 2018
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3

District Context

3.1 General

Chongwe is a district based on agriculture, mining, mineral processing and transport services (Chongwe district actually hosts the Kenneth Kaunda International Airport, which was formally called Lusaka International Airport and is Zambia’s most important air travel hub). Military bases, which include the Zambia Air Force base at KKIA, two Zambia National Service camps and Mikango Barracks of the Zambia Army, add to the public sector activity and population.

The resident population of the District is 186,000.

The Central Business District is a short stretch measuring about 0.25km wide on each side of the Great East Road running for some 1.5km.

Chongwe has some of the most unusual spreads of population centres of all districts in Zambia. Many of the affluent areas are the ones bordering Lusaka City near the Western district boundary (Airport Road hosting various industries and organisations such as Delta Auto, Hitachi Construction Machinery, National Institute of Scientific Research, Medicines Regulatory Authority National Laboratory; Waterfalls Shopping Mall; Garden City Shopping Mall; Meanwood Ibex Hill residential compound; Mika Convention Centre; OP Compound; parts of Chelston township; Silverest, etc.) The farming blocks are sparsely populated and then a cluster of mid-to-low market residential properties forms what may be referred to as Chongwe district proper. The rest of the population is in the military establishments, the several boarding schools and Chalimbana University in addition to the rural-most village dwellings further west, southwest and northwest.

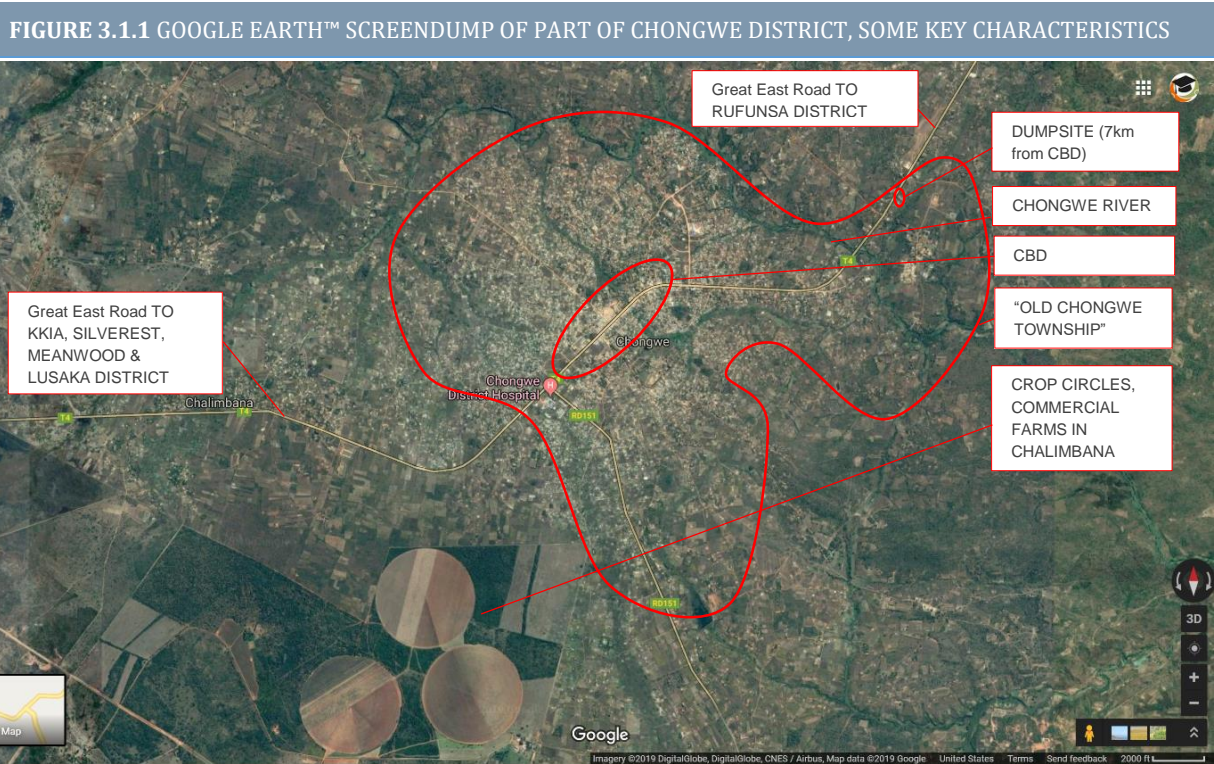
The Public Health department has recently (q4, 2018) demarcated the district into seven waste collection zones (called “districts”) but these are yet to be mapped, although they are described based on existing flagship area names as follows:

District	Flagship Areas/Townships	Other Areas	Current Collector	PTY count*
A	Chongwe (the old Chongwe township)	-	CMC	12,476
B	Chalimbana, Kanakantapa (farming areas)	-	-	-
C	Silverest, Waterfalls	Great East Rd	Citimop	710
D	Meanwood Ibex, OP Compound	Meanwood-Ibex Rd	Citimop	1,140
E	KKIA, Meanwood Ndeke, Vorna Valley, Zambia-China MFEZ		Citimop	3,102**
F	Chelston Ext. (aka Madido), Obama, Ngwerere		-	1,194
G	Kwamwena, Mutumbi	-	-	1,330

* estimated from street count, using satellite maps; refine using census door-to-door data and/or the Valuation Roll.

There is insufficient ready data to ascertain income levels specific to Chongwe District. However, some online sources [6], including the Zambia Development Agency [7], give indicative figures ranging between K7,700 and K15,800 as monthly incomes for moderately experienced first-degree holders across Zambia, across the various professions *in the private sector*. In its labour force survey published in December 2018, the Central Statistical Office [7] reported that the average income across all sectors, genders and experience levels by 2017 was **K3,330 per month**. These figures will be important for guiding expectations of ability to pay by households.

Figure 3.1.1 is a Google Earth™ screen-dump of part of the district of Chongwe captured to show some of the key features relevant to this study. The district does not yet have maps showing all current district boundaries.



Waste is collected in three ways in Chongwe:

TABLE 3.1.1 WASTE COLLECTION METHODS IN CHONGWE

TYPE	EXAMPLE	COLLECTION METHOD
SINGLE USER FACILITY (SUF)	Lodges, Schools, University, Colleges, Industrial Sites (e.g. Zambia China MFEZ), Hospitals	Privately contracted waste collectors or council recommended collector for that Waste Management District. The MFEZ is a special case since it is actually an aggregation of various SUFs which may not necessarily be contracted by the MFEZ management to one waste collector.
PUBLIC FACILITY	Markets, CBD	District Council directly responsible for collection. Charges facilities for Trading License and Health Certificates. Uses designated <i>open spaces</i> as localized <i>dumpsites</i> from where Council contracted collection trucks pick up the waste for direct transfer to the one municipal dumpsite. Council collects <i>daily</i> . Council has <i>no waste processing facility</i> so all collected waste is delivered to dumpsite as collected.
HOUSEHOLDS	The townships (as clustered into Waste Management Districts)	Council Responsible for collection. Where Council collects directly, collection fee is <i>K20/month</i> . Where collection is contracted to Third Party, fee is capped at <i>K135/month</i> . Council has contracted responsibility out to private companies and allows them to collect levies directly; in turn charges “License Fee” at <i>K7,000/year + K50/load</i> dumping Fee.

TYPE	EXAMPLE	COLLECTION METHOD
		Contractors required to collect waste from paying households at least: <i>no frequency prescribed.</i>

Prudent Estimation

There is no weighbridge at the dumpsite or anywhere else in the waste collection chain to establish volumes of waste collected with objective certainty. As waste can vary greatly in density, it is also not helpful to make uniform volume estimates for wastes sourced from different locations (counting number of full truckloads, for example, and multiplying by a common weight factor). As such, prudent estimates have been made as a starting point and may be subjected to strong correction later. A first level validation here has been done by comparing estimated total volume with a snapshot truck-count done at dumpsite.

TABLE 3.1.2 ESTIMATING CURRENT WASTE VOLUMES

DIST.	ESTIMATION BASIS	CONFIDENCE	BASE QUANTITIES	CALCULATION	WASTE VOL. (ton/month)
A	No. surveyed HH multiplied by waste generation factor, Wg	High	HH: 12,476 Wg: 2.7kg/HH/day	$12,476 * (2.7/1000) * 30$	1,011
B	Farming blocks (no waste collection currently done)	Low [†]	-	-	-
C	Currently served by one waste collection contractor who dumps on a regular basis. Waste from truck count approximation split according to ratio of PTY population.	Mid	PTY: 710	$20.1\text{tpd} * 30$ $*710/(710+1140+3102)$	86
D		Mid	PTY: 1,140	$20.1\text{tpd} * 30$ $*1140/(710+1140+3102)$	139
E		Mid	PTY: 3102	$20.1\text{tpd} * 30$ $*3102/(710+1140+3102)$	378
F	No. surveyed HH multiplied by waste generation factor, Wg	Low [‡]	HH: 1,194 Wg: 2.7kg/HH/day	$1,194 * (2.7/1000) * 30$	97
G	No. surveyed HH multiplied by waste generation factor, Wg	Mid	HH: 1,330 Wg: 2.8kg/HH/day	$1,330 * (2.7/1000) * 30$	112
TOTALS			PTY+HH: 19,852 HH only: 19,461		1,823

[†] These openly burn and/or bury much agricultural waste. Interviews would have to be conducted to estimate actual waste generated
[‡] High likelihood of waste leakage into Lusaka as these areas are actually "enclaves" inside Lusaka district radius.

A weighbridge and/or distributed scales to weigh waste bags would have to be included in the project implementation, going forward.

The figure of 1,823tons.per.month (equivalent to 22,180tpy) of waste is **available waste**. Collected waste is much less and is worked out from known dumpsite receipts (recall that these are heavily subjective estimates as there is no weighing of the waste at reception) as follows:

- Citimop deliveries (currently servicing future Districts C,D and E): 20.1tpd equivalent
- Abattoir and public facility waste collected and dumped by Municipal Council: 3,000kg per week equivalent
- Miscellaneous random dumping: 750kg per week equivalent

These receipts estimate the **collected waste** in the district at $(3,750 * 52)/1000 + 603*365/30$, or 7,532tpy, representing a **collection rate of 34%**.¹

¹ Given the analysis of Section 7.2 – where it is shown that real waste generation is closer to 3,392tpm, the lower limit of estimate of collection rate for the district is $7,532/(3,392*12)$, or 18.5%. When volumes from District B and

For a recently upgraded district,

- Without many waste collection facilities (such as skips or bins in the public facilities),
- Low coverage (hospitals only now under consideration to be added to the Municipal Council's waste collection route, for example; no licensed collector for a large part of the household population),
- A barely functional waste collection contracting system (only one licensed collector in Citimop Ltd), and
- No waste mapping to facilitate systematic planning,

It is not a surprise that the waste collection rate is as low as it is (about 11% points lower than Lusaka City Council which serves a much larger population at around 1.8million, compared to Chongwe at 0.186million).

Sustaining cash for waste management

In order for a municipality to assess the sustainability of its waste management system, a very critical factor to measure is the weight-specific self-sustaining cash available. In order to arrive at this number, all fees received by the municipality for in payment for any service or product of its waste management are totaled up and then divide by the total weight of waste handled. Any "free cash" such as grants, loans, etc., which are not received in payment for service or product are excluded as their availability does not follow naturally from the performance of routine waste management operations.

The district currently puts **US\$0.28/ton** into waste management and disposal. The near-term potential (i.e., after all seven Waste Management Districts are contracted out and at least one dumping is made from each of the WMDs per week) is \$0.73/ton

This level of *self-financing is highly inadequate* as it is as high as €100/ton in some OECD countries [5, pp31], [13] and as high as US\$30/ton in some African cities [14 pp13].

Table 3.1.2 is the analysis.

At this amount of cash available for waste management, it is not surprising that:

- The Council struggles to attract effective contractors into its waste management activities, especially to service the less affluent Waste Management Districts (outside of Districts C, D & E)
- Only one waste collection contractor who services the much more lucrative Airport-Waterfalls-Meanwood stretch – where the institutional and more up-market domestic waste generators are located – is fully operational, alongside the Council's own collection system serving the CBD and some registered institutions
- The Council has no cash available for many critical process steps at the dumpsite and frequently relies on Zambia National Service assistance with earth moving equipment to shift and compact waste at the dumpsite.

While the arrangement with the Zambia National Service might be a pragmatic solution at the moment, it is not to be relied upon as the Zambia National Service might, for own reasons, want to rationalize their heavy equipment running costs or to scale down their CSR activities in future. If that happened, it would leave the Municipal Council incapable of managing waste placement at its dumpsite, compromising its license conditions and, at worst case, losing its license to run the dumpsite altogether. It is therefore instructive that the council seriously consider all solutions to the problem of low self-sustaining cash in the waste management function.

actual weights are being used, rather than visual estimates, it will be possible to narrow the range of uncertainty. For now, the strictly correct report for the district waste collection rate is **26.5±8%**. The higher end of the range is maintained in main report as it contains far fewer assumed/estimated values.

Several scenarios could be considered to increase the self-sustaining cash, such as:

- Adjusting the fixed contractor license fee to bring it in line with similar size districts like Livingstone
- Stop the practice of allowing contractor companies to collect Waste Management fees directly. This allows the Council to regain the entire space of households from which Waste Management fees can be collected directly. The contractors can then be paid per weight of waste transported instead of being charged a license fee (they offer a handling and transport service only, instead of both that service and a fee collection service). WM fees are collected systematically using agency collector such as ZESCO or house-to-house collection, together with property rates or other regular fees, in a more mandatory/pro-active manner. See the *Optimised* scenario in Table 3.1.3 below for changed financials.
- Widening waste collection coverage
- See other suggestions below for WMG-based suggestions

TABLE 3.1.3 SUSTAINING CASH AVAILABLE FOR WASTE MANAGEMENT IN CHONGWE				
Scenario Root	One Off Fees	PAYG Fees	Waste Volumes	Working
<i>Current</i>	1 licensed contractor active: K7,000 * 1 = K7,000 / Year	1 dumping per day equivalent at K50/delivery K50 * 365 = K18,250	7,532 tpy	From Prudent Estimates above
	$(K7,000 + K18,250)/7,532$ = K3.35 per ton = \$0.28/ton			@ K11.9/US\$
<i>Increased Contracting</i>	7 licensed, active K7,000 * 7 = K49,000	1 dumping per week per WMD equivalent at K50/delivery * 7 * 52 wks/yr K50 * 7*52 = K18,200	7,727 tpy	Council hands over all current service areas to contractors who optimize frequency of dumping
	$(K49,000 + K18,200)/7,727$ = K8.70 per ton = \$0.73/ton			@ K11.9/US\$
<i>Waste-and-Fee Collection Separated</i> <i>(the "Optimised" scenario)</i>	7 licensed, active No license fees	K20/HH * 19,461 HH = K389,220 Less per weight payment to transporters K10/ton * 22,180 = K221,800	22,180 tpy	
	$(K389,220 - K221,800)/22,180 = K167,420/22,180\text{ton}$ K7.55 per ton = \$0.63/ton			@ K11.9/US\$

Thus, there is potential to increase cash available for waste management processes, **without increasing waste management fee per household** (although, at K20 per household per month, it is exceptionally low compared to other districts of similar demographics in Zambia. The *Optimised Near Term* scenario can be improved to net **\$2.00/ton**, total K529,449 per year by simply raising the collection fee into the range K30 – K70 depending on the Waste Management District where a household is located, an improvement of 714% on the current \$0.28/ton).

Alternative Collection Scenario 1

If the contracting only were increased (with pro-active management to ensure that each contracted company remains active), waste management cash could be increased by **260%** from current level. This scenario would not involve any change in the current waste collection fee. However, the Council would need to be more pro-active in supervision of the waste contractors to keep them active as well as in compelling householders to pay their collection fees in a timely manner, suggest quarterly payments rather than monthly.

Alternative Collection Scenario 2

If the method of fee collection were changed to one that is more mandatory, the Council maintains responsibility for *aggregation*, and only pays for contracted waste transportation, then waste management cash could be increased **225%** from current level.

Alternative Collection Scenario 3

Further, if, in addition to the actions in Scenario 2, the waste collection fee were rationalized to bring it in line with the minimum fees paid in other comparable districts, the cash improvement could be as high as **714%**.

In short, even at current low levels of waste management fee, there is potential to broaden the effectiveness of the waste management operations and to increase sustaining revenue from the waste supply side.

End-Of-Pipe Revenue

However, even at the most increased level, the sustaining cash is about *one-fifteenth* of the cash available for equivalent operations in some South African towns (\$2.00/ton cf. \$30/ton [14pp13]). It is therefore instructive that the Council take a critical review of sustaining cash generation using the Waste Management Grid (ibid., Section 2) as an additional step. As cited in Chapter 2, the Municipality actually loses some of the highest cash generation opportunities by short-stopping its Waste Management Grid (i.e., ending its waste management activities at the dumpsite), a commonly encountered error in many districts in Zambia.

The Municipal Council must therefore do some or all of the following:

- **Work on the supply side (entry-point solutions)** to justify collection of additional cash there. Ultimately, this will mean the Council taking back the responsibility for broadening the uptake rate of paid-for waste collection services (council taking back the responsibility for aggregation). These actions would make *Alternative Scenario 3*, above to be more acceptable to other stakeholders in the waste management function of the Municipal Council. They are also the critical link which increases captured waste volumes and enables *End-Of-Pipe* solutions to be feasible (the first requirement of industrial end-of-pipe waste consumers such as composting farms, waste-to-energy investors, AF/ARM customers, etc. is the attainment of **minimum volumes** of usable waste fractions). Some specific action proposals:
 - Educational campaigns in schools, hospitals, local radio, via market committee, etc.
 - Improving consistency of collection
 - Supplying appropriate waste bags and tagging them so that regularly compliant households can be quickly separated from the non-compliant ones in the database, to enable targeted follow-up and/or enforcement
 - Engagement of traditional leaders to enable common appreciation for planned waste management
- **Create value at the tail end** of the waste supply chain to attract *end-of-pipe* cash using *industrial ecology* activities such as waste-to-energy, waste-to-raw material projects, etc. The Waste Management Grid (pages 10 and 12) revealed that Chongwe loses all possible income from the decomposition stage of waste (compost and/or natural gas or leachate), succumbing instead to *open burning* of the potential feedstock. For the near term, the Council should consider a composting project. The creation of commercial outlets – even the signing of

product off-take MOUs – for the compost must be a key component of the project right from the start. For the long term – once wider uptake of waste collection service is achieved, an engineered landfill could be considered, with the sale of gas, leachate or heat being the income generation opportunities.

- **Invest in mid-grid activities** such as waste sorting, drying, bagging and baling, shredding, pelletizing, etc. (in short, “pre-treatment” activities) in order to earn mid-grid income from recyclers. A first-level overture has been made to the cement manufacturer, LafargeHolcim at Chilanga, for the possible uptake of the energetic fraction of the waste in exchange for support to better equip and protect the informal waste pickers at the dumpsite and a minimal logistics fee. A positive response has been received with an indication that sustainability of volumes would be the most critical factor in LafargeHolcim deciding to proceed their interest to the next step.

3.2 Regulations & Market Mechanisms Covering WM in Chongwe

The **Local Government Act** (cap. 281 of the Laws of Zambia) empowers local authorities to enact by-laws applicable in their parts of the country. Laws on air quality, cleanness of surroundings, people movement, etc., are particularly expected. The municipal and District councils are also responsible for construction and maintenance of the inner District, suburb and township road network. Under this project, this latter function of the District Council is important as it allows proper access for waste collection and waste movement.

The **Environmental Management Act** (2011) established and empowers the Zambia Environmental Management Agency (ZEMA) to regulate all matters related to environmental management, including approving environmental impact assessments for all prescribed projects (such as dumpsites or landfills). For the case of dumpsites or landfills, the ZEMA must issue an annually renewable operating license.

Incentives

There are certain steps the District Council has taken which could marginally/loosely count as being incentives. These might be referred to as indirect incentives, and they include:

- Provision of information to market committees on waste management within their shared public spaces,
- Provision of waste collection spaces in markets and bus stations
- Promotion of private entrepreneurial participation in waste management via the waste collection contracts offered
- Low waste collection and waste dumping fees (compared to similar cities locally and internationally)
- Flexible enforcement of penalties for waste management delinquencies (mostly, the educational rather than the prosecutorial route is chosen)

However, in the strict sense of making managed waste handling more attractive than unmanaged disposal, there are **no direct incentives** in place.

Deterrents

In a recent reinforcement of the battery of regulations subsidiary to the Local Government Act, the Minister of Local Government signed in to law S.I. No. 12 of 2018, also referred to as *The Local Government (Street Vending and Nuisances) (Amendment No. 2) Regulations of 2018*. These amendment regulations replaced the **schedule of penalties**, referred to as the First Schedule in the equivalent regulations of 1992. The penalties governing street vending, hawking, littering, waste disposal, cleanness of premises, etc., have been clarified and increased as shown in Appendix A1 to

this report. The District Council has full authority to enforce these penalties where it determines that they are necessary.

Information, Public Awareness and Internal Training

Available laws and by-laws notwithstanding, the main modes of supplying waste management information from the District Council to the public have been observed to be:

- Via the Market Committee (to marketeers)
- Via the official contacts (to contractor companies)
- Via the Councilors (elected local government politicians) who are the actual municipal council, working as a governing board providing local policy direction to the career Ministry of Local Government employees, and guidance to their electorate in the townships
- Via press releases (paid for advertisements) in the newspapers, radio and television
- Via tree-hugging posters, wall fence posters and notice board pinnings
- Via mobile loudspeaker going round the townships as need arises

The above means of raising public awareness may look adequate. However, all but the second one are only good for providing snapshot messages of a non-technical nature. In order to deliver information regarding waste management (correct segregation, collection, need-to-pay, safe re-use, recycling, etc.), there would be need for a deeper and more sustained engagement. Thus, the District Council needs to give this aspect its own space and resource allocation in its Waste Management Plans.

The Council must also ensure that its staff in the Department of Public Health receive the most relevant training available so that they can manage their function most innovatively.

4.1 Population Map

The Municipal Council is yet to generate its authoritative district map so the population centres could not be refined further than shown in Section 3.1

4.2 Waste Map

The Municipal Council is yet to generate its authoritative district map so the waste generation centres could not be refined further than shown in Table 3.1.2

4.3 Collection Systems

Two collection systems have been used in Chongwe:

- Door-to-door in all contracted areas
- Unmanned collection centres in the CBD and all other areas where the Council collects

Frequency

The frequency of collection is at least once per week.

Routing

The contractor has been left to optimize their own routing in the zones where they operate, so the routes may vary depending on households who have paid up for the service that month.

It is anticipated that in q2 of 2019, the Municipal Council will finalise its selection and contract awards to the seven contractors to collect waste from the seven WMDs. The contractors will still be left to optimize their routing for their own cost control.

Segregation

There is no provision for segregation at point of origin as the waste is thrown in an open space where it mixes freely (for the public spaces) or else the waste is recombined before dumping at dumpsite as there is currently no *mid-grid* waste processing of any kind in Chongwe district.

Quantities

One District-wide characteristic of waste collection is that there is *no weighing anywhere in the collection chain*. Some Zambian cities like Lusaka have a weighbridge at the dumpsite/landfill and this works like an end-of-chain validation on all estimates made upstream. Chongwe District does not have this provision. Nor does the District have a pressing need to weigh as all collection service charges are either *period-based* (per month) or *incident-based* (per dumping), without any reference to quantity dumped. Thus, all reported weight figures are based on experiential knowledge of volume estimation. This puts a large and open factor of uncertainty on the numbers. However, on a global scale, data has been compared to other places of similar demographics to Chongwe, as a first line of validation.

4.4 Waste Characterisation

There are five key points of interest at which a characterization was desired in this project:

1. Households (at least one set from each of the 7 zones)
2. CBD – shopping mall
3. Township public facility (market)
4. **Entrance to dumpsite**
5. Dumpsite – after waste picking

However, the number of samples necessary would be overwhelming under current project terms. The best compromise was to take sample #4 to represent general District waste.

The entrance to the dumpsite was easy to access and the trucks could easily be sampled. However, representativity was found to be a clear problem. The solution was to sample from freshly dumped materials, cut all the sampled particles down so that a new representative weight could apply, then downsample until a small enough representative weight (around 10kg) was obtained. The characterization below is of this final sample.

TABLE 4.4.1 CHARACTERISATION OF DUMPSITE RECEPTION SAMPLE																						
LINE	STEP	TOOLS	DETAIL	RESULTS																		
1	First Sample Dig-Out	Spade Shovel Polyethylene Bags	Dig out approx. 1.0m diameter, 0.5m depth, cylinder of waste from the stockpile																			
2	Mixing (see Photolog 7)	Garden Folk Spade	Use the garden folk to turn the waste around to homogenise the distribution of materials through the sample Use spade to cut and break down large pieces of waste																			
3	Down-sampling (see Photolog 7, 8)	Spade Shovel Clear floor space Polyethylene Bags	Cut out about 20% of the sampled material from the waste poured on a clear floor																			
4	Drying	Garden folk	Spread out the re-sampled materials to dry out naturally from daylight heat																			
5	Filtering	Grid/sieve	Use a grid (mesh size at least 50mm) to filter out abnormally sized objects																			
6	Separation	Garden folk	Spread the filtered materials out on clear floor and manually separate into the various material categories																			
7	Weighing	Scale	Weigh each of the materials separately	<table border="0"> <tr><td>Glass:</td><td>1.81 kg</td></tr> <tr><td>Plastic:</td><td>2.00 kg</td></tr> <tr><td>Organics:</td><td>6.00 kg</td></tr> <tr><td>Wood & Paper:</td><td>0.74 kg</td></tr> <tr><td>Textiles:</td><td>0.08 kg</td></tr> <tr><td>Rubber:</td><td>0.31 kg</td></tr> <tr><td>Metal:</td><td>0.13 kg</td></tr> <tr><td>Other:</td><td>0.29 kg</td></tr> <tr><td>All</td><td>11.36 kg</td></tr> </table>	Glass:	1.81 kg	Plastic:	2.00 kg	Organics:	6.00 kg	Wood & Paper:	0.74 kg	Textiles:	0.08 kg	Rubber:	0.31 kg	Metal:	0.13 kg	Other:	0.29 kg	All	11.36 kg
Glass:	1.81 kg																					
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Textiles:	0.08 kg																					
Rubber:	0.31 kg																					
Metal:	0.13 kg																					
Other:	0.29 kg																					
All	11.36 kg																					
8	Report	Calculator	Calculate the percentage of each type of waste by weight	<table border="0"> <tr><td>Glass:</td><td>16 %</td></tr> <tr><td>Plastic:</td><td>18 %</td></tr> <tr><td>Organics:</td><td>53 %</td></tr> <tr><td>Wood & Paper:</td><td>6.5 %</td></tr> <tr><td>Textiles:</td><td>0.7 %</td></tr> <tr><td>Rubber:</td><td>2.7 %</td></tr> <tr><td>Metal:</td><td>1.1 %</td></tr> <tr><td>Other:</td><td>2.6 %</td></tr> </table>	Glass:	16 %	Plastic:	18 %	Organics:	53 %	Wood & Paper:	6.5 %	Textiles:	0.7 %	Rubber:	2.7 %	Metal:	1.1 %	Other:	2.6 %		
Glass:	16 %																					
Plastic:	18 %																					
Organics:	53 %																					
Wood & Paper:	6.5 %																					
Textiles:	0.7 %																					
Rubber:	2.7 %																					
Metal:	1.1 %																					
Other:	2.6 %																					

4.5 Summary of Challenges

The following key weaknesses have been noted for improvement:

1. The waste collection rate is very low (estimated 34% cf. Lusaka 45%, Livingstone 57%, Ndola 49%). Contracting of collection companies should be expedited.
2. No district-wide mapping to enable systematic waste management planning.

-
3. A systematic and full-coverage WACS will validate and improve collection estimates. Time and resource constraint on current exercise limited the quality of characterisation achievable (as presented in Section 4.4 above). Section 4.6 (below) suggests a work-plan.
 4. No weighing of any part of the waste in the entire supply chain until the dumpsite.
 5. Short-circuiting of all the waste from point of generation to the dumpsite. There is no mid-grid activity other than the recycling that happens at *arm's length* disposal stage.

4.6 Opportunities for Development

WACS

The characterization achieved in this effort is good enough for opening the conversation on waste management in Chongwe District and for making high-level estimates only. However, in order to gain data to guide detailed plans and costs, it will be useful that a full Waste Analysis and Characterisation Study (WACS) is carried out involving all key points of the waste distribution chain. These should include:

- All the townships, using representative households – recommend 5-10 samples per WMD per day covering at least 3 carefully chosen days, total 105 - 210 samples
- All key public centres (markets, food outlets and shopping malls, bus stations, lodges, etc.) – recommend total 60 samples
- Industrial establishments – recommend total 10 samples
- The dumpsite entrance – recommend 3 samples
- The dumpsite (after the waste-pickers have completed their picking) – recommend 3 samples

The total of 181 - 286 samples analysed would create a very clear waste balance. It would require some 15-30 workers (sorters, weighers, data loggers, drivers or hired transport, and analyst/s) dependent on time available. Around 15 work days for the team should be allowed to complete the exercise.

The end result of the WACS would allow for a source/cause assessment to be made, and which assessment would supply waste generation functions which can confidently project the evolution in volumes and characteristics as the District develops its industrial and demographic structure. The Waste Management Plan, including composting and final disposal, could then be updated with information of the highest quality.

Technical Training

However, for the above study to happen with full ownership at the Municipal Council, some targeted practical/hand-on training is recommended for the senior and technical staff of the Council's Department of Public Health. This would enable them to take fullest advantage of the resources available to them in conducting the WACS as well as the results when they are obtained.

Dumpsite

Some key factors at the dumpsite need to be clarified and resolved for any plans around it to be bankable, including but not limited to:

- **The leasehold.** As the land is still under control of traditional leadership, the uncertainty of continued access and use as a dumpsite remains, especially if there were to arise any difference in strategic interests between the Municipal Council and the traditional leadership which currently allows access to and use of the land for waste dumping. While the goodwill and positive neighbourliness of the traditional leadership is noted and much appreciated, *the Council should still pursue a more legally defensible claim on the dumpsite land for planning and other purposes discussed below.*
- **Licensing.** A silent condition of license is that the license holder have legal entitlement to access and use the land involved for the licensed purpose. The license is non-transferrable to other parties or other locations. In the event that access to and/or use of the land were denied by the current leaseholder, any current license to operate the dumpsite would become invalid, leaving the Council with the catastrophe of having nowhere to dispose of its waste. While the goodwill and positive

neighbourliness of the traditional leadership is noted and much appreciated, the Council should pursue a more legally defensible claim on the dumpsite land for licensing purposes.

- **Health & Safety.** There are two groups of organized pickers at the dumpsite. These are employed by a private entity. However, that they are operating on Council property implies that the Council has given its consent for the said pickers to access the property and carry on their business. Thus, the Council holds duty of care over the safety of the pickers. It will be in the Council's interest to ensure that the pickers are subjected to regular Health & Safety checks by their employer and are provided with appropriate PPE whose use is constantly enforced.

Recycling

There is no industrial or quasi-industrial waste recycling operation in Chongwe District. However four key recycling works operate either at subsistence (household income) level or as sourcing operations only, and three potential recycling off-take opportunities have been identified. These need to be either simply accounted for officially or explored further in official Opportunity/Feasibility Studies for possible industrial implementation.

Current recycling activity:

- **PET bottles and thick-film plastic.** The waste pickers at the dumpsite are employed by entities to isolate and bag these materials which are then shipped out to Lusaka for recycling. The pickers are paid according to the weight of materials recovered from the waste heaps.
- **Textile off-cuts** from tailors in the public market. These are used for making door mats and are sold to off-takers directly by the tailors as they accumulate the offcuts over many work-days
- **Wood chips and saw dust** from the woodworkers and any wood waste arising in the public market. These chips are used as alternative fuel by home-based makers of the local drink called *munkoyo*. Saw dust is used as bedding material for chickens in the home-based poultry rearing.
- **Saw dust** from the woodworkers in the public market. Saw dust is used as bedding material for chickens in home-based poultry rearing. The quantities involved here are very small (less than 50kg per month).

In interview, the waste pickers indicated that they are also encouraged to pick aluminium cans as their principal employers at Lusaka are interested in aluminium too. However, the quantity of cans arriving at the dumpsite is, apparently, negligible and is therefore not included above as a separate recycling activity in Chongwe.

Potential *end-of-grid* operations:

- **Energetic fraction at bottom-end.** After contact with the Geocycle Manager at LafargeHolcim, Chilanga, it was discovered that LafargeHolcim still have a strategic focus on Alternative Fuels and Alternative Raw Materials to fit their group ambition of getting 50% of their energy from alternative, greener sources by 2020. As such, subject to realizable volumes, LafargeHolcim Zambia plc would be willing to explore in an Opportunity Study, the potential for taking the residual energetic fraction (including abattoir waste) from Chongwe on a consistent basis.
- **Compost.** Unusually for municipal waste, the Chongwe dumpsite characterization revealed a very high (53%) organic fraction (25 – 35% is more regular). This result is attributed to the fact that much of the waste comes from only 3 WMDs which include affluent households, the airport, and two major shopping malls at Waterfalls and Garden City, as well as the presence of abattoir waste (Chongwe is a major beef supplier, based on the various cattle herds within the district and the neighbouring Rufunsa district). This high organic fraction would be good raw material for a compost yard.
- **Glass.** Recently, a strong proof of concept was encountered in Livingstone for partial substitution of aggregates with crushed glass in the manufacture of cement blocks. At 16%, the glass fraction is likely to be a useful resource for block makers willing to pilot glass-substituted concrete blocks in Lusaka. If an opportunity or feasibility study were decided upon, much test material is already available at IB Blocks Ltd at Livingstone.

Recycling and Recyclables

5.1 Current Practices

There are four recycling related operations in the district; three are home-based subsistence-scale recycling work while the more industrialised one is completed in Lusaka, with Chongwe only hosting the raw material sourcing using pickers at the dumpsite. These operations are:

- Hand-knitting of door mats – using textile off-cuts
- Brewing of *munkoyo* – using wood chips
- Bedding for poultry – using saw dust and wood filings
- Picking of PET bottles and thick-film plastic

Not surprisingly, there is *very little metal* (1.1%) found at the dumpsite. It is commonly known that scrap metal has a ready customer at Kafue, south of Lusaka, willing to pay lucratively for it. As such metal is picked up regularly from many towns in Zambia. Looking at the stark absence of metal at any of the waste sites and at the dumpsite, it is reasonable to believe that Chongwe also supplies its scrap metal to the steel plant at Kafue. However, because no actual observation or interview response was met giving a positive indication of the dispatch of metal to this or any other route, metal recovery and recycle has not been included on the above list of recycling activities.

Table 5.1.1 is the grid of current off-take and the terms thereof

TABLE 5.1.1 RECYCLING – CURRENT OFF-TAKERS				
MATERIAL	KEY PRODUCERS	CURRENT OFF-TAKER	PRICING (\$/kg)	SPECIFICATIONS AND END-USE(S)
TEXTILE OFF-CUTS	Tailors in market	Home-based knitters of door mats	K1 – K3 per kg	None
PET PLASTIC & THICK-FILM PLASTIC	All hotels, lodges, restaurants, shops, supermarkets, malls	Local (Chongwe): various cooking oil MSMEs - Chinese community who source bottles informally in Lusaka.	K0.10/bottle in batches of 10 K0.05 – K0.30 per bottle	Local: must have lids/caps – strictly not recycle but reuse. Lusaka: wash only
OTHER THICK-FILM PLASTIC	Manufacturing industry, hotels, malls, supermarkets	Many home-based MSMEs	K3.00 – K5.00 per kg	Make floor polish (“cobra”)
WOOD CHIPS	Woodworkers and civil contractors in market	Home-based brewers of <i>munkoyo</i>	0	None
SAW DUST	Woodworkers in market	Poultry farmers for bedding	0	None
METAL	Various canned food outlets; C&D waste; garages	UMCIL Kafue (Trade Kings Group)	K2,000 – K2,500 per ton	Volumes required for the long transport (>100km) to off-taker

5.2 Opportunities

Table 5.2.1 is the recycling table showing potential off-takers identified and the specifications expected.

TABLE 5.2.1 RECYCLING – POTENTIAL OFF-TAKERS

MATERIAL	KEY PRODUCERS	POTENTIAL OFF-TAKERS	EXP. PRICING (\$/kg)	SPECIFICATIONS AND END-USE(S)
GLASS	Hotels, eateries. Lodges, bars	Block makers (after technical appraisal and market sensitisation)	Uncrushed: 0 Crushed: Suggest pricematch aggregates	None. Suggest development of ZS to increase market
THIN-FILM PLASTIC	Households (from supermarkets)	Cement manufactures (LarfargeHolcim, Chilanga) will accept to strict specs at no fee Recyclers reject for poor handling	0	Zero Chloride content Suggest pre-treatment (melt and cut) then join to thick-film plastic
PAPER	Numerous	Cement manufacturers (LarfargeHolcim, Chilanga), high-energy users (AF)	AF: 0 Other: K1-1.5/kg	Glossy and coloured paper to AF. May need test for chlorides
RUBBER	Garages and households (tyres)	Project proposed at LarfargeHolcim, Chilanga	Up to US\$100/ton	Washed whole tyres. May have to shred later
ORGANICS	Households; all eateries and hotels	CMC Composting project	K0	Fatty oils undesirable Presence of inorganics will increase handling, reduce feasibility

5.3 Roadmap Proposed

The end state desired is where all recyclable materials are captured at the dumpsite reception yard and systematically routed to off-takers at regular intervals. In order to get to this state, some common steps need to be followed in a roughly predictable manner. Table 5.3.1 presents these activities with ball-park estimates of costs and initial incomes to target before advancing to next actions.

TABLE 5.3.1 SUGGESTED ROADMAP TO SYSTEMATIC MID-GRID ACTIVITY AT CHONGWE

STEP	STEP SUMMARY	ACTIVITY	ESTIMATED MAX CAPEX	TARGET INCOME
			K'million	K'million
1	Supply side lobby	Prepare strategic plan with a market-capturing theme to promote development of managed waste handling in the district. Promote at Town Clerk or Mayor level for best publicity and support Engagement of key interested parties and supporters under the project theme Obtain financial and commercial support to carry out immediate next steps	0.06	0.70
2	Completion of Full-Scale WACS	To support a bankable recycling Business Case Can swap timing with previous step.	0.25	n.a.
5	Focus: Glass	OS for partial substitution of aggregates. Engagement of possible off-takers Enforce EPR requirements of distributors of the rejected specifications of glass to either export back or use it in other innovative ways	0.05	0.30+
6	Focus: Organics & Food	Coincide with composting project (see Section 6.2) Study other possibilities such as oil extraction	0.30	0.30+
7	Focus: Paper, Wood, Textiles, Rubber	OS for AF (LarfargeHolcim?) and ARM (egg tray forming, furniture, construction, etc.)	0.40	0.70+

5.4 Quantities and Sustainability

Without the opportunity to validate any of the weight information at any stage in the waste distribution chain (no weighbridge), the estimates here must be taken as indicative only and subject to validation and correction as soon as actual weighing becomes possible.

Secondly, without a WACS to enable direct counting of the various waste components, the only possible means to work out the quantities available for recycling activities is to back-calculate them from the total quantities of waste available and the characterization of Table 4.4.1. Table 5.4.1 is the mass balance showing quantities available at the various stages of the waste distribution chain.

ID	COMPONENT	%	tpm	Guide	Re-Use	Re-Cycle	AF/AR M	Composting	Land-fill*	O/S**
1	Glass	16	290.5	No off-taker					290.5	▼ ³
2	Plastic	18	321.0	Thin film (c.30%) difficult to recycle		224.7			96.3	
3	Organics	53	962.9	No off-taker					962.9	▼ ²
4	Wood & Paper	6.5	118.8	No off-taker at dumpsite					118.8	▼ ¹
5	Textile	0.7	12.8	No off-taker at dumpsite					12.8	▼ ¹
6	Rubber	2.7	49.7	No off-taker					49.7	▼ ¹
7	Metal	1.1	20.9	Finds way to steel plant		20.9				
8	Other	2.6	46.5	-					46.5	
		100	1,823			246			1,577	
					0%	13%	0%	0%	87%	

* Majority of the mass burned in apparently accidental fires

** Opportunity Study proposed, i.e., potential off-taker identified

▼¹ O/S for use as AF

▼² O/S for composting

▼³ O/S as ARM for partial substitution of aggregates

Table 5.4.1 shows that 87% of the materials that currently arrive at dumpsite end up either being burnt in the fires that apparently auto-ignite or are compacted over and buried with earth as a final landfilling action. The recycle rate is projected at 13% (see notes below for adjustment).

Additional Notes on Plastic

There is a strong possibility that some PET and other plastic materials do by-pass the dumpsite on their way to Lusaka recycling facilities as some picking was observed in the CBD although it was not possible for any interview with the picker concerned to be conducted.

Additional Notes on Textiles

The count of tailor stands in the market on the day of survey there was 17 and more. Unfortunately, the respondents who were randomly approached gave widely differing responses for the quantities they produce as textile off-cuts from their tailoring operations. This could well be acceptable as the quantity of off-cuts does also depend on experience and expertise in maximization of textile for tailored garments without throwing off much material in off-cuts. One respondent said they sell off approximately 25kg in off-cuts per week. A second said they sell off approximately 15kg every three months, while a third admitted to 5kg every fortnight. Clearly 25kg per week (translating to 1ton every year for the one tailor alone, or close to 20tons for all the tailoring section in the market) was overstated (otherwise this market alone, serving about 1% of Zambia's population, would be a 200ton/year textile consumer). The other two responses at 15 – 30 kg per quarter appears to be more palatable as it translates to around 0.6 – 1.2 ton/year in textile offcuts. A more targeted study involving raw material procurement data and off-cut sales data would provide higher quality results.

For the current study, the only reliable feedback is that around 100% of the textile off-cuts are recycled into door mats and similar hand produced crafts.

Aluminium Cans

It was expected that a good quantity of these would be found being picked at dumpsite seeing as some of the waste catchment facilities are big shopping malls and the largest international airport in the country. The obvious lack of these indicates the presence of more up-stream off-take of the cans before the waste stream arrives at dumpsite. A longer exercise would establish for sure what happens to the cans.

Overall figures

Tables 3.1.2 and 5.4.1 indicate that the waste in Chongwe totals 1,823ton/month. However, comparison with other districts and, more specifically, Livingstone (3,285ton/month) whose resident population at 180,000 is comparable to Chongwe's at 186,000, shows that the real volume of waste in the district is likely to change the indicated figure to 3,392ton/month. This agrees with indications from other assessments such as the absence of aluminium cans, non-collection from District B (the farming blocks), non-collection from some public facilities such as the District Hospital, etc.

Without dedicated waste picking from the unserved locations – except for opportunistic/irregular uninvited scavengers – it is reasonable to expect that the recovery of recyclables from these other locations is poorer than occurs at the dumpsite. The extreme cases of recycle from these unserved or under-served places are zero recycle and less than 13% (which is the calculated rate for the dumpsite – see above). In the case of zero recycle from the unserved and under-served waste generation centres, the overall recycle rate for the district would be 6.987%. This is the more prudent estimation. Hence:

- *Current overall recycle rate: 7%*
- *Waste disposed of in other ways, including burning and burying: 93%*

District-Level Waste Disposal

6.1 Current Dumpsite and Its Challenges

Even with a low overall waste collection rate, Chongwe lacks an adequate landfill or fully managed dumpsite. The current dumpsite is located on the Southern side of Great East Road on the Eastern exit from the District. The following features are worth noting:

1. The land is still under traditional ownership; the Council has simply been allowed to access and to use it as a dumpsite by the Village Headman for that part of the district.
2. The 15 waste pickers who work here are actually employed by a private waste recovery company, a very unusual occurrence for waste pickers operating in the dumpsites in other districts in Zambia. They were willing to be interviewed and to supply key information on the type of materials they pick and the supply chains after picking. Interviews conducted in local language for clearest communication.
3. The inconsistent use of PPE by the waste pickers, even though they mentioned that their employer provides PPE and they actually showed some of it. However, it appeared that the PPE (e.g., the gumboots) needed to suit the weather. In the hot season, the temperatures made the use of the given PPE highly uncomfortable and it was not used.
4. During the time of on-site survey at Chongwe, a sub-surface fire had been active at the dumpsite for over three days. The fires are said to be accidental.
5. The well fenced dumping area complete with guardhouse at entrance, another unique feature for district dumpsites in Zambia.

6.2 Improvement Plan

While the ultimate aim in each waste disposal plan is to have a sanitary landfill to take the residual material after all mid-grid and tail-end activities have been completed, it is clear from the leasehold situation on the dumpsite land as well as the lack of sustaining cash entering waste management in the District that a landfill – particularly an engineered one – is very far out. Thus, the only actions for the district's waste disposal plan centre on managing of the current dumpsite and resolving the open risks that its peculiar leasehold presents. A few activity proposals stretch beyond the dumpsite in search of some end-of-pipe revenue, but even these can only be low-value, short term proposals until longer-term certainty of access can be assured. These activity proposals are presented in the next sub-section as “quick-win opportunities”.

- **Normalisation of leasehold** on the dumpsite land to allow long-term development work (land currently still under control of traditional leadership). This situation means that certain significant actions, *not limited to outright restriction of access or even closure of operations*, are effectively under the control of a third party other than the Municipal Council,
- **Licensing.** An implicit condition of dumpsite license from the environmental regulator, ZEMA, is that the license holder have legal entitlement to access and use the land involved for the licensed purpose. The license is non-transferrable to other parties or other locations. While the goodwill and positive neighbourliness of the traditional leadership in availing land to the Municipal Council for use as a dumpsite is noted and appreciated, the Council should pursue a more legally defensible claim on the dumpsite land for the purpose of achieving a less precarious licensing situation.
- **Health & Safety.** The pickers at the dumpsite are employed by a private entity. However, that they are operating on Council property implies that the Council has given its consent for the said pickers to access the property and carry on their business. Thus, the Council shares equally in the duty of care over the safety of the pickers. It will be in the Council's interest to ensure that the pickers are subjected

to regular Health & Safety checks by their employer and are provided with appropriate PPE whose use is constantly enforced.

- **Weighing.** The first steps in planning for any further work on the dumpsite is to know the quantities of waste it will have to host. The proposed opportunity studies for AF projects will also require this as basic data. As such, the council must implement a reliable system of weighing the waste received. Of the three options shown below, a mobile weighbridge appears to be the best compromise between cost and development needs of dumpsite operations. It is recommended that the Council pursue this in its next steps for managing the dumpsite operations.

TABLE 6.2.1 ALTERNATIVES/OPTIONS FOR A WEIGHING SOLUTION FOR THE DUMPSITE			
OPTION	PROS	CONS	PRIORITY
1 Do Nothing	<ul style="list-style-type: none"> • Lowest cost • No demobilization needed on exit 	<ul style="list-style-type: none"> • Difficult to support improvement efforts with reliable data 	2
2 Mobile Weighbridge	<ul style="list-style-type: none"> • Can be leased so that cost directly linked to waste collection, lowest impact on current Council cash • Quick deployment • Quick demobilization on exit from land 	<ul style="list-style-type: none"> • Highest maintenance costs, especially if poorly protected from the elements and the regular fires at dumpsite • Unless physically protected in such a way that effectively no different from fixed weighbridge, features high risk of theft and/or damage 	1
3 Fixed Weighbridge	<ul style="list-style-type: none"> • Typically, features lower maintenance costs than mobile options • Best physical protection possible hence may be cheaper to insure 	<ul style="list-style-type: none"> • Highest capex demand • Slow deployment • Slow and expensive demobilization on exit from land 	3
4 "Weigh & Estimate" (contracted regular weighing to validate daily estimates)	<ul style="list-style-type: none"> • Low cost • No mobilization or demobilization costs 	<ul style="list-style-type: none"> • Requires highest disciplined data management • Must find and keep service providers • Highest potential for data leakage leading to high errors in information and decisions 	4

6.3 Quick-Win Opportunities

The following sub-components present quick win opportunities (opportunities where the payback time can easily be brought to less than 12 months). They can be pursued as early as possible in order to gather momentum for the more demanding phases:

- Composting, using the organic fraction of the waste from the various eateries within the District. That Chongwe appears to have an unusually high organic fraction in its waste would be a blessing for composting.
- Oil extraction from food waste, to be used as an alternative fuel within the food industry or lighting uses.
- Shredding and baling of non-recyclable paper to be transported, together with whole tyres, to cement manufacturers as alternative fuel. For this part to be successful, however, the volumes of this type of waste – sorted and uniform – have to be very high (can consume over 30tons in a single day). Periods of aggregation may be required. It can also be expected that such off-takers globally experienced in AF/ARM matters may bargain hard for lowest possible prices (or may not want to pay prices at all and instead seek to charge the Council a disposal fee). In order to be successful with these, a higher level partnership must be sought where they overtly support the longer term objectives of the project and

are willing to make some contribution via the low-price purchase of pre-processed waste materials. Alternatively, the materials may be given free of cost but a commercial fee charged on logistics (sorting, storage and transport). The Project Consultant made an initial approach to LafargeHolcim plc at Chilanga and the intention was received positively and proactively. The Council is encouraged to pursue this interest further.

7

Proposals on Collection System

7.1 Overall Strategy

A significant number of households in the district currently run without paying for waste collection service. Nor do they receive regular prompts to contract a service provider. This finding agrees with the fact that Chongwe currently carries the **lowest** waste collection fee, at K20 per month paid monthly, of any comparable urban district in Zambia, a sampling of which is presented in Section 7.5.

A SWOT has been completed on the Municipality's waste collection system to critically search for actions which could help the Council to achieve sustainability of the process by increasing uptake rate of the waste collection service.

Rationalising of the service fee(s) would be the next step. While affordability appears to have been given strong consideration, cost recovery is the counterbalancing need. If the process is not able to sustain itself without constant hand-outs from unknown sources, it will eventually fail leaving a big legacy problem. It is instructive that, in its quest for modernisation, called *lusumpuko* in local Chongwe language and proudly stamped on Municipal Council letterhead, the district must want to keep reviewing all its key decisions to ensure that they remain relevant and able to give its residents the beautiful and healthy living surrounds that they desire.

7.2 Volume Estimates

From the estimates of Table 3.1.2 and the caution of Section 5.4 on overall figures, the collection system must be designed to service the following loading:

TABLE 7.2.1 VOLUME ESTIMATES FOR PROPOSED COLLECTION SYSTEM

DISTRICT	FLAGSHIP AREAS	MAPPED	ADJUSTED	MAXIMUM	MAXIMUM
		VOLUME	VOLUME	ESTIMATE	ESTIMATE
		Ton/Mth	Ton/Mth	Ton/Mth	Ton/Day
A	Chongwe (the old Chongwe township)	1,011	1,642	2,053	68
B	Chalimbana, Kanakantapa (farming areas)	-	110	138	5
C	Silverest, Waterfalls	86	230	288	10
D	Meanwood Ibex, OP Compound	139	280	350	12
E	KKIA, Meanwood Ndeke, Vorna Valley, Zambia-China MFEZ	378	560	700	23
F	Chelston Ext. (aka Madido), Obama, Ngwerere	97	280	350	12
G	Kwamwena, Mutumbi	112	280	350	12
All areas		1,823	3,392	4,228	141

Adjustment

As cited earlier in Section 5.4, the total raw estimate figure at 1,823ton/month (population 186,000) appeared to be too low compared to similar sized districts. The example of Livingstone was given at 3,245ton/month (population 180,000). The specific waste generation rate for Livingstone worked out to 608g per capita per day. Taking the same specific generation rate for Chongwe estimated the macro-level waste generation rate at 3,392ton/month.

Maximum Estimate

For prudence an overcapacity factor of 25% has been added to each area's adjusted mapped volumes. This is especially necessary since all weights reported are based on visual estimates. This *safety factor* allows for volume growth over a 6-10 year period.

Table 7.2.2, below, is a mass balance sheet of waste routing in Chongwe district after implementation of the proposed steps. Note that due to the limited scope of the basic characterization in Section 4.4, the design routing below is only indicative. Also, some materials such as paper may be theoretically recyclable but due to colour and other chemical treatments, they may be rejected for recycle while the chemical treatments may also render them inappropriate for composting, and so they may be routed to landfill instead. A full WACS would provide results which are far more readily usable.

TABLE 7.2.2 MASS BALANCE FOR ECOLOGICALLY OPTIMISED ROUTING OF CHONGWE WASTE										
ID	COMPONENT	%	tpm	Guide	Re-Use	Re-Cycle	AF/AR M	Composting	Land-fill*	O/S**
1	Glass	16	673.6	Substitution of aggregates (c.70%)		471.5			202.1	▼ ³
2	Plastic	18	744.3	Thin film (c.30%) difficult to recycle		521			223.3	
3	Organics	53	2,232.8	No off-taker				2,232.8		▼ ²
4	Wood & Paper	6.5	275.4	No off-taker at dumpsite			275.4			▼ ¹
5	Textile	0.7	29.8	No off-taker at dumpsite			29.8			▼ ¹
6	Rubber	2.7	115.4	No off-taker			115.4			▼ ¹
7	Metal	1.1	48.4	Finds way to steel plant		48.4				
8	Other	2.6	107.9	-					107.9	
		100	4,228		-	1,040.9	420.5	2,232.8	533.3	
					0%	25%	10%	53%	13%	

* Majority of the mass burned in apparently accidental fires

** Opportunity Study proposed, i.e., potential off-taker identified

▼¹ O/S for use as AF

▼² O/S for composting

▼³ O/S as ARM for partial substitution of aggregates

Table 7.2.2 shows that, for 100% yield at every sorting stage:

- The dumpsite would receive only 13% (533tpm) of the district waste. 53% (2,233tpm) of the waste would be available for composting works. 10% (421tpm) would be available for delivery to alternative fuel projects. Up to 25% of collected materials could be available for re-cycle.
- The mid-grid activities, including composting are therefore critical not only for the additional cash realisable but also for sustainability of the dumpsite project. If these activities are short-circuited out of the chain, then the 87% waste which would otherwise be re-routed would all end up at the dumpsite, shortening dumpsite life and losing all the potential revenue as well.
- In order for all the above opportunities to be realized, it is necessary for the Council to develop Business Case documents together with interested third parties who would provide commercial off-take of the various materials. That is the first *third* of the necessary hard work. The second *third* is to work on the service uptake and collection rate, because the higher the available volumes the better the achievable pricing from waste off-takers. The final *third* of the necessary hard work is to ensure that the waste sorting is happening efficiently. For that, there might be need to invest in some shelter and to enlarge the group of waste pickers operating at the dumpsite.

7.3 SWOT Assessment

On Chongwe Waste Collection System

Strengths	Weaknesses
<ul style="list-style-type: none"> • CBD well serviced, given current limited resources • Dumpsite well managed, given current limited resources • Positive relationships with local stakeholders enabling Council to manage facilities beyond own financial capacity (e.g., acquisition of land for dumpsite, waste handling at dumpsite, etc.) • High youth population available for many necessary low-skill processes • Fair road network to all key waste generation centres 	<ul style="list-style-type: none"> • Very low sustaining cash available per unit of waste (28cents/ton) • Some key facilities in CBD (e.g., district hospital) <i>not</i> serviced and found to have been incinerating all waste • Waste burying in backyard pits observed even in mid-income areas near CBD • Some basic WM equipment such as skips unavailable even in CBD • Lowest waste collection fee, difficult to pay for many needed WM operations • Only one licensed waste collector currently active in district • Yet to complete a full WACS • No full-boundary district map(s) • No study done on household capacity to pay for WM services
Opportunities	Threats
<ul style="list-style-type: none"> • Much goodwill from many stakeholders for better waste management to keep town clean • Relatively low population (room to design and test WM operations without quickly over-burdening them) • Relatively high unemployment in District (low-skill roles easy to fill) • Many nationally important facilities within the district (goodwill and ready support for WM initiatives) • Organised and experienced waste pickers (available for mid-grid activities) 	<ul style="list-style-type: none"> • Many parts of the population too familiar with burying and burning of waste instead of paying for collection service • Dumpsite land ownership outside Council control • Low uptake of collection service especially in the households. • Lowest waste collection fee, difficult to pay for many needed WM operations, difficult to rationalize (to increase to break-even level)

Detailed actions to address weaknesses and threats:

Weaknesses & Threats	Negative impacts	Control Action
Very low sustaining cash available per unit of waste (28cents/ton)	High-capex tasks impossible to carry out without handouts Higher financing costs due to repayment risks	Consider raising income at all points of the grid Early engagement of traditional leadership to support improvement Work aggressively on aggregating (broadening service uptake)
Some key facilities in CBD (e.g., district hospital) <i>not</i> serviced and found to have been incinerating all waste	Aggregation (broader uptake of collection service) hard to achieve as cheaper alternative <u>perceived</u> to be available	Close anomaly asap
Some basic WM equipment such as skips unavailable even in CBD	Risk of sweepage and run-off	<i>See actions on increasing sustaining cash</i>
Lowest waste collection fee, difficult to pay for many needed WM operations	Difficult to pay for WM operations as needed	

Weaknesses & Threats	Negative impacts	Control Action
Only one licensed waste collector currently active in district	Large parts of district already mis-educated on unregulated disposal	Expedite engagement of others; supervise pro-actively to avoid work abandonment
Yet to complete a full WACS	Design data for mid-grid and end-of-pipe activities still to be confirmed O/Ss with interested off-takers will take long to complete	Complete asap to allow proper feasibility assessments of next steps
No full-boundary district map(s)	Planning less than systematic Analysis and operations review slow	Produce maps asap
Waste burying in backyard pits observed even in mid-income areas near CBD	Aggregation (broader uptake of collection service) hard to achieve as cheaper alternative <u>perceived</u> to be available	Marketing/educational campaign using the health risks associated with open burning, as well as benefits to the district of using collection service
Many parts of the population too familiar with burying and burning of waste instead of paying for collection service		Do not be shy to use enforcement actions where necessary Bundle: Either – With other council fees, or With other utilities charged by third-Party, e.g., ZESCO (power)*
Low uptake of collection service especially in the households.		
No study done on household capacity to pay for WM services	Difficult to challenge the low service fee, ultimately maintaining problem of low sustaining cash	Conduct study (via third party if needed) <i>See actions on low sustaining cash</i>
Dumpsite land ownership outside Council control	High risks of sudden loss of access, license and operations Cannot install many fixed assets on location	Normalise asap
Lowest waste collection fee, difficult to pay for many needed WM operations, difficult to rationalize (to increase to break-even level)	Low sustaining cash Difficult to attract waste management contractors/partners <i>See above</i>	<i>See actions on low sustaining cash</i> Early engagement of traditional leadership to appreciate problem

*** Bundling WM Fees with Third-Party Utility Company**

Of special note: the recommendation to seek out another higher compliance utility such as ZESCO with which the waste management fees can be bundled for wider service uptake – especially in the peri-urban areas where unique addresses are difficult to hold down. This could be done in same manner as the TV license fee was bundled with the ZESCO utility bills. Although this strategy might require high level – even ministerial – approval to implement, it is worth the effort for the long haul and is highly recommended if the Council is to achieve a higher service uptake and offer much more predictable waste management services.

Strengths & Opportunities	Value-Adding Impacts	Sustaining Action
CBD well serviced; given current limited resources	Lobbying for improvement/sustaining actions will have ready reception	Prepare prudent improvement actions, ready to be supported on increased cash (if possible prepare in bankable Business Case format)
Dumpsite well managed, given current limited resources	Easier to demonstrate upsides of improved waste collection fee and/or piggy-back on electricity payments – that failure of service delivery is low risk.	
Positive relationships with local stakeholders enabling Council to manage facilities beyond own financial capacity (e.g., acquisition of land for dumpsite, waste handling at dumpsite, etc.)	Lobbying for improvement/sustaining actions will have ready reception	Regular courtesy updates
High youth population available for many necessary low-skill processes	Manual sorting and other processes at dumpsite possible Opportunity to add value by creating employment	Prepare training and up-skilling plans for highest benefit to community
Fair road network to all key waste generation centres	Route planning easier Higher equipment performance factor for collection companies	Regularly monitor routes and document for contract performance reviews
Much goodwill from many stakeholders for better waste management to keep town clean	Lobbying for improvement/sustaining actions has ready reception, including at central government	Maximise opportunity now with campaigns to establish mid-grid and end-of-pipe activities to reduce loading on dumpsite and increase sustaining cash
Relatively low population (room to design and test WM operations without quickly over-burdening them)	More predictable WM needs	Accelerate WM plans while opportunity still available
Relatively high unemployment in District (low-skill roles easy to fill)	Low-skill roles easy to fill.	<i>See actions at 'high youth population available'</i>
Many nationally important facilities within the district (goodwill and ready support for WM initiatives)	Lobbying for improvement/sustaining actions has ready reception, including at central government	Maximise opportunity now with campaigns to establish mid-grid and end-of-pipe activities to reduce loading on dumpsite and increase sustaining cash
Organised and experienced waste pickers (available for mid-grid activities)	Will help to accelerate mid-grid activities like sorting providing steady feedstock to re-cyclers	Highlight as additional aspect to attract mid-grid and/or end-of-pipe investment to Chongwe

7.3 Key Derived Actions

As some of the actions repeat (being relevant to multiple issues identified), the following is the summary of unique actions needed:

- (a) Consider raising income at all points of the waste management grid. *This means conducting a critical review of the entire district waste management process using the waste management grid and following up on all proposed income points.*

-
- (b) Early engagement of traditional leadership to support improvement and sustaining actions. *This is especially so because, unique to Chongwe, some of the Council's operations (e.g., dumpsite) are over-dependent on goodwill from traditional leaders, and there is no cross-dependence (the said leaders themselves sit outside of the purview of Council controlled facilities)*
 - (c) Work aggressively on aggregating, including quick closure of anomalous situation where some public facilities such as the district hospital are still unserved. *A low coverage of 34% translates to very high escape of potential revenue.*
 - (d) Expedite engagement of full squad of waste collection companies and pro-actively supervise them to anticipate and, wherever possible, avoid work abandonment
 - (e) Complete a WACS study at appropriate time
 - (f) Produce authoritative full-boundary district map to enable systematic planning and review
 - (g) Conduct marketing and educational campaigns using the health risks associated with open burning of waste and benefits to the district of using the managed waste collection service
 - (h) Conduct a household capacity-to-pay study to support the systematic setting and regular review of waste collection fees. *Note that the fee does not have to be uniform across all the Waste Management Districts within the district.*
 - (i) Normalise ownership/control of the dumpsite land to increase confidence in investment efforts dependent on the dumpsite
 - (j) Prepare prudent improvement actions for collection of waste from the CBD and for management of the dumpsite, preferably in a bankable Business Case format. These should enable quick response to investment or support approaches from third parties
 - (k) Provide regular courtesy updates, to traditional leaders assisting the Council, to maintain and sustain the positive stakeholder relationship
 - (l) Prepare training and up-skilling plans so that highest community contribution can be derived from employment of lowly skilled labourers
 - (m) Regularly monitor –*take survey route drive-throughs* - waste collection routes and document results to support contract performance reviews
 - (n) Create bankable Opportunity (or Feasibility if possible) Studies with interested third parties for mid-grid and end-of-pipe activities at dumpsite. *LafargeHolcim is one interested party.*
 - (o) Seriously consider a contract with the power utility, ZESCO, to collect waste management fees together with payments for power, in same manner as TV license fees are collected by agency
 - (p) Separate the task of 'waste collection' from the problem of 'fee collection' so that the problem can be solved. It is not a problem unique to Chongwe. The solution may therefore have to be national in nature. Chongwe, with a unique need to lead in District cleanness, can take the lead.

7.4 Collection Systems and Collection Centres

Currently, there is a multiplicity of collection points as follows:

- Open locations in public areas
- Skips in SUFs
- Individual households in the townships

As experience has shown, the first two types of collection points are sustainable under current conditions while the last one continues to present Aggregation challenges (the contractors concerned struggle to achieve the critical mass of customers to break even on costs and sustain their operations).

The District Council, being local government is best placed to take the first steps toward resolving the Aggregation problem.

However, since the Council has already initiated an improvement plan starting with the appointment of waste collection contractors for the unserved waste management districts, the only comment now is that the process be completed speedily and the contractors proactively managed in order to anticipate and resolve quickly any matters that might hinder aggregation or even lead to work abandonment.

A separation of the task of *waste collection* from the responsibility of *fee collection* is recommend for this district too.

7.5 Fees and Payment Systems

Fees

At 28cents per ton put into waste management, the current waste collection fee seems inadequate (It is certainly ultra-low when compared to other countries). The Council is encouraged to look at this, especially if they have access to a Capacity-To-Pay assessment for the district at same time.

A comparison with other towns, see further below, also indicates that there may yet be room to increase the collection fee. Caution however, must be taken as livelihoods and income levels in Chongwe might have to be reviewed in a more disciplined manner as should the collection efficiency.

Fee Structure – End Users:

<i>Collected by Council (Households):</i>	<i>K20 per month per household</i>
<i>Collected by Council (SUFs):</i>	<i>K200 per month per site</i>
<i>Collected by contractors (Households):</i>	<i>up to K135 per month per household</i>
<i>Collected by contractors (SUFs):</i>	<i>As negotiated in contract</i>
<i>Public Spaces & CBD:</i>	<i>As bundled with trading licenses</i>
<i>Dumping Fee (if self-transporting to dumpsite):</i>	<i>K50 per load</i>
<i>Penalties for failing to dispose in regulated way:</i>	<i>As stipulated in S.I. (1,666.67 fee units)</i>

Fee structure – Contractors:

<i>License Fee:</i>	<i>K7,000 per year</i>
<i>Dumping Fee:</i>	<i>K50 per load</i>

Fee structures for selected municipalities

<i>Town</i>	<i>Population</i>	<i>Status</i>	<i>Fees</i>	<i>Settlement</i>	<i>Collector</i>
<i>Livingston</i>	<i>0.18m</i>	<i>City</i>	<i>K50 / K30</i>	<i>Monthly</i>	<i>Franchisees</i>
<i>Lusaka</i>	<i>1.80m</i>	<i>City</i>	<i>Up to K135</i>	<i>Up to 3 months in advance</i>	<i>Franchisees</i>
<i>Chilanga</i>	<i>0.10m</i>	<i>Small Town</i>	<i>K40</i>	<i>Monthly</i>	<i>Council</i>
<i>Ndola</i>	<i>0.55m</i>	<i>City</i>	<i>K80</i>	<i>Monthly</i>	<i>Franchisees</i>
<i>Chongwe</i>	<i>0.18m</i>	<i>District</i>	<i>K20</i>	<i>Monthly</i>	<i>Council</i>

Fee settlement

The current preferred fee collection system is *contracted collection*. This is whereby the entity which legally collects waste *also* collects payments using its own payment collection channels and administers those collections according to own operations. The one-off license fee and the incident-based dumping fee are all the waste-related payments which the Council receives. In this way, the contractor has very predictable fixed costs and they can plan their variable costs with high certainty. After that they only need aggregate collections to break even. For its part, the Council has predictable and deliberately limited waste-related revenue, leaving any excess to the waste entrepreneurs to profit from. This model is designed to attract SMEs into waste management business as waste collectors.

The problem with the above model, however, is that the Council is also hands over the responsibility of collecting the fees to the contractor. Several studies worldwide indicate that when the municipality hands over its duty like this, the problem of non-compliance actually increases. This is likely because the contracted company has limited powers of enforcement against clients who fail to pay up for the service. They can only resort to denial of service (DOS: already reducing the coverage) until the client falls off the grid altogether. In the end, the contractor find themselves limited to few clients at specific addresses who provide them their regular business and the rest are left undisturbed.

If the Council were involved, on the other hand, not only would the DOS route be followed but punitive measures (PM) can immediately be taken demanding the household owner to show and justify their alternative waste disposal route, because the only likely alternatives to paid-for collection would be *burying, burning or fly-tipping*. This double-barreled DOS+PM response is far much more effective than DOS measures alone. So, the Council can contract waste collection services but it should not presume to have solved the aggregation problem in that one simple stroke of pen on paper. Actual boots on ground are still needed if the problem is to be defeated.

It is therefore recommended that the Council be the only body responsible for collection of waste collection fees. From its receiving account it can then pay each contractor by the volume of waste handled. This is the reason for the recommendation in Section 7.4 that the task of *waste collection* be separated from the duty of *fee collection*.

7.6 Collector Characteristics

The following characteristics and performance metrics shall apply. All but the *frequency of collection* are inherited from current practice:

TABLE 7.6.1 COLLECTION CHARACTERISTICS

NO	CHARACTERISTIC	VALUE	BASIS
1	Type of Contract	Franchise	<i>Current practice</i>
2	Number of Trucks	Contractor decides	<i>Current practice</i>
3	Transport Capacity	See Table 7.2.1 for each Waste Collection Zone	Interview and truck count at dumpsite
4	Type of Collection	A: Door-to-Door: Public spaces and USFs B: Door-to-door: Households	A: higher collection rate noted, no fix needed B: Fix aggregation problem
5	Collection Routes	Contractor decides	<i>Current practice</i>
6	Frequency to Dumpsite	Contractor decides	Can process or aggregate waste further before taking to dump
7	Frequency of Collection	As agreed on regular (monthly?) performance reviews with Council	Avoid need for big skips at CCs Allow contractors to optimize their business cases

7.7 Projected Cost Impacts

The following parties are currently involved in the collection system:

1. **Waste producers:** households and the facility owners/managers in the CBD and SUFs. These dispose of waste and pay for the waste disposal service. In the newly enacted EPR Regulations, the waste producers have been redefined to mean the manufacturers of the packaging and other materials which end up as waste. While this concept works well for waste lying unclaimed in the open environment, it may be difficult to enforce over waste which is clearly under the control of known third parties. As such, the waste producers in this work are specifically the households and facility managers/owners.
2. **Waste Collectors:** contractors. Includes the Department of Public Health of the CMC in its capacity as waste collector for the CBD and public spaces. These link the *arm's length* disposal to the *end-of-life* disposal stages. They collect actual waste and transport it to dumpsite, in addition to gathering important information for process improvement. Some of these collectors may also be involved in some mid-grid activities, such as sorting and recycling, to serve their independent objectives.
3. **The Municipal Council:** operates the *end-of-life* receptacle, the dumpsite. The Council also ultimately collects all waste management cash in order to use it for running waste management processes in the district.

The following changes are now proposed and they are expected to increase waste management costs, apart from any positive impacts they may also bring:

1. **Waste management database:** the beginning of much improved waste management. Into this data base will be entered all properties (household and non-household waste generation points). All contractors shall be required to submit returns of collection points so that regular monitoring of which generation points are paying for waste collection and which are not can be done via the database. The Council can then use this database for targeted enforcement actions, educational campaigns, etc.

2. **Route Surveillance:** routine and regular physical drive-throughs through the waste collection routes of each waste collector. Will help in making collections but also in having useful performance monitoring reviews with contractors.
3. **Opportunity Studies:** These are preparedness studies prepared in the format of a Business Case document to enable the principals in a firm to make an investment decision or to commission a detailed feasibility study. Such studies will be need as identified in Table 7.2.2

TABLE 7.7.1 PROJECTED COST IMPACTS OF THE PROPOSALS

NO.	PARTICIPANT	FUNCTION	COST DELTA	BASIS
1	Waste Generators	Produce and segregate waste Pay for waste disposal		
2	Waste Collectors	Receive waste from on-site receptacles Transport to drop-off points Handle waste receptacles in manner to allow re-use Drop off waste		
3	District Council (as is)	Works as Waste Collector in CBD and SUFs Operate dumpsite Collect WM fees to keep the management process sustainable Conduct waste collection route surveys Lead waste collection performance review sessions with contractors Run the WM Database Conduct O/S's with/for potential off-takers of mid-grid and/or end-of-pipe materials	Capex: up to K300,000 Opex: + K4000 / month	Capex for O/S's as/when needed Opex for route surveys and hosting of collection performance review sessions with contractors
4	Waste Management Database	1. Track compliant vs non-compliant addresses, so that: - monitor impact of waste collection fee - target educational and/or enforcement actions to increase compliance 2. Track waste data, including: - generation points - quantities - Collection points used - Drop-off points used - any weight loss due to mid-grid activities - payments and cash flows	Capex: +K100,000 to +K1,000,000 Opex: up to +5,000/month	Depending on initial complexity/customisation required, costs can vary greatly. Suggest use of India-based application package developers who market services online Opex is for ad-hoc technical support, upgrading and/or server hosting if required
8	Waste Receptacles (bags and skips)	Hold and quarantine waste Track waste	Capex: +K150,000 to +K500,000 Opex: +K3,000/mth	Capex includes tagged/traceable bags and few skips Opex for repairs and bag replacements.
	Capex	Min: +K250,000	up to + K1,800,000	Save K1,550,000 (86%) on O/S's, database and receptacles
	Opex	Min: +K7,000/month	up to + K12,000/m	Save up to K5,000 (42%) on database management

7.8 Projected Revenue Impacts

Using Table 7.7.1, the maximum change in opex for all the sustaining and development initiatives proposed in this report is K12,000 per month. This translates to 600 households paying directly to the Municipal Council at K20 per month each, or approximately 86 households in each WMD. That is the target for the Council in order to make all opex-impacting proposals of this report to be fully cost covered. 600 households is only 3% of the current *surveyed household population* in the district. The Council should assess the difficulty of meeting this target with concerted effort.

For the capex, the top end of the need is K1.8m while the bottom end is K0.25m. Taking an amortisation period of 36-months means that an additional K6,944 – K50,000 (capex/36) per month must be generated. This translates to an additional 348 – 2,500 households paying at the lowest rate (direct to Council at K20/month). This target is 1.8% - 12.8% of the current surveyed household population. The Council should assess the difficulty of meeting this target with concerted effort.

In the above working, the cost of finance has not been taken into account. This implies an assumption that the capex has been sourced from grants (central government or well-wishers). It is the least preferred for planning and is here referred to as the “grant-sourced capex” scenario.

Extending to other scenarios:

TABLE 7.8.1 AGGREGATION TARGETS TO SELF-FUND THE COLLECTION IMPROVEMENT PROJECT

LINE	COST COMPONENT	LOW COST IMPLEMENTATION	HIGH COST IMPLEMENTATION	“GRANT-SOURCED” CAPEX
1	Capex @ 3-year amortisation	K250,000	K1,800,000	K1,800,000
2	Opex per year	K84,000	K144,000	K144,000
3	Capex financing cost @ 30%	K100,200	K583,200	-
4	Minimum Additional Households Required for Full Payback and % of the household population	603 (3.1%)	3,510 (18.0%)	2,500 (12.8%)

7.9 Implied Changes in Cost and Revenue Administration for WM

In the proposals presented, the following adjustments to the manner in which costs and revenue are administered are implied:

- (1) Waste Collection Fees (more accurately called Waste Management Fees) for all areas bundled (collected together with) land rates or power utility pre-payments and collected *directly* by the Council. Justification see Section 7.5;
- (2) An increase in cash flow even if actual revenue decreased because now *all* income first received by Council before being distributed to the various actors in the waste management chain. It increases administrative demand but worth it because it enables the Council to raise much more revenue to use on the various improvement and sustaining works;
- (3) A ‘smart’ (higher skilled) component added to the chain in form of running costs for a Waste Management Database, operated directly by the Council with possibility of out-sourcing later. The systematic intel gathered from consistent updates of the database is used to ensure that the efforts of the Council in Waste Management are directed in a very precise manner every time. It represents a sharpening of the tools to increase uptake of and timely payment for waste collection services in the district.

A study of the waste management system at Chongwe has been completed. This was a broad study looking at the entire grid from point of origin to end-of-life disposal, including fee structures, collection systems and contracting. The areas for further assessment have been identified. Proposals for system improvement, which could be made even with the current level of results, have also been presented.

Collection systems

The Council is using two types of collectors: *self*, *contracted franchisees*.

The franchisees are empowered to collect fees directly and use as their own income. The only intervention is that the fee levels are set by the Council as local government. Currently only one licensed contractor is active. A competitive tender process is in progress to select more contractors to service the entire district. The collection fee for the Council for households is K20 per month paid monthly in advance, while fees chargeable by the contractors peak at K135 per month in the affluent District C (Meanwood Ibex Hill area) and householders can pay 3 months in advance. They (the contractors) in turn pay two amounts, one fixed and the other paid per incident, i.e., a one-off license fee of K7,000 and a dumping fee of K50 per load. The franchisees collect waste **door-to-door** from those from whom they have received waste collection fees. In this manner, the franchisees have the lever of scale to control revenue and cost-efficiency to control their level of profitability.

For its part, the council collects waste from the CBD where the waste collection fees are bundled with other charges connected to the Trading License, and the collection is done from open spaces allocated for arm's length waste dumping by marketeers and CBD users. The Council also collects from households and SUFs where the waste collection fee for *door-to-door* collection is K20 monthly for households and K200 monthly for SUFs.

Re-use, recycling and disposal

The district's overall recycle rate is currently **7%** while overall waste collection rate has been estimated at **34%**. The recycle rate is unexpectedly high (buoyed by the stationed waste pickers operating at the dumpsite, employed and paid by a private recycling materials company from Lusaka). The overall collection rate is one of the lowest in the country for an urbanised district. The **66%** un-accounted-for waste (equivalent to 14,344tons/year) is disposed of by **open burning, incineration and burying** (in unregulated backyard pits). *Fly-tipping* is a much smaller problem as almost all tippable areas outside of the tipping clearings in the public spaces were found to be fenced off.

The key recycling activities (some even part-mechanised) utilize PET and thick-film plastic, textile off-cuts, wood chips and saw dust.

The re-use and recycling projects, taking around 7% of the district's yearly waste, form a significant part of Chongwe social and economic life. Some street pickers earn a livelihood – even support entire families – from picking mineral water PET bottles and selling these in batches to cooking oil, paraffin (lighting) oil and drinks (“munkoyo”) packagers operating in the townships. The public market also supplies two basic forms of raw materials for the recycling industry, i.e., textile off-cuts and wood waste (chips and saw dust). These recycle materials support the home based industries of door mats, *munkoyo* and poultry.

Chongwe does not have a publicly run waste processing facility and so there are no mid-grid activities other than the already mentioned picking at dumpsite.

Dumpsite and landfill

There was minimal assessment and comment directly related to the dumpsite except the emphasis that the Council normalize the leasehold on the dumpsite land to assure security of tenure there.

Service uptake rate and fee collection

In terms of managed waste disposal, a recommendation has been made that the *task* of waste collection be unbundled from the closely linked but not identical *problem of fee collection*. This should allow the Council to either re-bundle the collection of this fee with other utilities such as pre-paid electricity. If successful, ZESCO (the national power utility company) could then be engaged in an agency contract to collect waste management fees on a monthly frequency. This action could make a strong step-change to compliance with both fee payment and waste handling. It is envisaged, however than this agency contract might take a long time before acceptance and implementation. As such, it is recommended that the Council consider other methods mandatory door-to-door collection together with property rates.

The outstanding risk remains of how high the public appetite might be for paying even the underlying fee on which the waste management fee would be piggy-backing as proposed. While there would be little choice if the waste fee piggy-backed the electric bill (ZESCO worked long at their own collection problem until they came up with pre-paid meters), the problem might persist longer if property rates were the ones piggy-backed.

Broadly speaking, the public never has appetite to pay for anything at all! As such, the Council has to develop its own appetite for occasionally meting out enforcement actions on waste management to begin to change the underlying culture toward waste handling. The Council can also carry out wide educational campaigns designed to create the right attitudes toward waste disposal, especially in schools whose pupils can then influence home managers toward taking the right actions. This two-pronged approach (enforcement and education) may be indispensable even under a ZESCO-as-agency scenario. The problem may be cultural as well – why should I be stopped from burying my waste at my own privately owned land...?

In other words, bundling of the waste management fee (as the case is now) is *not* the problem; it is what the waste management fee is currently riding on that is. Currently, the collection of the fee is bundled with the collection of waste and then the two are contracted out to weakly capitalized entities who are then tasked with navigating their own way around the very real and common problem of low compliance to waste collection regulations. This combination almost guarantees poor compliance. It is strongly recommended that the Council take a different approach.

A key part of the recommendation of next steps is that the Council carries out a full WACS (waste analysis and characterization study). The results of the WACS would enable the collection planning, re-cycling and dumpsite roadmaps to be fleshed out in a lot more detail than presented here.

PHOTOLOG

1. A WASTE DISPOSAL LOCATION AT MARKETPLACE. SKIPS ARE UNIVERSALLY ABSENT IN CHONGWE CBD.



2. OPEN BURNING AT ROADSIDE CORNER. COMMON OCCURENCE



3. WASTE PICKERS. NOTICE PARTIAL PPE. SACVENGER-STYLE WORKING COULD BE IMPROVED BY WORK-BENCH, CONVEYOR AND/OR WORK-SHED



4. THIS FRACTION CLEARLY FROM EATERY IN SHOPPING MALL (NOTE AMOUNT OF GLASS BOTTLES, PET BOTTLES AND ORGANICS)



5 - 6. ABBATOR WASTE AT DUMPSITE. SOME ITEMS LIKE HORNS, BONES & HIDE CANNOT BE DOWNSAMPLED FOR THE CHARACTERISATION



7 - 8 DOWNSAMPLING AT DUMPSITE



9. COUNCIL HIRED TRUCK PICKING WASTE FROM OPEN DUMP LOCATION IN MARKET IN CBD



10. COUNCIL TRACTOR PICKING WASTE FROM SAME DUMP LOCATION IN MARKET IN CBD



11. ORGANIC WASTE AT OPEN DUMP LOCATION IN MARKET



12. UNPICKED/UNPICKABLE MIXED WASTE AT DISTRICT HOSPITAL. NOTE MEDICAL WASTE MIXED WITH NON-MEDICAL MATERIAL



13. "TAILORS' STREET" IN MARKET IN CBD. ALL OFF-CUTS SYSTEMATICALLY BAGGED FOR SALE TO DOORMAT MANUFACTURERS



14. SOURCE OF CHARACTERISATION ERROR: GLASS HEAVILY COATED WITH ORGANICS. FULL WACS PROCESS WOULD REQUIRE WASHING, DRYING AND SUBTRACTING OF WEIGHTS TO ALLOCATE TO CORRECT WEIGHT FRACTIONS (GLASS AND ORGANICS). IN THIS BASIC CHARACTERISATION. ALL THIS WEIGHT ALLOCATED TO GLASS.

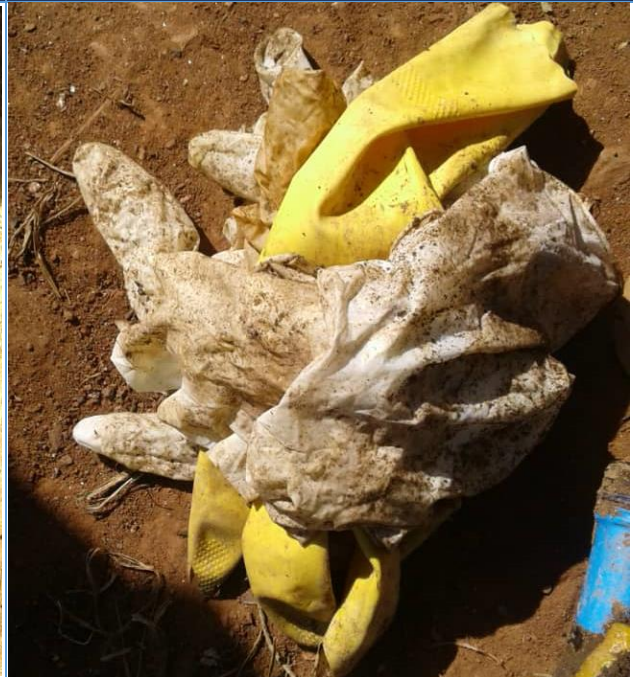
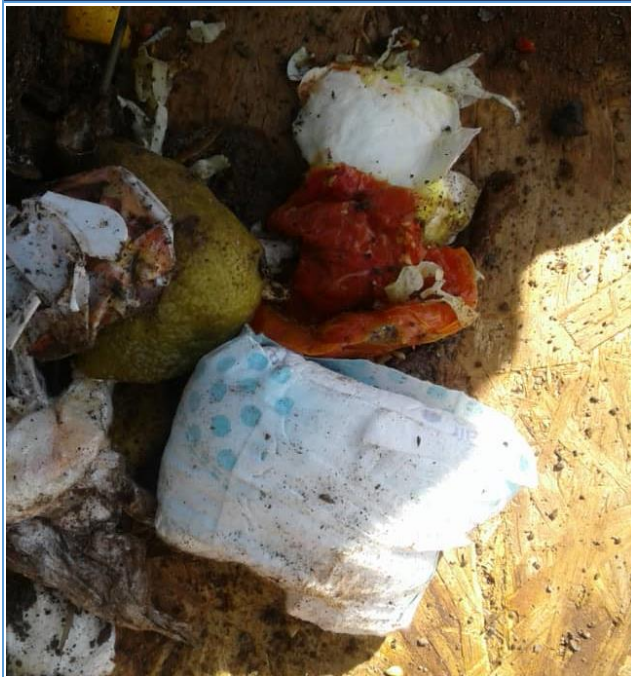


15 - 16. WIEGHING THE DOWNSAMPLED MATERIALS USING BUTCHERY SCALE IN CBD, FOR LACK OF WEIGHBRIDGE AND/OR OUTDOOR SCALE AT DUMPSITE.. DOUBLE LAYERS OF CLEAN PLASTIC BAGS A HEALTH & SAFETY MEASURE FOR THE BUTCHERY ENGAGED. THIS HEAVY DOWNSAMPLING TENDS TO INCREASE ERROR. FULL WACS WOULD REQUIRE THE PRIOR PREPARATION OF RIGHT EQUIPMENT REMOVING THIS PART OF THE UNCERTAINTY IN RESULTS.



17. LOADED BABY DAIPERS WEIGHED IN AS "ORGANICS". ACTUAL DAIPER NOT "ORGANICS" BUT HEALTH & SAFETY CONSIDERATION CAUSED THE CONSCIOUS ERROR TO BE ACCEPTED.

18. RUBBER GLOVES COATED WITH ORGANICS. SOURCE OF ERROR



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