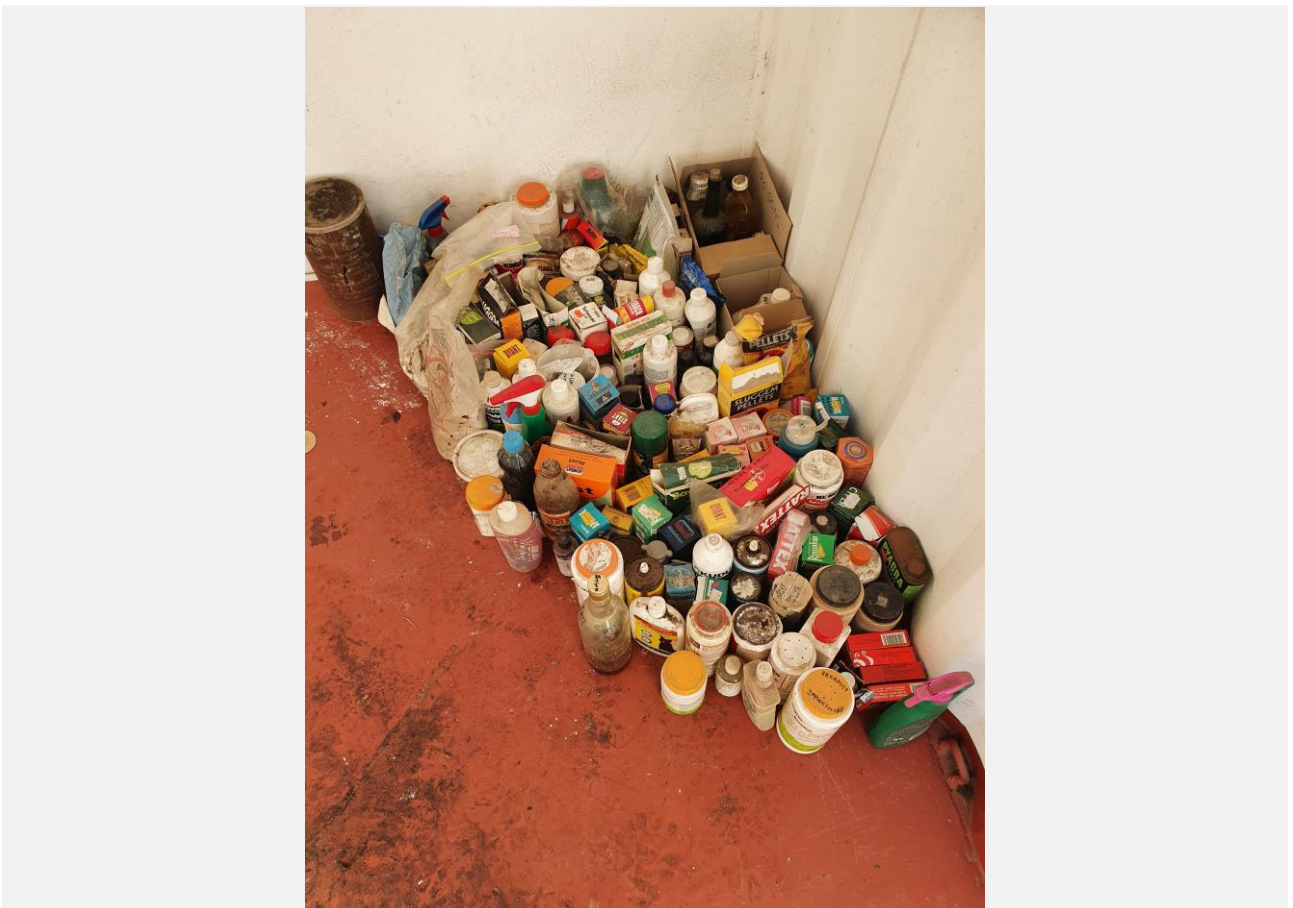


Cost Assessment for Implementation Plan for Household Hazardous Waste in South Africa

FINAL VERSION



Sweco AB

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Acronyms used in the implementation plan

AM	Administrative Manager
BCMM	Buffalo City Metropolitan Municipality
CM	Communications Manager
FTE	Full-time equivalent
HHW	Household Hazardous Waste
IWMP	Integrated Waste Management Plan
OM	Operations Manager
PIT	Project Implementation Team
PM	Project Manager
PCP	Permanent Collection Point

1. Introduction

1.1 Objective

This document supports municipalities to assess the costs of undertaking the various packages of the Household Hazardous Waste (HHW) collection implementation plan . It provides a simplified tool for dimensioning and budgeting. The target groups for the document are the stakeholders involved in the implementation plan elaboration. The team has developed an Excel-based tool that will help estimate and illustrate the costs of undertaking the implementation plan in general and provided the specific conditions in each municipality.

The key objective is to help assess the waste generation and key fixed and variable costs associated with investments and operations, including staff needs, capacity-building, equipment and infrastructure and other costs. Budget planning is a pre-condition towards integrating HHW collection into the Integrated Waste Management Plans (IWMP), mobilise political support and secure financing for the implementation.

As highlighted in the implementation plan, each municipality has unique pre-conditions and resources. The cost assessment therefore takes into consideration the different pre-conditions in terms of the type of municipality, population, location and targets for the HHW collection. Its outcomes provide an approximate understanding of the waste generation and costs. Nevertheless, the assumptions and the underlying model provides only a simplified assessment of the costs. The assessment should be viewed as a description of common practice of the three suggested collection methods. Scaling (up or down) and cooperation between municipalities may be necessary and this would impact the cost estimations.

The cost assessment does not include costs that may arise for other stakeholders, e.g. national or provincial authorities. This could include costs for instance for development of template by-law documents, coordination and general awareness raising activities. The cost assessment has not taken into consideration synergies and cost savings that are likely to arise from resource pooling and cooperation between municipalities and/or municipalities and other stakeholders.

1.2 Approach and methodology to cost assessment

This report and the underlying model are based on the following steps:

1. **Inputs and outcomes:** Information about the municipality's population, type, location, collection rate targets and cooperation with other stakeholders is required to generate specific outcomes;
2. **Assumptions and data:** Data has been collected during the site visits and from open sources to substantiate the analysis;
3. **Collection:** Estimation of staff resources and equipment required for the packages based on the inputs and data. Training is assumed constant for all municipalities;
4. **Treatment:** Estimation of the waste generation of municipal waste and hazardous waste, including breakdown into common waste streams, based on waste generation indicators linked to the inputs;
5. **Cost assessment:** Costing of the estimated staff, equipment, training, collection and treatment service based on the actual needs upon introduction and on an annual basis

The cost assessment provides an estimation of the capital and operational expenditures for undertaking the implementation plan. It presents the results for three types of fictional municipalities.

The tool and underlying model allow to undertake other analyses and is annexed as Appendix 1.

The outputs provided should be considered approximate. In this study, the results have been illustrated for three fictional municipalities representing different types of municipalities. The tool attached to this report allows a municipality to generate estimations adapted to their pre-conditions.

<u>Fictional municipality type</u>	<u>Population</u>	<u>Results representative to municipalities with a population of</u>
Large urban municipality in Gauteng province (50 km from Johannesburg)	1,600,000	of more than 600,000 inhabitants
Small-or medium urban municipality in KwaZulu-Natal (80 km from Durban)	300,000	of 50,000 - 600,000 inhabitants
Rural municipality in Eastern Cape (500 km from Cape Town)	30,000	of less than 50,000 inhabitants

Table 1. Presentation of the three fictional municipalities used to illustrate the outcomes.

The three fictional municipalities are assumed to:

- target a 40% collection rate of the total generated HHW in the basic and first add-on packages. The collection rate target rate is assumed to increase to 60% in the second add-on package
- not have a current collaboration with ROSE Foundation or similar organisations for no- or low-cost collection
- plan to undertake the implementation plan in-house, i.e., not outsource any part of the HHW collection process

- have available space at an existing transfer station site or similar where the **permanent collection point (PCP)** will be located and;
- plan to hold quarterly event-based collection

The team has used a similar definition for HHW Streams as was used in the Buffalo City Metropolitan Municipality (BCMM) pilot. This level of detail has been selected based on its representativeness and the availability of treatment cost data. The cost assessment is based on information collated during the site visits in South Africa, from reports produced by trusted organisations and experiences from the pilot collection scheme in Buffalo City Metropolitan Municipality.

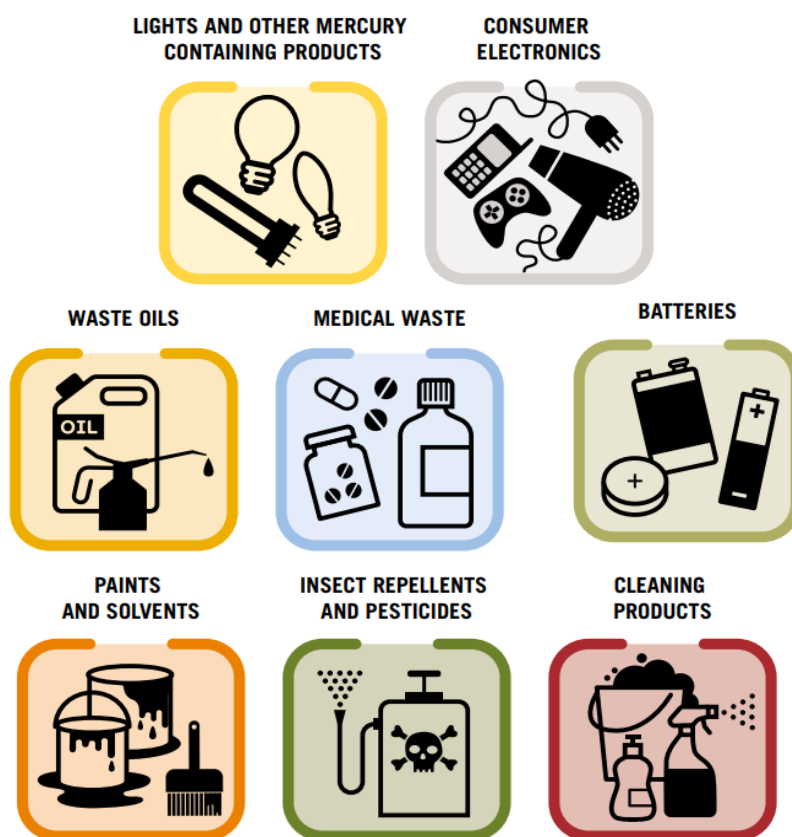


Figure 1. Household Hazardous Waste Streams used in the assessment.

2. Cost assessment exercise

The cost assessment is developed to fit municipalities operating in different contexts and stages of HHW collection. It is meant to allow for adaptability to these contexts and to support municipalities to plan the steps towards implementation. The report firstly introduces the estimated collection costs and secondly the transportation and treatment costs.

The current costs used in the assessment should reflect the price level of 2022. The forecasted costs are presented in current prices. The tool allows to adjust the costs based on Consumer Price Index level (e.g. 6% per year).

2.1 Costs for introducing HHW collection

The HHW collection costs refer to the cost related to setting up each of the packages and phases and ensure collection of HHW in the municipality. It is assumed that the packages are undertaken consecutively and that the costs for the first and second add-on packages are accumulating on top of the basic package. The costs for the foundation package refer to the overall municipal waste management system, in which HHW collection is one component. They have not been taken into consideration in the cost assessments as it is not an integrated part of the HHW implementation plan but rather a pre-condition to adopt it.

The implementation plan will entail both capital and operational expenditures. The capital expenditures represent a one-time cost in equipment, vehicles, infrastructure and tools to set up the collection package. The operational expenditures for collection are monthly costs for staff resources, transportation and treatment required to develop the packages and the collection system for HHW.

The following needs are foreseen per package:



Basic package, PCP aims to offer the public basic, robust and permanent collection of HHW through permanent drop-off locations. Requires:

1. Project Implementation Team (PIT): Project Manager (PM), Operations Manager (OM), Communications Manager (CM), Administrative Manager (AM) and expertise
2. HHW Collection staff at PCP with appropriate training
3. Equipment in terms of containers for the PCP, interior, tools, safety equipment and communications materials. In some cases, infrastructure for fencing and security.



First add-on package, event-based collection aims to offer additional availability in collection and holds a public awareness function. Requires:

1. Additional resources from Project Implementation Team
2. Additional resource from communications staff
3. Basic equipment to organise the event, including tables and boxes and communications materials



Second add-on package, mobile collection aims to increase availability to all areas and income levels by offering scheduled drop-off at various locations. Requires:

1. Additional resources from Project Implementation Team
2. Additional resource from HHW Collection staff and driver
3. Vehicles, weather protection, basic equipment, tools and communications materials
4. Licensing for transportation of HHW

As some costs cannot be allocated to a specific phase within each package the phases have therefore, in some cases, been grouped. The cost of each package is estimated according to the three municipality types. It is assumed that the implementation will require more resources in large urban municipality to allow a sufficient uptake and outreach.

Costs for:	Basic package: Permanent Collection Point	Add-on package 1: Awareness-raising events	Add-on package 2: Mobile Collection Point
Project Manager	X		
Operations Manager	X	X	X
Communications Manager	X	X	X
Administrative Manager	X		
External expertise	X		
HW operations staff	X		X
Communications staff		X	
Driver			X
General training	X	X	
Specialised training	X		X
Equipment (containers)	X		
Equipment (other)	X	X	X
Vehicle			X
Other			X

Figure 2. Summary of the cost types that arise to the three implementation packages.

2.1.1 Staff costs

All staff and experts involved in the implementation are assumed to belong to one of the below staff categories. Most of the staff costs are indicated in Full-

time equivalent (FTE) units, i.e. scheduled hours divided by the employer's hours for a full-time work week (40 hours).

	Gross staff cost ¹ in ZAR per month		
	Large urban municipalities	Small-or medium-sized urban municipalities	Rural municipalities
Project Manager	75,700	52,990	30,280
Operations Manager	75,700	52,990	30,280
Communications Manager	48,577	34,004	19,431
Communications staff	37,585	26,310	15,034
Administrative Manager	38,919	27,243	15,567
HW operations staff (collection staff)	36,919	25,843	14,767
HW operations staff (driver)	39,581	27,707	15,832
External expertise	80,000	56,000	32,000

Table 2. Gross staff costs in ZAR per month for employees in large urban municipalities.

Staff costs are lower in small- and medium-sized urban and rural municipalities. The staff costs used in the analysis have been discounted for small- and medium-sized urban municipalities by 30% and for rural municipalities by 60% compared to large urban municipalities.

2.1.2 Timing of packages implementation

The time frame for setting up a package of choice is estimated to 3-5 years depending on resources and pre-conditions of the individual municipality. When the implementation of one package is complete, the operational phase begins. The three packages are not foreseen to be undertaken in parallel. However, some overlap between the timings is likely.

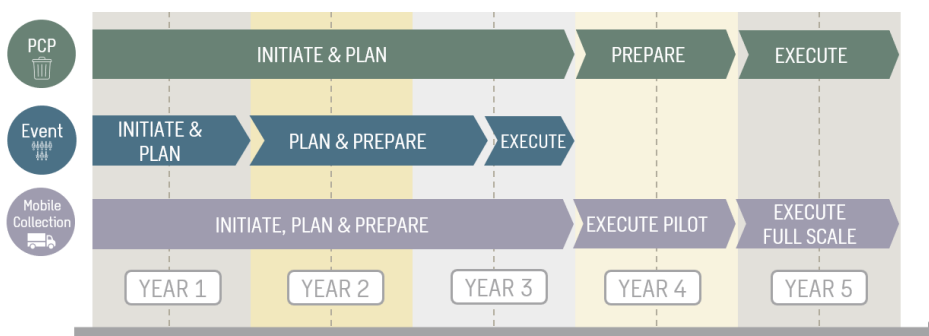


Table 3. Approximate timing of the implementation of the packages.

The PIT is assumed to be appointed and carry costs from the first month of Year 1.

¹ Net salaries have been investigated during the site visit and from the City of Cape Town. They have been recalculated to gross salaries using Talent.com's Income tax calculator South Africa (<https://za.talent.com/tax-calculator?salary=13000&from=month®ion=South+Africa=>)

2.1.3 Costs for basic package, permanent collection point

The basic package focuses on establishing one or several permanent collection points in the municipality.

Staff resources

Firstly, the basic package requires the delegation of duties and authorities related to the PIT. It is foreseen that the PIT will require nearly 2 FTEs in rural municipalities and 2-4 FTEs in urban municipalities. On top of this, 2-3 operational staff members are required to man the PCP.

Staff category	Assumed tasks	FTEs required per municipality type		
		Large urban municipality	Small-or medium urban municipality	Rural municipality
Starting from Phases 1-2: Initiation / planning				
PM	Ensure support of political leadership Join collaboration platforms Organise training, Be responsible for implementation progress Hand over to operational team after competition	1	0.5	0.5
OM	Plan logistics, locations and treatment Prepare classification of HHW, safety data sheets and waste manifest systems Measure and record, Plan for expanded collection	1	0.5	0.5
CM	Plan communications, Roll out planned communication plan	0.3	0.3	0.3
AM	Support to all tasks, Report progress to national government	1	0.5	0.5
Expertise	Support to Plan logistics, treatment, risk assessment and safety routines, Capacity-building, Support IWMP/by-law process	0.3	0.1	0.1
Starting from Phases 3-4: Preparations / Execution				
HW operations staff	Staff operations Install equipment	3	2	2

Table 4. Overview of the staff categories, their tasks and resources required for the basic package. The FTEs express full-time equivalent of an employment, i.e. 40 hours per week. As an example, a FTE of 0.5 corresponds to 20 hours per week.

Capacity building

Capacity building is required to ensure sufficient capacity to organise and staff the collection point. The training costs for staff are assessed to 10,000 ZAR per day of training and is assumed to be procured from private sector. Two types of trainings are foreseen:

- General training, targeting municipal staff
- In-depth, interactive and hands on training, targeting HHW operational staff

Type of training	Days required per municipality type		
	Large urban municipality	Small-or medium urban municipality	Rural municipality
General training	4	2	1
In-depth training, targeting HW operational staff.	1	1	1

Table 5. Overview of the foreseen number of days of training per training type and municipality type. The training is foreseen to be provided in Phase 3 Preparations.

The training is foreseen to be undertaken in the first month of Year 4.

Equipment

The PCPs are foreseen to be based in retrofitted 20-foot containers as this is a cost-effective and proven approach. The type and population of a municipality will give rise to a recommendation on the size and number of PCPs per municipality. In general, large urban municipalities with critical mass in terms of population are encouraged to establish large-scale, but fewer collection points in the municipality to achieve scaling benefits. It is estimated that one large collection point, consisting of 7-8 containers, is suitable to service 550,000 inhabitants². Small-or medium urban municipality are encouraged to establish smaller-scale PCPs with three containers servicing 150,000 inhabitants. Rural municipalities are foreseen to build one PCP with two containers that services the entire population. It is recommended to equip the PCP with a table, shelves for packaging and storage inside the containers, safety equipment, personal protective equipment and equipment to measure and record the incoming waste. The costs for safety equipment are relatively similar for all sizes of PCPs.

² Net salaries have been investigated during the site visit. They have been recalculated to gross salaries using Talent.com's Income tax calculator South Africa (<https://za.talent.com/tax-calculator?salary=13000&from=month®ion=South+Africa=>

² The factors were benchmarked with the number of PCPs in other cities of similar type.

Required equipment	Items per municipality			Cost per item
	LM	SM	RM	
Container 20 ft standard, retrofitted with ventilation and locks	8	3	2	100,000
Shelves and minor equipment e.g. table for reception and packaging for container	16	6	4	3,300
Safety equipment Fire extinguisher, fire alarm and safety shower and eye wash	1.0	0.9	0.8	110,000
Personal Protective Equipment For HW operations staff	3	2	2	15,000
Equipment to measure and record e.g. tablet or mobile phones, scale	2	1	1	10,900
Plastic boxes to store fractions separately and labelling	10	10	10	188
Communication materials Signage and printing	2	1	1	20,000

Table 6. Required equipment items with amount and unit cost in ZAR per item for basic package and collection point location. LM=Large urban municipalities. SM = Small and Medium urban municipalities. RM = Rural municipalities.

The investment in equipment is foreseen to be undertaken in year 2, month 1.

The municipalities are assumed to arrange a suitable site for the PCP free-of-charge and without investments into infrastructure, e.g. fencing or security. This would, in most cases, be a functioning transfer station site. Municipalities that lack such site can add an investment amount into the tool to take this cost into consideration.

2.1.4 Costs for first add-on package, Event-based Collection

The first add-on package focuses on extending the HHW collection to event-based collection on a periodic basis. In the tool, the municipality can select the planned event frequency.

Staff resources

The event logistics and communications need to be planned in advance and will require additional time allocation for some of the PIT members.

One collection event is estimated in itself to take one full workday. It is assumed to be arranged at or nearby the PCP and that the HHW staff and equipment at the PCP can be used to undertake the event.

The communications staff involved are to be reallocated from other work tasks within the municipality (not newly appointed employees) and are assumed to only be engaged at the collection events. It is recommended to host the events on weekends or outside office hours to increase availability to the public. Therefore, it is likely that the HHW staff cost should include a bonus as a result of weekend work. The size of the bonus could not be quantified.

Staff category	Assumed tasks	FTEs required per municipality type		
		Large urban municipality	Small-or medium urban municipality	Rural municipality
Starting from Phases 1-3: Initiation / planning / Preparations				
OM	Plan logistics	0.0	0.2	0.2
CM	Plan communications	0.2	0.2	0.1
Communications staff	Plan the communications and support at events	0.5	0.5	0.5
Starting from Phase 4: Execution				
		Staff members required per event		
Communications staff for events (per 1 event)	Support at events	8	5	3

Table 7. Overview of the additional staff categories, their tasks and resources required for the first add-on package. Note that the additions to OM, CM and communications staff refer to FTEs and the event staff to number of staff members required per event.

The costs for communications staff for events have been accounted from the sixth month of Year 3 in line with the selected frequency of events.

Capacity building

Capacity building is recommended to maintain sufficient capacity to organise and staff the collection point. The training costs for staff are assessed to 10,000 ZAR per day of training and is assumed to be procured from private sector. It will cover the general training targeting municipal staff. It is foreseen to be implemented for a total four days in large urban municipality, two days in small-or medium urban municipality and one day in rural municipalities in the sixth month of Year 2. **Equipment**

As most equipment is available at the PCP, the only foreseen purchase is tables and containers to sort, store and label fractions separately, estimated to cost a total 5,000 ZAR, assumed to be purchased in the first month of Year 3. Other costs related to communication materials have been included in the analysis and budgeted to 10,000 ZAR in total.

2.1.5 Costs for second add-on package, Mobile Collection

The second add-on package focuses on extending the permanent collection to mobile collection on a regular basis which significantly increases the service availability to the population.

Staff resources

The mobile collection logistics and communications need to be planned in advance and will require additional time allocation from the PIT.

In addition, it is assumed that two new staff members will be hired. Based on the experience from BCM, the mobile collection requires one driver and one HHW staff member. The additional staff members are foreseen to assume duties in the seventh month of Year 3.

A regular day is foreseen to be planned as follows:

- Preparation and packaging of vehicle, 30 minutes
- Transportation to and from the collection site, depends on the number and duration of stops
- Implementation of mobile collection point, 2-3 hours
- Sorting and packaging of the collected HHW, 30 minutes

It is assumed that all municipalities operate with one vehicle on all weekdays. The resources can be pooled between small- and medium-sized urban and rural municipalities.

The additional staff needs are presented below.

Staff category	Assumed tasks	FTEs required per municipality type		
		Large urban municipality	Small-or medium urban municipality	Rural municipality
Starting from Phases 1-3: Initiation / planning / Preparations				
OM	Plan logistics	0	0.3	0.3
CM	Plan logistics	0.3	0.3	0.1
Communications staff	Plan communications and support at events	0	0.3	0.3
Starting from Phase 4: Execution				
Communications staff	Support communications at events	1	1	0.5
HHW operations staff	Operate the mobile collection point	1	1	1
HW operations staff	Driver	1	1	1

Table 8. Overview of the additional staff categories, their tasks and resources required for the second add-on package in terms of FTEs.

Capacity building

Capacity building is required to allow sufficient capacity to organise the service and ensure safe transportation of the collected HHW. The training costs for staff are assessed to 10,000 ZAR per day of training for HHW operational staff and 15,000 ZAR per day for safe transportation and is assumed to be procured from private sector. Two types of trainings are foreseen:

- In-depth, interactive and hands on training, targeting HHW operational staff
- Training for mobile collection vehicles drivers on transportation of dangerous goods

Type of training	Days required per municipality type		
	Large urban municipality	Small-or medium urban municipality	Rural municipality
In-depth training, targeting HW operational staff	1	1	1
Training for mobile collection vehicles drivers	1	1	1

Table 9. Overview of the foreseen number of days of training per training type and municipality type. The training is foreseen to be undertaken in the seventh month of Year 3.

Vehicle, equipment and license

The second add-on package adds significant capital investments to the collection system for HHW.

Required vehicle and equipment	Items per municipality			Cost per item
	LM	SM	RM	
Collection vehicle Roofed pick-up or conventional truck (at a higher cost), compliant to HHW transport	1	1	1	310,000
Equipment for collection Foldable tables and plastic boxes to sort and store fractions separately and label it	1	1	1	7,000
Weather protection Pop-up tent or similar structure	1	1	1	15,000
Equipment to measure and record e.g. tablet or mobile phones, scale	2	2	2	10,900
Communication materials Signage and printing	1	1	1	20,000
License fee for vehicle License for transportation of dangerous goods by local emergency responders	1	1	1	1,500

Table 10. List of required vehicle and equipment items and item costs in ZAR for the second add-on package. LM=Large urban municipalities. SM = Small and Medium urban municipalities. RM = Rural municipalities.

The purchases are assumed to be made in month 1, year 3. Some needs in terms of training of the staff is foreseen. The operational costs for the vehicle during the execution and operational phase have not been taken into consideration as it is difficult to make general estimations of the geographical distances within the municipalities.

2.1.6 Outsourcing of collection service

The team has identified some large urban municipalities that fully outsourced the operations of their existing PCPs to the private sector contractors. In these cases, the infrastructure and PCP itself was constructed and owned by the municipality. The municipality normally pay a management fee to the private sector operator. The management fee includes provisions of staff, equipment, some transportation and overhead. It excludes the provision of any infrastructure (e.g. the permanent collection point), transportation and treatment of HHW. It should be underlined that the PIT duties cannot be outsourced and

that the municipality is foreseen to purchase the necessary infrastructure. It is realistic to assume that event-based collection and mobile collection can be outsourced too.

For the basic package, it is foreseen that the PCP can be staffed by an external service provider from the 12th month of Year 3. It is considered realistic that the management fee includes 2-3 trained staff members and the necessary personal protection equipment. This way, the municipality will avoid the costs of internal HHW operational staff and training.

For the first add-on package, it is expected that the events can be arranged by an external service provider. The management fee should include 3-8 trained staff members depending on the size of the municipality and the necessary personal protection equipment. This way, the municipality will avoid the costs of internal communications staff.

For the second add-on package, it is expected that the mobile collection service can be arranged by an external service provider. It is assumed that the management fee includes two trained staff members, one HHW operational staff and one driver, a vehicle and all necessary equipment. This way, the municipality will avoid costs of internal HHW operational staff, driver, vehicle, necessary equipment and licensing. The staff is expected to be contracted from the 12th month of Year 3.

2.2 HHW transportation and treatment costs

The costs for treatment are variable and depend on the amounts of waste generated, collected and disposed for treatment. It is assumed to arise on a periodic basis and change on a year-by-year basis in line with population growth or decline as well as growth in the overall waste generation.

The key indicator is the waste generation rate.

2.2.1 Generation of HHW

The waste generation of municipal waste in South Africa was investigated in 2012 by the Department of Environmental Affairs. Later reports do not include the waste generation indicators. The data from 2012 has been adjusted to the assumed levels of waste generation of 2022.

<u>Province</u>	<u>2011 data</u>	<u>2022 adjusted data</u>
Western Cape	675	600
Eastern Cape	113	150
Northern Cape	547	150
Free State	199	247
KwaZulu Natal	158	150
North West	68	150
Gauteng	761	600
Mpumalanga	518	600
Limpopo	103	150

Table 11. Generation of municipal waste in kilograms per capita in 2011. The indicators have been adjusted to the 2022 level assuming an annual growth of 2% in waste generation, delimited to boundaries of 150-600 kg per capita and year. Source: Department of Environmental Affairs, 2012. National Waste Information Baseline Report.

The adjusted data for 2022 is used for the analyses as basis for the first month of Year 1. The forecasted waste generation data, it is assumed to grow by 2% per year.

The variations throughout the country are very large. In an international comparison of upper middle-income countries, waste generation rates above 700 kg per capita and year are considered high whereas rates below 100 kg per capita and year are considered very low. The organic waste category includes putrescibles, greens and garden waste.

The share of hazardous waste of the total municipal waste generation is 1-2% in other upper middle-income countries, based on Sweco's experience. This rate has been assumed to calculate the generation of HHW in the provinces.

<u>Province</u>	<u>Generation of HHW</u>
Western Cape	6.0-12.0
Eastern Cape	1.5-3.0
Northern Cape	1.5-3.0
Free State	2.5-4.9
KwaZulu Natal	1.5-3.0
North West	1.5-3.0
Gauteng	6.0-12.0
Mpumalanga	6.0-12.0
Limpopo	1.5-3.0

Table 12. Range of estimated generation of HHW per province in kilogram per capital and year.

Thus, the estimated HHW generation is **1.5-12.0 kg per capita and year** for the cost assessment.

As the treatment cost varies with different waste streams, it is necessary to break down the waste generation in line with the composition. The team has outlined the foreseen composition below to be applied to the ranges of estimated generation of HHW.

<u>Composition of HHW</u>	<u>Weight share</u>
Consumer electronics	70%
Batteries	10%
Paints and solvents	10%
Waste oils	3%
Insect repellents and pesticides	2%
Lamps and other mercury containing products	1%
Cleaning products	1%
Medical waste	1%
Unknown, mixed or other streams	3%

Table 13. Estimated composition of HHW per waste stream expressed as share in terms of weight. Source: Avfall Sverige, 2008. Report 2008:11 and Sweco analysis.

2.2.2 Transportation

HHW transportation refers to the transfer of HHW from the collection point or intermediate storage to a treatment facility. It requires a licensed driver with specialised training and vehicle. Most municipalities do not have trained and licensed staff and procures the service from a hazardous waste management operator. In most cases, the transportation cost is included in the overall treatment price offered by the operators to the municipalities. Following the training of a driver and purchase of a vehicle in the second add-on package, the transportation can be carried out by the municipality (if preferred).

2.2.3 Pricing of treatment and transportation

The waste generation data per capita, year and waste stream are used to estimate The cost range to dispose of collected HHW is based on the waste generation data per capita, year and waste stream. Municipalities are foreseen to procure the services of licensed hazardous waste management operators to collect, treat and dispose of HHW.

The cost for treatment is set on a commercial basis by each treatment facility. As all HHW treatment facilities are operated by private enterprises, there is no transparent information on the pricing of treatment of HHW available to the team. Therefore, price estimations have been collected from multiple sources, compiled, compared and presented as a range. The sources include municipalities, sector experts and treatment facilities, of which some requested the information to be handled confidentially.

<u>Waste stream</u>	<u>Range (ZAR)</u>
Treatment facilities:	
Consumer electronics	17 - 22
Batteries	4 - 5
Paints and solvents	12 - 19
Waste oils	13 - 29
Insect repellents and pesticides	26 - 169
Lamps and other mercury containing products	17 - 23
Cleaning products	36 - 49
Medical waste	18 - 24
Unknown, mixed or other streams	60 - 169
Hazardous waste landfills:	
Gate fee for various waste types	1 - 3

Table 14. Range of treatment costs in ZAR per kilogram, including classification and excluding transportation costs, for household hazardous waste per waste stream for small volumes (<15 tonnes per load). The landfill gate fees are assumed to apply

There are variations for all fractions depending on volume, risk and composition. To reflect this an uncertainty margin of 15% has been added to the pricing above. Several sources mentioned to the team that the treatment costs normally increase by 20-30% if the content is unknown or mixed, but in reality the treatment cost may increase much more. For instance, easily identifiable and separated pesticides are treated at around 26-30 ZAR per kg. However, when mixed or not possible to classify, the treatment price per kilogram can be five-fold. Similar characteristics apply to mixed or other waste streams. The gate fees to hazardous waste landfills are generally very low compared to the costs of other types of treatment, e.g. recycling. However, the hazardous waste landfills do not accept all waste streams.

It is foreseen that some waste streams, e.g. waste oils, are or will be collected from municipalities free-of-charge or for a lower fee than indicated above. The tool provides the municipality with an option to indicate such exceptions.

Multiple sources stated that the transportation cost from the collection point or intermediate storage to the treatment facilities is regulated and fixed at 4-5 ZAR per kilometre for one full truck load (average truck assumed to carry 2 tonnes). The team has not been able to confirm the information and therefore used the conservative assumption of 20 ZAR per kilometre per truck load. For calculation purposes, the transportation cost is assumed to represent 15% of the total price for HHW disposal that is offered to a municipality by a private operator.

2.2.4 Timing of treatment and transport

The cost of treatment and transportation depends on the volume of the collected HHW. To reduce the cost of treatment and transportation, it is assumed that municipalities will accumulate and store the collected HHW and

dispose it for treatment in bulk. The team foresees that the launch of the PCP will trigger collection of HHW that has been stockpiled in households over a long time. Thus, it is foreseen that large amounts of HHW will be collected during the first months after which the amounts decrease to the level of actual generation and level out. The analysis demonstrates an annual estimated costs for transportation and disposal of waste generated during the previous year.

3. Results

The tool provides an approximate cost assessment for any municipality in South Africa. For the purpose of illustration, the tool has been used to generate approximate costs for assessment for the three fictional municipality types:

1. **Large urban municipality in Gauteng province** with 1.6 million people
2. **Small-or medium urban municipality in KwaZulu-Natal** with 300,000 people
3. **Rural municipality in Eastern Cape** with 30,000 people

The cost assessments are presented below.

Cost item	Total costs per municipality type			Unit
	Large urban municipality in Gauteng province	Small-or medium urban municipality in KwaZulu-Natal	Rural municipality in Eastern Cape	
Total cost for basic package (broken down into categories):	21,690,000	7,953,000	4,355,000	ZAR
Staff costs (over 60 months)	18,289,000	6,917,000	3,953,000	ZAR
Investments (equipment)	3,345,000	1,002,000	379,000	ZAR
Training	56,000	34,000	23,000	ZAR
Outsourcing	-	-	-	
Other costs	-	-	-	ZAR
Total cost for first add-on package (broken down into categories):	1,208,000	1,250,000	641,000	ZAR
Staff costs (over 36 months)	1,150,000	1,213,000	614,000	ZAR
Investments (equipment)	16,000	16,000	16,000	ZAR
Training	42,000	21,000	11,000	ZAR
Outsourcing	-	-	-	
Other costs	-	-	-	ZAR
Total cost for second add-on package (broken down into categories):	5,372,000	5,219,000	2,650,000	ZAR
Staff costs (over 60 months)	4,937,000	4,784,000	2,215,000	ZAR
Investments (vehicle and equipment)	405,000	405,000	405,000	ZAR
Training	28,000	28,000	28,000	ZAR
Outsourcing	-	-	-	
Other costs	1,625	1,625	1,625	ZAR
Approximate annual cost for transportation and treatment	11,388,070	548,090	74,790	ZAR/year
Transportation cost	507,530	38,060	23,790	ZAR/year
Treatment cost	10,880,540	510,030	51,000	ZAR/year

Table 15. Results unique to the three fictional municipality types. The values are rounded up or down to the nearest thousand.

Please note that the three packages are presented separately and not accumulated.

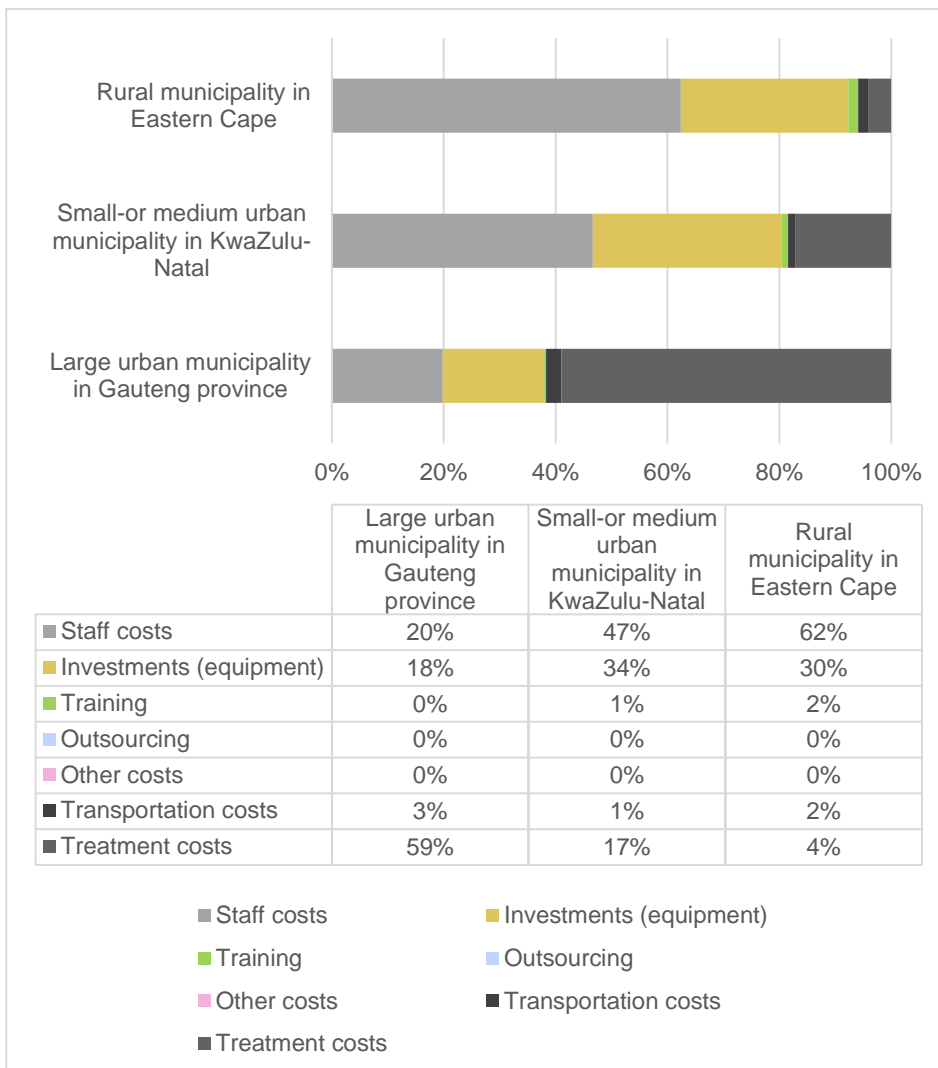


Figure 3. Breakdown of the annual cost for the Basic package for the three fictional municipality types. The average annual cost is estimated to 18.4 million ZAR for the large urban, 3.0 million ZAR for small- or medium-sized urban and 1.3 million ZAR for rural municipality for the five-year period.

The cost assessment confirms that treatment and staff costs are the key cost drivers in the introduction of HHW collection in the basic package. In large urban municipalities which generate large amounts of HHW, the treatment cost represents the key cost driver. The treatment costs account for 59% of the total cost in large urban municipalities, 17% in small and medium-sized urban municipalities and 4% in rural municipalities. The treatment costs vary greatly between different provinces due to the large variations in waste generation rates. It is likely that large urban municipalities will be able to negotiate lower treatment costs based on volumes, if the collection rate is high. In medium-sized and small urban and rural municipalities, the staff costs are the key cost drivers due to the small amounts of HHW generated. The staff costs account for 20% of the total cost in large urban municipalities, 47% in small and medium-sized urban municipalities and 62% in rural municipalities. The investment in equipment is less than 35% of the total cost for all municipality types.

The annual cost per citizen in the three municipality types to introduce the basic package are 12 ZAR large urban municipalities, 10 ZAR in small and medium-sized urban municipalities and 42 ZAR in rural municipalities excluding the transportation and treatment costs. The reason for the per capita cost for the small and medium-sized urban municipalities to be smaller than in large urban municipalities is that they generate significantly less HHW and thus have lower treatment costs.

Outsourcing of the service for an individual municipality is estimated to increase the operational cost by up to 15% as compared to in-house management. It is estimated that municipalities that join forces and sub-contract some services may achieve cost savings.

A key priority for urban municipalities should be to seek partnerships, e.g. with the private sector, in order to explore ways to reduce the treatment costs for the collected HHW. Small-sized urban municipalities would benefit from cooperation between municipalities or with the private sector to pool staff resources and reduce costs.

Appendix 1: Excel tool

The tool and model for cost estimation of the implementation plan is attached as a separate file.

The tool is created to support municipalities in the introduction of Household Hazardous Waste (HHW) collection. It is developed in line with the Implementation Plan document and its three packages. The dynamic model will help estimate the generation of HHW and the main fixed and variable costs associated with investments and operations, including staff needs, capacity-building, equipment and infrastructure and other costs. Budget planning is a pre-condition to integrate HHW collection into the IWMP, mobilise political support and secure financing.

The tool user will need to indicate the following basic information about the municipality below:

- Population
- Size group depending on the indicated population and features of the municipality
- Province that your municipality belongs to
- Road distance to a treatment facility, which are assumed to be located in Cape Town, Durban and Johannesburg
- Collection target, i.e. to collect x % of the total generated household hazardous (40% and 60% are reasonable targets for permanent collection points and mobile collection points, respectively)
- Current cooperation with ROSE Foundation or similar organisations for no- or low-cost collection of waste oils.
- In-house implementation or outsourcing of some activities of the implementation plan
- Frequency of collection events of the first add-on package
- Estimated cost for preparing a site for the PCP at an existing transfer station site or similar

The tool provides the following results:

- Estimated amount of HHW generated in the municipality
- Proposed number of permanent collection points
- Costs of staff, investments, training, outsourcing and civil works broken down per package
- Costs of transportation and treatment of the generated HHW