

# Assessment of Alternatives and Implementation Plan

## Integrated Waste Management Plan



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## TABLE OF CONTENTS

<b>Executive summary</b> .....	<b>5</b>
<b>1 Introduction</b> .....	<b>8</b>
<b>2 Approach &amp; methodology for the assessment of alternatives</b> .....	<b>9</b>
2.1 Gap analysis .....	9
2.2 Implementation Strategy and Plan.....	9
2.3 Prioritization framework .....	9
<b>3 Identified needs and gaps</b> .....	<b>11</b>
3.1 Solid waste management .....	11
3.2 Waste collection and associated needs.....	11
3.3 Waste characterisation .....	12
3.4 Law enforcement and Community Engagement .....	12
3.5 Waste minimisation.....	12
<b>4 Implementation Strategy and Plan</b> .....	<b>15</b>
4.1 Organisational structure and institutional arrangements .....	15
4.2 Enforcement and by-law requirements .....	18
4.3 Education and awareness .....	19
4.4 Waste information management.....	21
4.5 Waste collection and asset management.....	22
4.6 Waste minimisation, re-use, recycling and disposal.....	23
<b>5 Prioritization framework</b> .....	<b>27</b>
<b>6 Conclusion</b> .....	<b>36</b>
<b>Appendix A: Gap Analysis Workshop</b> .....	<b>37</b>

## LIST OF TABLES

Table 1: Process to develop an Integrated Waste Management Plan	8
Table 2: Proposed rating system	9
Table 3: Proposed alternatives for management associated with organisational structure and institutional arrangements	16
Table 4: Law enforcement and by-law proposed alternatives	19
Table 5: Proposed action plan to raise education and awareness within the CoT	20
Table 6: Proposed alternatives for waste information management	21
Table 7: Waste collection and asset management proposed alternatives	22
Table 8: Proposed alternatives for the waste industry	24
Table 9: Prioritization of action items for the improvement of CoT waste management stream	27

## LIST OF FIGURES

Figure 1: Soshanguve Waste Disposal Site, 2012	14
Figure 2: Onderstepoort Waste Disposal Site, 2012	14
Figure 3: Ga-Rankuwa Waste Disposal Site, 2012	14
Figure 4: Valhalla Waste Disposal Site and waste sorting facility, which has been closed, 2012	14
Figure 5: Garskloof Waste Disposal Site, 2012	14
Figure 6: Informal houses on the face of Garskloof Waste Disposal Site, 2012	14
Figure 7: The Waste Management hierarchy (Source: NWMS)	15
Figure 8: Schematic diagram depicting elements to be considered to assess effectiveness of organisational structure	16
Figure 9: Cradle-to-Grave approach	23

## Executive summary

The development of the Assessment of Alternatives and Waste Management Implementation Plan follows from the preparation of the comprehensive Status Quo report. The Status Quo report was based on field assessment, stakeholder engagement and assessment of waste management practices within the City of Tshwane (CoT) which was conducted within the framework of the National Waste Act (NEM:WA) and National Waste Management Strategy (NWMS).

As part of the final Integrated Waste Management Plan, responses have been provided for the key issues and gaps identified in this assessment of alternatives and finally a coherent Implementation Plan has been proposed. Together with the Status Quo report, this Assessment of Alternatives and Waste Management Implementation Plan report forms the overall Integrated Waste Management Plan for CoT.

The City of Tshwane, as with many municipalities in SA, is confronted with increasing waste burden as a result of rapid urbanisation and burgeoning consumption patterns. The way that waste is generated and handled has an impact on everyone, from individual citizens and small businesses to public authorities and international trade. The uncontrolled spread of waste is harmful to the environment and to human health.

Existing landfill sites are rapidly reaching their operational capacity and there are huge financial and environmental challenges in establishing new landfill sites. Against this background, there is a need to look at alternative and innovative ways in dealing with the waste burden. Within the context of the emerging green economy, and the need for job creation in a developing economy and an imperative of the National Planning Commission, the challenge of waste management can be translated to a basket of opportunities that can bring strategic advantage to a region and its society.

It is against this background that the following critical areas are noted. These form the basis of the Implementation Strategy and Plan due to the need for focused urgent attention. These include:

- Formalisation of recycling initiatives
  - Dedicated personnel and special units for recycling
  - Each region must have dedicated drop-off locations
  - Each region must have transfer stations for the types of waste that is mostly generated in that region
- Integration of transfer sites within the greater network of waste minimization strategies
- Assess permit conditions and redirect waste to appropriate sites
- Consider viable use of waste as a resource
- Incentives for support of minimization strategies by the public, including a possible reduction in waste collection tariffs to encourage waste minimization
- Develop appropriate by-laws and guidelines
- Development of appropriate Public Private Partnerships
- Development of Materials Recovery Facilities (MRF) to support waste minimization strategies
- Invest in cheaper alternative options for waste minimization and collection (such as community based waste collection) for reducing the need for waste collection by CoT
- Hire appropriately qualified personnel
- Provide relevant training to all personnel
- Provide under-served communities with the basic infrastructure and material they need to become part of the municipality's waste collection system (such as equipment, protective gear, buy back centres etc., as well as education and training, management, and supervision)
- Create opportunities for under-served communities to become active participants in the management of their own waste
- Increase the maintenance of the existing infrastructure to increase its lifespan
- Propose adopt-a-spot programmes and projects to raise awareness

- Alignment of internal processes with that of the IDP requirements
- Dedicated Metro Police Officers for law enforcement of waste related offences
- Signboards to be erected in places where illegal dumping takes place
- Ongoing communication with other departments
- Development of Integrated Waste Management Policy for CoT which outlines the goals, objectives and scope as prescribed by NEM:WA
- Investigation of closure permits and rehabilitation of abandoned/ old sites to ensure compliance with National Environmental Management: Waste Act
- Obtain necessary environmental and waste permits and ensure that permitted sites are compliant
- Contract management should only be put in place to fill gaps/limitations
- Determine beats or routes to be take and fill gaps with contractors
- Determine fleet requirements
- Reallocation of resources between sister departments/ directorates
- Improve communication
- Undertake bank feasibility studies for waste minimization strategies and Public Private Partnerships
- Monthly management meetings at director level to continue, with improved communication of these decisions to all staff
- Communication of roles and responsibilities follow regionalization of CoT waste management
- Identification of job specific training requirements of all personnel

It is important to be informed on the costs associated with the respective aspects of waste management and express this proportionally to total cost of the waste management service. This information can be used to inform the Municipality of the impact should a particular aspect of waste management be ineffective. For example, ineffective routes for collection add to the haulage distance which results in additional costs being incurred which consequently reduces the lifespan and increases maintenance on fleet. Similarly, it is also important to determine whether the staff required are sufficient and how inadequate staffing impacts on the waste management service and associated costs. This emphasises the importance of integrated waste management which leads to informed decisions that can realise cost savings and result in efficient waste management services. Alternatives in this regard have therefore taken such factors into account.

The availability of waste disposal sites and their lifespan is one of the critical decision areas for the CoT. This process is not straightforward since the provincial authorities will determine, through an authorisation and licensing process, what decisions will have to be taken. Alternative considerations will need to take into account options such as drop-offs, transfer stations, as well as a regional facility within Region 7 in addition to the expansion of the existing waste disposal site.

Another area of focus for the City of Tshwane is waste minimisation. Alternatives which are being proposed include economic and political instruments such as green taxes, recycling subsidies<sup>1</sup>, however importantly, the appropriate mix of instruments which foster cost-effectiveness in environmental regulation is crucial and needs careful investigation and planning. Financial incentive for waste generators, for example, to reduce or recycle waste (e.g. pay-as-you-throw<sup>2</sup>) policy measures. A two-tiered charging system with a fixed cost for the overhead costs (staff salaries, admin costs, environmental studies etc) and variable cost for actual waste service (collection, disposal, treatment – based on the volume etc.) can be considered. For successful implementation, the fixed cost should be as low as possible to urge the citizens to increase their efforts for waste reduction. Importantly, the inclusion of public private partnerships, community involvement and

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<sup>1</sup> Turner, R. L., Salmons, R., Powell, J. and Craighill A. (1998) Green taxes, waste management and policy economy, *Journal of Environmental Management* **53**, 121 - 136

<sup>2</sup> Karagiannidis, A., Xirogiannopoulou, A. and Tchobanoglous, G. (2008) Full Cost Accounting as a tool for financial assessment of Pay-as-you-throw schemes, A case study for Panorama municipality, Greece, *Waste Management* **28**: 2801 – 2808.

alternative technologies are crucial and the appropriate mix will have to address the needs of the City of Tshwane accurately.

There is a fundamental need for capacitating the community, the private sector, as well as municipal officials regarding best practice in waste management. Various alternatives in this regard have been proposed, but importantly, an integrated approach will need to be realised. A number of these proposals will require proper analysis for its effectiveness and in particular, regarding recycling initiatives relating to education programmes, (e.g. schools recycling, buy-back centres, etc.), material flow and investment flows will direct the sustainability of the same.<sup>3</sup>

The proposed alternatives are based on the priority ratings and have been discussed with the interested and affected parties. An action plan with key performance indicators to be implemented achieving effective monitoring or progress and improvements can now be realised as part of this Implementation Strategy and Plan.

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<sup>3</sup> Lang, D. J, Binder, C.R., Stauffacher, M., Ziegler, C., Schleiss, K. and Scholz, R., (2006) Material and Money Flows as a means for Industry analysis of recycling schemes: A case study of regional bio-waste management, *Resources, Conservation & Recycling*, **49**:159 - 190

# 1 Introduction

Integrated waste management takes into account all aspects of waste management and requires careful consideration in terms of planning, design and monitoring to ensure that the service is equitable and cost effective. It is crucial to be well informed on what the important challenges are that the CoT is facing and target the root causes of this to arrive at a workable solution which is sustainable.

This report focuses on the assessment of alternatives, and the implementation thereof. It forms part of the final process in the development of an Integrated Waste Management Plan (IWMP), which is outlined as follows.

**Table 1: Process to develop an Integrated Waste Management Plan**

Part		Description
<b>A &amp; B</b>	Status Quo and Gap Analysis	Part A refers an in-depth review of the current status of waste management in the City of Tshwane. This phase of the project includes baseline information. Part B is a summary of the gaps and needs which inform the next phase of the project.
<b>C &amp; D</b>	Assessment of Alternatives and Implementation Plan (IWMP)	Assesses the gaps and needs contained within Parts A & C and recommends suitable alternatives with concomitant priority status.
		After ranking the alternatives, this phase established the preferred alternatives and provides the plan for implementing the same. The Action Plan results which assigns timeframes, responsibilities and a monitoring framework in order to assess the implementation of the plan.

The final Status Quo report outlines the baseline of the integrated waste management status in the area. It includes the gaps identified as well as the proposed needs for the CoT. Linked to this gap analysis is an indication of whether the gap triggers the waste management legislation, policies or strategies which would inform prioritisation of these needs.

It is the intention of this Assessment of Alternatives report to assign priorities to the gaps and needs identified, based on discussions held with the public and the municipality, as well as the information which was obtained through a desk-top review. It is imperative that priorities are assigned so as to achieve a better understanding of the dynamics of the municipal systems and processes.

The Assessment of Alternatives report is intended to provide a stepping-stone between the Status Quo Report and the final Integrated Waste Management Plan and covers the following:

- An assessment and analysis of the “status quo” situation of the current solid waste management functions;
- Prioritisation of needs to allow for improved planning and addressing immediate needs of the municipality;
- Identification of key points to be taken forward into the strategies and plans/ policies that will comprise the IWMP.



## 2 Approach & methodology for the assessment of alternatives

### 2.1 Gap analysis

As explained in the introduction of this report, the final Status Quo report outlines the baseline of integrated waste management in the area. It includes the gaps identified as well as the proposed needs for the Municipality. Linked to this gap analysis is an indication of whether the gap triggers waste management legislation, policies or strategies which would inform prioritisation of these needs.

A workshop was held with stakeholders from within the CoT's Waste Management Department. During this workshop, the gaps that were highlighted in the Status Quo and Gap Analysis Report were discussed to determine a comprehensive set of gaps; along with possible solutions and strategies that would best fit the circumstance within the CoT to achieve desirable sustainability outcomes.

### 2.2 Implementation Strategy and Plan

Following the prioritization of the CoT's priority gaps and needs, an assessment was provided of potential action plans that could be implemented. This section aims to provide a mix of solutions that will strive to provide a framework for continual improvement and a reduction in the amount of waste requiring disposal at waste disposal sites.

### 2.3 Prioritization framework

Following the identification of gaps and needs of the CoT, these issues were ranked in terms of priority. This was done to facilitate the identification of the way forward that will ensure priority areas are focused on first, as well as those action items that can be implemented easily and within short timeframes, but will yield the greatest positive change. The following rating system was utilised.

**Table 2: Proposed rating system**

Action items	Action items to address the identified gaps
Risk to humans (A)	The risk to humans that may be affected: <ol style="list-style-type: none"> <li>1. Exposure to hazardous material;</li> <li>2. Interaction with waste disposal site activities or operations;</li> <li>3. Costs to consumer;</li> <li>4. Disease vectors;</li> <li>5. Aesthetics and social degradation; and</li> <li>6. Pollution of soil, air and water.</li> </ol>
Waste minimisation (B)	Action items were rated based on the contribution to waste minimisation strategies based on the following categories: <ol style="list-style-type: none"> <li>1. The promotion of waste minimisation strategies;</li> <li>2. Contribution to livelihoods, green economy or local economy; and</li> <li>3. Financial benefit to the CoT.</li> </ol> <p>One point was allocated per applicable category, for each action item.</p>
Priority (A+B)	The priority of action items were determined by combining the ratings of risk to humans and waste minimisation. <p>1-3 = Low priority</p>

Action items	Action items to address the identified gaps
	<p>4-6 = Medium priority</p> <p>7-9 = High priority</p> <p>While all proposed action items are relevant to the improvement of waste management in the CoT; it is this rating that should be followed to identify priorities.</p>
Timeframe	Timeframe based on ease of implementation, e.g. how long will it potentially take to implement the proposed action item.

To complete the IWMP, a set of action items was provided to follow on from the assessment of alternatives and the requirements of relevant legislation, guidelines and targets.

## 3 Identified needs and gaps

Efficient waste management, including waste disposal, requires a co-ordinated approach. At the centre of a co-ordinated approach are people with the requisite knowledge, skills and experience to prevent problems, and to develop and implement long-term solutions. The correct resources are also a valuable requirement in ensuring service delivery. All of these things require substantial investment in the right people, training, technology and systems/ process development.

Understandably, finding the resources to invest in effective waste management when there are other priorities to be addressed is challenging. However, doing nothing or implementing piecemeal approaches that are unco-ordinated is costly, let alone ineffective. It is therefore imperative that the efforts to find lasting solution to waste management challenges within the municipality are holistic, well planned, appropriately funded and implemented at the correct level.

To facilitate this process, this section contains a discussion on the identified gaps and needs of the CoT. It is followed by prioritization of the gaps in terms of the immediate needs or the most pressing concerns. The sections that follow address how these gaps can be corrected.

### 3.1 Solid waste management

Waste disposal in South Africa is governed by specific legislation. Therefore, the CoT must ensure that its practices are in full compliance with the various legislation, policy directives and by-laws. Waste management officials should be properly trained to ensure that they understand their responsibility with respect to compliance matters, and are able to discharge those responsibilities effectively and timeously.

Officials should be provided with the support they need in terms of systems and infrastructure. For example, the waste disposal site management team will not be able to collect waste disposal statistics if they have not been trained and provided with the necessary equipment to do so.

Landfill airspace is very expensive to develop, and limited in its lifespan. The disposal of uncompacted waste causes pressure on available airspace, time and money. The municipality should invest in proper waste compaction equipment to optimise on these aspects. Forward planning for personnel training and equipment maintenance are desperately needed. Development of facilities to recycle and compost waste on-site is also needed, in order to reduce waste quantities that are deposited at various waste disposal sites when this waste can be diverted – this is discussed further under Section: 3.4.

### 3.2 Waste collection and associated needs

The municipality's waste collection infrastructure and equipment is inadequate and aging in light of increased number of service points and larger municipal area. There are insufficient processes and systems to support the mandatory levels of service. The municipality needs to make strategic investments (people, systems and infrastructure) ahead of the growth curve in order to cope with future demands resulting from population dynamics (such as increased number of households), urban development and burgeoning consumption patterns.

The success of waste collection and transportation depends, to a very large extent on the availability of qualified personnel to develop the correct systems and processes to acquire, operate and maintain the equipment. Currently, Municipality does not have enough suitably qualified staff to execute this function to meet the required level of service. Besides staff requirements, budget is another key constraint. Waste collection and transport competes with other service delivery priorities.

To successfully deliver on its waste collection and transport mandate, the CoT needs to develop a systematic process, beginning with full understanding of the particular needs of various communities within the

municipality. This includes the correct fleet of vehicles depending on service requirements and efficient collection routes.

The Status Quo report and discussions at the Gap Analysis workshop revealed that as a result of the CoT implementing a regional model, there has been a lack of communication regarding the roles and responsibilities, and allocation of resources. It is therefore anticipated that as the regionalisation model is implemented and communication improves, a better understanding of the allocated roles and responsibilities, collection routes and fleet allocations will fall into place within the regions.

The communication of new aspects linked to regionalisation is very important to ensure service delivery, and the appropriate use of funds. In response, it is equally important that the regions communicate when there are discrepancies or inefficiencies, so that this can be addressed speedily.

### **3.3 Waste characterisation**

In order to effectively manage waste in the CoT, an understanding of the waste types and quantities is necessary. As a result it is suggested that a waste characterisation assessment is undertaken for the entire CoT. Only once a complete picture has been formed can the City begin to plan and provide for the various needs of each region, in a manner that sustainable financially and makes use of waste as a resource to the benefit of the CoT.

This level of assessment will require financial input for the assessment as well as ongoing support in the form of personnel that have been appropriately trained, and resources for recording and reporting requirements. However, in the long-term, the goal is to ensure appropriate and efficient management, which will ultimately lower waste management costs.

### **3.4 Law enforcement and Community Engagement**

Formal law enforcement for waste related matters is important to curb illegal dumping and burning of waste. Currently, the Metro Police supports the CoT by providing officers to patrol certain areas. This should be expanded on to ensure all problematic areas are patrolled. This could include making contact details for complaints more visible within the public too, and the erection of 'no dumping' signboards in areas that are prone to illegal dumping.

The CoT should promote ongoing community engagement in waste management through establishment of a waste management forum, facilitating community based job creating waste management opportunities and repetitive community based clean-up campaigns. This awareness based strategy will slowly cultivate a new ethos of responsible waste management from the point of generation.

Furthermore, every element of the waste management process from collection, through to transportation, separation, processing needs to be considered with the objective to create local jobs and stimulate the local economy. Transition towards a community based LED can be realized through a series of changes in our way of thinking and acting. This must first start with community empowerment programmes through workshops and demonstration centres and then creation of small projects with a strong focus on mentoring, trouble shooting and ongoing monitoring and evaluation.

### **3.5 Waste minimisation**

According to the waste management hierarchy, landfilling of waste is the least desirable option because of the demands made on spatial resources, the need for aftercare in perpetuity, the loss of material resources involved and the pollution caused by landfill sites. It is widely acknowledged that landfills are potential sources of contamination of soil and groundwater, even after termination of landfilling activities. NEM:WA is therefore promoting waste minimisation, re-use and recycling, and reducing the amount of biodegradable waste to landfill (causing methane emissions).

The main concern that was raised during the discussions at the gap analysis workshop focused around informal recycling that is currently taking place on the face of many waste disposal sites. This not only poses a health and safety threat to the individuals working and living on and around the waste disposal site but it is also an opportunity for the City to make use of solid waste as a resource, which is currently not being realised.

Figures 1- 6 contain photographs of some of the waste disposal sites within the CoT. It is evident from the photographs that there is a dire need for the City to formalise recycling and support private initiatives. In many areas recycling is driven by scavengers and as a result there is a lack of protective gear and co-ordination. On other disposal sites, sorting and recycling processes are well co-ordinated and appear to be less hazardous. Overall, there is great potential for the City to facilitate the formalisation and other processes and industries to ensure maximum use of waste as a resource for the benefit of the CoT and the local economy.



**Figure 1: Soshanguve Waste Disposal Site, 2012**



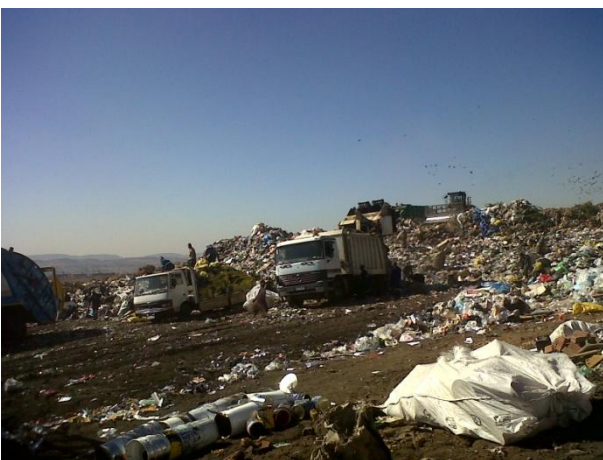
**Figure 2: Onderstepoort Waste Disposal Site, 2012**



**Figure 3: Ga-Rankuwa Waste Disposal Site, 2012**



**Figure 4: Valhalla Waste Disposal Site and waste sorting facility, which has been closed, 2012**



**Figure 5: Garskloof Waste Disposal Site, 2012**

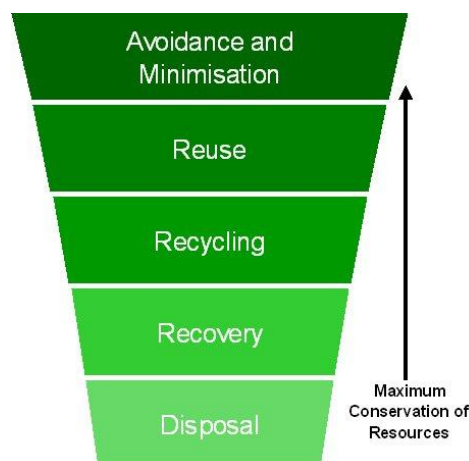


**Figure 6: Informal houses on the face of Garskloof Waste Disposal Site, 2012**

## 4 Implementation Strategy and Plan

This section aims to provide a mix of solutions that will strive to provide a framework for continual improvement and a reduction in the amount of waste requiring disposal at waste disposal sites. It is therefore based on the principles of the Waste Management hierarchy. The Waste Management hierarchy outlines a list of approaches to managing waste, arranged in order of preference. Below is a common graphical representation of the hierarchy, with the least preferred option for managing waste, disposal, located at the bottom and the most preferred option, avoidance and minimisation, located at the top. The Waste Management hierarchy was used to devise initiatives that focus on:

- Strategies which try to avoid products becoming waste
- Strategies which seek to find a use for waste
- Strategies for disposal, which should be used as a last resort.



**Figure 7: The Waste Management hierarchy (Source: NWMS)**

The implementation of one action item per identified gap may not be sufficient to ensure that waste management activities become more holistic. However, the CoT should strive for continual improvement and alignment of systems in a structured manner that foresees a complete cycle of waste handling activities in the near future, like that in the cradle-to-grave approach. With this in mind, the sub-sections that follow include a number of alternatives for each of the gaps identified. These alternatives could all be implemented, or individuals selected, depending on what is identified as achievable at the time.

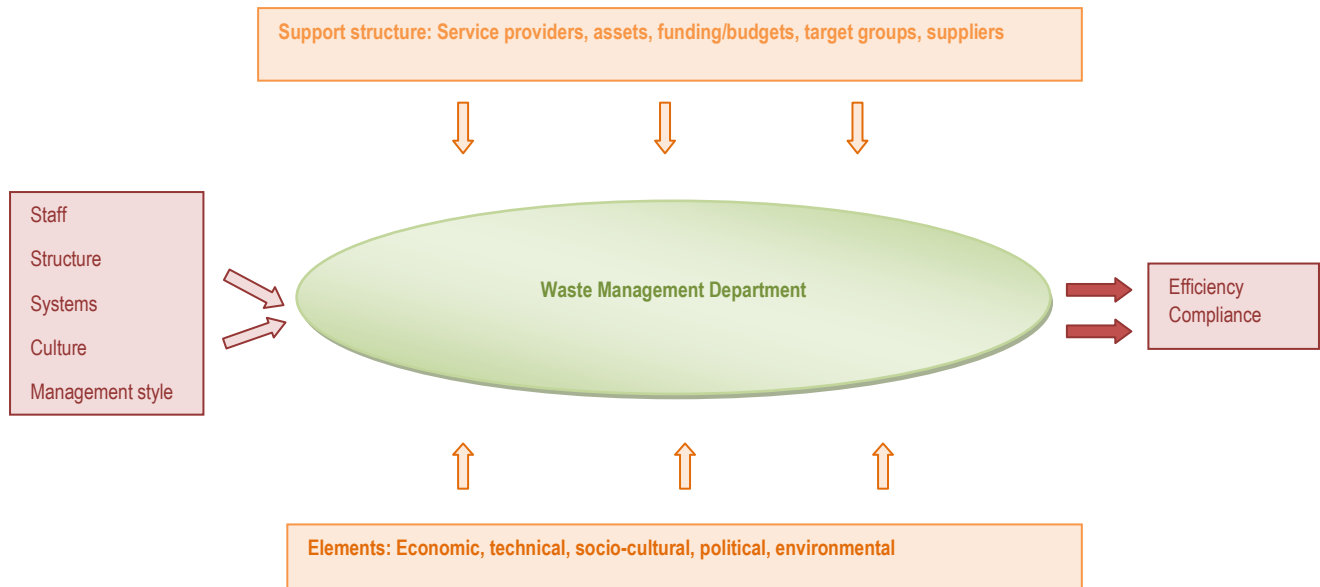
### 4.1 Organisational structure and institutional arrangements

The regionalisation of waste management has resulted in shifts in organisational structure, roles and responsibilities, and reallocation of resources. This process and communication thereof is still underway. The introduction of a change management process may be required to prepare the organisation for new structures and future institutional arrangements. This should include the identification of skilled personnel and resource requirements.

The effective operation of any business unit requires an accurate organisational arrangement which considers elements such as capacity, capability, responsibilities, management style, strategy and staff to achieve the stipulated objectives of that company. This organisational design is necessary for the implementation of any strategy or plan and it is one of the toughest and most sensitive challenges that an organisation's leadership has to face.

A principle of good design which takes into account the decision making skills of executives is imperative. A proper organisational assessment is therefore required which monitors the effectiveness of that particular design aligned with the outputs of the organisation, company or business unit.

The organisational assessment will guide the institutional and financial needs and provide accurate information regarding the specific requirements for the municipality. A schematic diagram depicting aspects specific to solid waste management that should be considered include the following.



**Figure 8: Schematic diagram depicting elements to be considered to assess effectiveness of organisational structure**

Each of the elements (inputs) should be assessed for its suitability whether it is staffing which takes into account the capacity, capability and suitability of the staff compliment for the task at hand. It is therefore critical to assess the roles to be played and the outputs to be achieved with the resources made available. An assessment will provide better insight into the overall picture and will allow for integration of a fragmented institutional framework that may exist.

The following table outlines proposed alternatives for management associated with organisational structure and institutional arrangements. The first set of actions (Action Plan 1) is associated with the scenario that no specific action is taken and Status Quo remains. Action Plan 2 indicates the actions of highest priority that should be addressed urgently, and Action Plan 3 and 4 refer to actions that demonstrate continuous improvement.

**Table 3: Proposed alternatives for management associated with organisational structure and institutional arrangements**

Gap Identified	Action plan 1 Status Quo	Action plan 2 Highest priority	Action plan 3 Continuous improvement	Action plan 4 Continuous improvement
<b>Lack of human resources</b>	Some positions remain unfilled or some filled with inappropriately skilled personnel for the job requirements.	Positions filled with appropriately skilled personnel.	Job specific training, including refresher courses, for existing staff.	



Gap Identified	Action plan 1 Status Quo	Action plan 2 Highest priority	Action plan 3 Continuous improvement	Action plan 4 Continuous improvement
<b>Lack of training</b>	Personnel not trained regularly, or do not receive job specific training.	Key Performance Assessments (KPAs) used to identify job specific training requirements, with incentives linked to regular training.	All personnel trained on legislative requirements, guidelines and targets, at an appropriate level for the job.	Train-the trainer programmes: service providers provide accredited programmes for government, industry, commercial, retail sectors, schools and tertiary institutions.
		Establish Partnerships through corporate education programmes.  Establish strategies, objectives and targets.  Learnerships/ Internships: Identify research areas and create learnerships with tertiary institutions and align with SETA, SAQA etc.	Communication network within communities, e.g. door-door education, street theatre, university fund-raising programmes, field trips etc.	Integration of all initiatives into an integrated waste minimisation and education programme for community, corporate, industry and agriculture, institutions.  Accredited training with alignment with IWMSA or similar.
<b>Communication of decisions made by corporate are not communicated</b>	Continued uncertainty with respect to roles and responsibilities, and resulting inefficiencies, inappropriate use of resources and funds.	Clear communication of the changes resulting from regionalisation, e.g. workshops; resulting in a smoother transition to new systems.	Regular monthly management meetings by the deputy director and all the staff at director level.  Communication of decisions to the rest of the staff complement in all regions.	
<b>Lack of Public-Private Partnerships</b>	Lack of partnerships with the private sector, and continued loss of opportunities for more efficient and sustainable city.	Offer support to existing private initiatives, especially recycling activities.	Use feasibility studies to explore the opportunities for joint initiatives.	Bridge the gap between industries to promote the use of waste as a resource.
<b>Lack of political support</b>	Continued confusion or misunderstanding of the required political and financial support.	Improved communication with respect to what is required by the regions for waste management, and improvements in the sector.	Advertising/ communicating proposed projects and successful projects.	
<b>Institutional arrangements</b>	Baseline: Status quo remains.	Organisational assessment to		

Gap Identified	Action plan 1 Status Quo	Action plan 2 Highest priority	Action plan 3 Continuous improvement	Action plan 4 Continuous improvement
<b>fragmented and inefficiencies exist</b>		rearrange institutional and financial arrangements.		
<b>Lack of recovery of costs</b>	Baseline: Status quo remains.	Review of strategies for revenue completeness to ensure services are paid for.		
<b>Data collection and information</b>	Baseline: Status quo remains.	Revenue collection needs to ensure accuracy of measurement systems and efficacy of financial controls.		
<b>Full cost accounting</b>	Baseline: Status quo remains.	Salary and wage costs to be analysed and aligned with national best practice.	Polluter pays principle to be considered – ‘pay as you throw’ for proper cost recovery.	
<b>Lack of monitoring and evaluation</b>	Baseline –Status quo remains.	Implement performance indicators to monitor and evaluate efficiencies of service delivery mechanisms.	Conduct regular audits and obtain data to assess performance.	

## 4.2 Enforcement and by-law requirements

The National Environmental Management: Waste Act (No. 59 of 2008)(NEM:WA) has clearly outlined the minimum requirements and responsibilities of the local, provincial and national government structures. It is imperative to revisit these in accordance with the various needs of the Municipality and implement as a minimum the requirements of integrated waste management, waste management hierarchy, waste information management, extended producer responsibility, minimising of natural resource usage, promotion of sustainable practices, prevention of pollution, and ecological degradation

Focus should also be directed to the Waste Management Officer (WMO) who will be responsible for co-ordinating waste management in their various spheres of government. The activities carried out by the WMO must be aligned with the National Waste Management Strategy established in terms of Section 6 of NEM:WA. A generator of waste has a general duty to take all reasonable measures to adhere to the waste management hierarchy. The generator of waste must ensure that the management of the waste is carried out to cause the least or no harm to the environment or human beings.

Industry Waste Management Plans (IndWMPs) are the main co-regulatory instruments within the waste management system. They describe the waste related issues within an industry, and specify how the industry will address these issues, giving specific actions, targets and timeframes.

**Table 4: Law enforcement and by-law proposed alternatives**

Gap Identified	Action plan 1 Status Quo	Action plan 2 Highest priority	Action plan 3 Continuous improvement
<b>Illegal &amp; permitted sites</b>	Baseline – illegal operation and non-compliance with permit conditions.	Obtain necessary environmental and waste permits & ensure that permitted sites are compliant.	Investigate closure permits and rehabilitation of abandoned/old sites to ensure compliance with NEM:WA.
<b>Compliance and enforcement</b>	Non-compliance to permit conditions.	Bi-annual second party permit compliance audits.	Quarterly first party permit compliance audits.
<b>By-laws</b>	Outdated waste management by-laws at local government level.	Integrated waste management by-laws required at the local level which follow the principles of the NEM:WA.	
<b>IWM Policy</b>	No policy drafted.	IWM Policy required outlining the goals, objectives and scope of an IWM Plan.	

### 4.3 Education and awareness

An outline is provided of the immediate needs of waste education in the CoT and in particular how this can be implemented as action plans, and guide future planning.

#### a) Political support

There is a need for heightened and continuous political support for continuous waste education. Further to this, it is imperative that the capacity and proper skills be ensured through appointment of custodian of waste management in general. Continuous political support at all government levels is key to a sustained and successful waste education effort that is independent from political changes and instabilities.

Dedicated long-term funding for the maintenance and initiation of a waste awareness, education and training programme and the concomitant human and financial resources must be provided. All spheres of waste management, including domestic, commercial, industrial and governmental, must be identified and regularly monitored and evaluated for its effectiveness and impact.

#### b) Capacity building and internal communication

The Waste Management Department needs to ensure that all staff is capacitated to deal with the current needs and legal requirements pertaining to waste management. Internal and inter-departmental communication and skills transfer needs to be ensured. This is important especially where financial budgets and asset management are involved. Communication and support for waste education and training has to be implemented. Better co-ordination and communication across departments and directorates must be achieved e.g. by avoiding operating in 'silos' and rather choosing an integrated approach to waste education. The effective inter-departmental sharing of existing resources and best practice experience will avoid unnecessary financial and human resource duplication and wastage.

#### c) Public Private Partnerships and the need for integration

The need for involvement from various private companies and organisation and integration of fragmented activities regarding initiatives to improve waste management is one of the key aspects when it comes to waste education. Various waste minimisation, waste to energy and other best practice initiatives that are attempted by private companies (e.g. composting, waste to energy etc.) need to be considered and where appropriate supported.

d) Institutions

Various opportunities exist within the universities and schools to establish programmes for waste education and these are not currently exploited. Through the proper planning and involvement of the respective parties, major improvements can be realised. These refer to eco-schools programmes and other similar projects which can benefit the respective parties.

e) Commerce and Industry

Industry waste management planning is one of the key focal areas of the NEM:WA and through capacitating industry on various aspects of waste management, and in particular integrated waste management, partnerships can be realised to alleviate pressures at “end-of-pipe”.

f) Enforcement of legislation and in particular the NEM:WA, NWMS and others

Enforcement of legislation is a key tool for the Municipality to equip those who will implement the IWMP with the necessary skills and knowledge for ensuring that an acceptable service delivery in terms of waste and other municipal services is achieved internally. In addition, the various sectors externally become more informed about non-compliant practices and these can be managed more effectively.

g) Incentivising and reward programmes.

Through motivation a better and more enthusiastic response can be realised and it is important to therefore implement programmes where the role-players can benefit.

Table 5 contains various action plans to raise waste related education and awareness within the City of Tshwane.

**Table 5: Proposed action plan to raise education and awareness within the CoT**

Gap Identified	Action plan 1 Status Quo	Action plan 2 Highest priority	Action plan 3 Continuous improvement	Action plan 4 Continuous improvement
<b>Marketing success and awareness internally and in public</b>	No marketing of projects with the public via news media, e.g. radios, newspapers.	Liaison with internal marketing and communications department within the CoT.	Ongoing communication with other departments.  Every department should have in place reportable waste minimisation targets.	All successful projects must be circulated and communicated through the internal and external media such as municipal accounts, billboards, newspapers and radio shows.
<b>Illegal dumping or burning of waste</b>	Ongoing illegal dumping and burning of waste.	Conduct awareness and educational campaigns in schools.	Sign boards should be erected in places where illegal dumping takes place.	
<b>Failure to adhere to law enforcement specifically the</b>	Ongoing illegal dumping and burning of waste.	Dedicated person for metro police for law enforcement.		

Gap Identified	Action plan 1 Status Quo	Action plan 2 Highest priority	Action plan 3 Continuous improvement	Action plan 4 Continuous improvement
<b>waste management by-laws</b>				
<b>Waste strategies should be included in the IDP</b>	Lack of alignment with political structures, and a general lack of political support and buy-in (and therefore a lack of funding of projects).	Alignment of internal processes. Waste management must be a cross cutting theme in the IDP development process.	Form a working group to focus on contemporary approaches to waste management: waste to energy, composting, material recovery, etc.	
<b>Educational Awareness Team</b>		Team should include the regional and waste management structures.	Adopt a spot programme, for example, the EPWP projects like <i>Vat Alles</i> and informal parks or vacant properties	

#### 4.4 Waste information management

As the population numbers grow, as well as increased consumerism and changing population dynamics, this growth is directly translated into more solid waste generated per capita per day. The same applies to waste generated by businesses in the area. Proper management of all this waste requires investment in human capital, processes, systems and infrastructure.

As far as waste management is concerned, the overriding objective of the municipality is to succeed with the execution of its service delivery mandate. To do this, requires that the municipality should make informed choices and taking timely actions. Improving its performance along the two dimensions of informed choices and taking timely actions, the City of Tshwane's needs to:

- Generate better information;
- Analyze that information and make sound choices;
- Make those choices quickly; and
- Convert strategic choices into decisive action.

Currently, the available waste characterisation and generation data is limited. This is an important aspect to facilitate future planning, and will need to be undertaken for the entire City of Tshwane.

**Table 6: Proposed alternatives for waste information management**

Gap Identified	Action plan 1 Status Quo	Action plan 2 Highest priority
<b>Lack of waste generation records</b>	No waste generation records.	Implement a framework for the operators to complete and submit once a month.
<b>Lack of industry waste generation records</b>	No industry waste information records.	Obtain industry waste generation records.
<b>Absence of an integrated waste information system</b>	No integrated waste information system currently.	Develop an integrated waste information system (WIS).
<b>A model to estimate per capita</b>	Continue with the business as usual	Commission the development of the model.

Gap Identified	Action plan 1 Status Quo	Action plan 2 Highest priority
waste generation information	scenario.	The model should be ward based and calibrated against real data.
A reliable database to collate waste related information	Continue making rough estimates on the basis of available information.	Develop a proper database.
Translation of the database statistics into a Waste Information System	No Waste Information System (WIS).	Develop the WIS and align with IPWIS and SAWIS.
Capability and skills for collection and collation of data	Baseline – status quo remains.	Train staff and conduct regular checks on waste data at Waste Disposal site. Implement standard measurement tool aligned with SAWIC framework.

#### 4.5 Waste collection and asset management

Proper asset management begins with a well co-ordinated and up-to-date asset register. While there are current asset register documents of the municipality's waste management assets, these fall short of providing sufficient resources to cover the maintenance costs of the existing infrastructure. A co-ordinated approach is needed to redistribute assets to support regionalisation of the CoT, and acquire new assets (if need be) without compromising the quality of the existing infrastructure and by extension, the quality of service rendered.

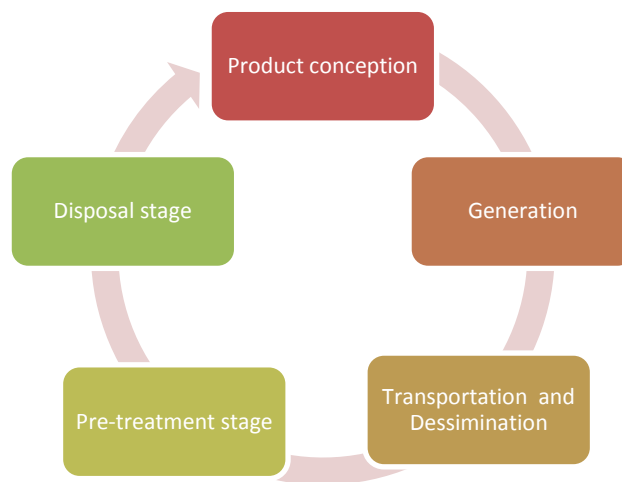
**Table 7: Waste collection and asset management proposed alternatives**

Gap Identified	Action plan 1 Status Quo	Action plan 2 Highest priority	Action plan 3 Continuous improvement
There is not enough waste collection taking place to meet the level of service at the community	Keep things as is and risk illegal dumping with the associated clean up costs.	Provide under-served communities with the basic material they need to become part of the municipality's waste collection system.	Create opportunities for under-served communities to become active participants in the management of their own waste.
There is a growing need for additional waste collection equipment	Continue to operate with the current aging and insufficiently maintained infrastructure.	Increase the maintenance of the existing infrastructure to increase its life.	Consider purchasing additional modern equipment to support the existing infrastructure.
Budget for modernisation of the infrastructure	Business as usual.	Municipality finds alternative sources of funding to support effective waste collection.	Invest in cheaper alternative options for reducing the need for collection.
Qualified waste management staff with the knowledge and experience of developing the required systems and processes	Retain the current staff.	Hire more qualified personnel with the requisite experience.	Provide further training to the current personnel.
Lack of incentives to lower staff turnover	Keep the current staff retention strategy.	Provide better incentives to retain highly qualified staff.	
Lack of investment in new infrastructure	Retain the current infrastructure even though it is a struggle to cope again the growing demand.	Invest in modernisation of the waste collection infrastructure.	Outsource collection to private service providers.

Gap Identified	Action plan 1 Status Quo	Action plan 2 Highest priority	Action plan 3 Continuous improvement
<b>Lack of Infrastructure Asset Management</b>	Records of mechanical plant and equipment available for those that are leased.	Institute a formal waste management based asset management programme to assist in optimisation fleet utilisation and ensuring a preventive maintenance programme.	

#### 4.6 Waste minimisation, re-use, recycling and disposal

The CoT should aim to shift all waste related activities to a system that follows the principles of the ‘cradle-to-grave’ approach. This approach follows a holistic view of waste, from the sourcing of ‘virgin material’ for production conception, the use thereof, and then rather than disposal, the re-use of these products to generate new products; and therefore, the formation of a complete and closed cycle. The desired cradle-to-grave approach is illustrated in Figure 9.



**Figure 9: Cradle-to-Grave approach**

This approach will not only reduce the environmental impact and ensure preservation of finite resources; but also assist the City of Tshwane by adding value to the local economy in the long-term once systems, infrastructure and markets have been established.

The promulgation of the NEM:WA will ensure more stringent control and improved mechanisms for waste minimization, re-use and recycling for domestic, commercial and industrial waste. This provides sufficient incentives for appropriate frameworks for waste minimisation.

As indicated in NEM:WA, policy instruments including those outlined below will need to be enforced and hence the importance of an Integrated Waste Management By-law.

#### **Policy and regulatory requirements, and recommendations**

- Setting clear targets for waste minimisation and recycling in the CoT, and aligning these with the Gauteng Provincial IWMP;
- Introduction and focus on Extended Producer Responsibility to the local industry and commerce with the aim of influencing the type and design (and amount of packaging) in order minimise production of potential wastes at sources;

- Mandatory waste minimisation audits and reviews as part of existing permits is recommended;
- Promoting environmental procurement requirement and public awareness campaigns; and
- Revision of by-laws to align to the NEM:WA and supplement Provincial and National legislation and policy.

### **Economic instruments and Socio-Economic Environmental Incentives and Disincentives**

- Develop sufficient financial incentive for waste generators to reduce or recycle waste (e.g. pay-as-you-throw<sup>4</sup>) policy measures. A two-tiered charging system with a fixed cost for the overhead costs and variable cost for actual waste service needs to be considered;
- Consideration of an airspace credit saving scheme paying out relevant parties according to the contribution made to the savings on the waste disposal site life;
- Investigating waste disposal site tax, product tax, deposit refund schemes (airspace credits) and financial incentives for waste minimisation initiatives. This will require capacitating decision makers with the required skills and technical information.

### **Partnerships with community and private sector**

- Consideration of community participation for waste management with focus on segregation of waste at source into biodegradable and recyclable material. Ensuring the economically viable system is investigated and tested as in the case of Mumbai, India<sup>5</sup>;
- Public private partnerships to encourage segregation and improve on waste management services. Economic viability and suitability for the CoT to be determined<sup>6</sup>; and
- Alternative technologies for implementation as best practice such as waste to energy, community based composting, vermiculture, etc.

### **Information, awareness raising, education and training initiatives**

- Capacitating officials and general public on the accurate terminology and technology based on best national practice of waste minimisation, recycling and re-use.

**Table 8: Proposed alternatives for the waste industry**

Gap Identified	Action plan 1 Status Quo	Action plan 2 Highest priority	Action plan 3 Continuous improvement	Action plan 4 Continuous improvement	Action plan 5 Continuous improvement
<b>Closure of existing landfills and limited airspace availability of remaining landfills</b>	Business as usual.	Separation of waste at the source as part of a waste minimization strategy; with the provision of 130 litre wheelie bins.	Public-Private Partnerships: Small enterprises to be appointed for collection of waste and support of waste minimization strategies.	Materials Recovery Facility, to support waste minimisation strategies.	
<b>Legislation (National Waste Act, 2008) does not speak to the landfill air space</b>	Business as usual.	Investigate air space assessment approach as a measure of landfill remaining capacity.			

<sup>4</sup> Karagiannidis, A., Xirogiannopoulou, A. and Tchobanoglous, G. (2008) Full Cost Accounting as a tool for financial assessment of Pay-as-you-throw schemes, A case study for Panorama municipality, Greece, *Waste Management* **28**: 2801 – 2808.

<sup>5</sup> Rathi, S. (2006) Alternative approaches for better municipal solid waste management in Mumbai, India, *Waste Management* **26**.

<sup>6</sup> Rathi, S. (2006) Alternative approaches for better municipal solid waste management in Mumbai, India, *Waste Management* **26**.



Gap Identified	Action plan 1 Status Quo	Action plan 2 Highest priority	Action plan 3 Continuous improvement	Action plan 4 Continuous improvement	Action plan 5 Continuous improvement
		assessment.			
<b>Insufficient waste minimization strategies</b>	Incentives for support of minimization strategies by the public include a reduction in waste tariffs.	Tenders should be developed specifically for waste to energy solutions.		Organic composting and promoting biomass (methane gas projects), to support waste minimization strategies and waste-to-energy.  Parks department should be outsourced for composting.  The use of wood instead of coal for cooking or heat in rural households.	
<b>Lack of permits, or management according to permits</b>	Continue disposing of waste at disposal sites by extending its life.	Assess permit conditions and redirect waste to existing, appropriate sites.	Expand the existing transfer stations. Store the waste and transfer to a regional waste disposal site.	Build additional transfer stations and transport the waste a regional waste disposal site.	
<b>Lack of alternative waste disposal sites, following regionalisation, and eminent closure of Waste Disposal Sites</b>	Continue disposing of waste at existing disposal sites.	Find an alternative site possibly a regional site.	Redirect waste to existing sites.	Consider viable use of waste as resource(s) (e.g. waste-to-energy, production of new material, up-cycling) that could reduce the need for a waste disposal site.	
<b>Lack of garden refuse transfer sites</b>	Continue disposal at waste disposal site(s).	Redirect garden waste to transfer stations in other regions.	Invest in composting projects.		
<b>Lack of waste minimisation activities</b>	Waste minimisation activities not rolled out in all areas / regions.  Not all waste minimisation opportunities are investigated and implemented.	Formalise recycling initiatives and increase collections of recyclables to other areas/ regions.	Assist private enterprise with existing recycling initiatives and encourage new initiatives.	Encourage on-site source separation at key areas. Key areas could include shopping centres, office complexes, residential complexes, and factories/ manufacturing plants.	Incorporate a financial "penalty" for the unnecessary disposal of recyclable materials in large volumes from industry.

<b>Gap Identified</b>	<b>Action plan 1 Status Quo</b>	<b>Action plan 2 Highest priority</b>	<b>Action plan 3 Continuous improvement</b>	<b>Action plan 4 Continuous improvement</b>	<b>Action plan 5 Continuous improvement</b>
<b>Lack of waste minimisation activities (continued)</b>	Implement a 2-bag waste collection system and a new tariff structure to incentivise less waste for collection, e.g. pay as you throw.	Encourage the establishment of Recyclable Buy Back Centres in municipal areas (MONDI, SAPPI, Nampak, Consol Glass, Collect-a-Can etc.).	Impose penalties for not recycling correctly. Such a penalty could as minimum include refusal of waste collection.		
<b>Lack of partnership initiatives</b>	Involvement and capacitating communities, private sector on the best practice principles.	Assist communities with participation in segregation of waste, with concomitant recovery benefits. Determine economic viability.	Public private partnerships for waste management. Determine economic viability.	Investigate best practice alternatives such as waste to energy, vermi-composting and determine economic viability.	
<b>Lack of awareness and education</b>	Currently very limited waste education and awareness is taking place.	Provide residents and businesses with information on how to dispose of their waste in a responsible way at designated waste disposal sites.	Additional awareness and education campaigns to encourage waste minimisation and recycling.	Increase access and information to the public on drop off points for recyclables for the public.	Provide residents and businesses with information on how to dispose of their waste in a responsible way at designated waste disposal sites.
<b>Insufficient utilization of the composting potential</b>	Business as usual.	Increase the volumes of compostable waste received at the site and/or increase the number of sites.	Employ dedicated and well trained staff to operate and manage the site.	Outsource the function and allow the private contractor to use own equipment.	Outsource the function and mandate the contractor to collect additional waste to meet the demand.

## 5 Prioritization framework

Following from the assessment of the CoT's gaps and needs and proposed action items in order to improve the waste management stream, it is important to prioritize items for the way forward. Table 9 contains the proposed action items for each gap that has been identified. These actions have been rated based on the risks to humans and the contribution to waste minimisation strategies.

Priority items are based on these ratings, and an estimated timeframe for implementation has been provided. From this table, the CoT waste management team can easily identify action items that should be undertaken immediately (priority rating 7-9), followed by action items that are less pressing although important (priority rating 4-6).

**Table 9: Prioritization of action items for the improvement of CoT waste management stream**

Identified gaps	Action items	Risk to Humans 1- Exposure to hazardous materials 2-Interaction with landfill activities or operations 3-Costs to consumer 4-Disease vectors 5-Aesthetics and social degradation 6-Pollution of soil, air and water	Waste Minimisation 1 - Promotional 2 - Livelihoods 3 - Financial benefit	Priority (A+B) 1-3 = Low 4-6 = Medium 7-9 = High	Timeframe < 3yrs Short 3 - 4yrs Medium >5yrs Long
<b>Organisational structure and institutional arrangements</b>					
<b>Lack of human resources</b>	Employ appropriately skilled employees.	6	3	9	Short
<b>Lack of training</b>	Identify job specific training requirements and ensure regular training is undertaken by all personnel.	6	3	9	Short
	Clear roles and responsibilities following implementation of the regional model.	5	3	8	Short
<b>Lack of communication of decisions made by corporate</b>	Monthly management meetings by the deputy director and all the staff at director level, these decisions should then be communicated to the rest of the staff.	4	3	7	Short
<b>Lack of Public-Private Partnerships</b>	Conduct bank feasibility studies.	5	3	8	Medium
<b>Lack of political support</b>	Improve communication.	5	3	8	Medium

Identified gaps	Action items	Risk to Humans	Waste Minimisation	Priority (A+B)	Timeframe
		1- Exposure to hazardous materials 2-Interaction with landfill activities or operations 3-Costs to consumer 4-Disease vectors 5-Aesthetics and social degradation 6-Pollution of soil, air and water	1 - Promotional 2 - Livelihoods 3 - Financial benefit	1-3 = Low 4-6 = Medium 7-9 = High	< 3yrs Short 3 - 4yrs Medium >5yrs Long
<b>Not all personnel have offices at regional level, nor phones, computers or internet connections</b>	Reallocation of resources between sister departments/ directorates.	5	3	8	Short – Medium
<b>Lack of funding for tender process</b>	Reallocation of resources between sister departments/ directorates.	5	3	8	Short – Medium
<b>Continued problem of internet and cable theft</b>	Regional Managers to address issue of office accommodation and equipment (particularly computers).	5	3	8	Short
<b>Operational service delivery: inappropriate fleet vehicles, and management</b>	Determine fleet requirements.	4	3	7	Short
	Determine beats or routes to be taken and fill gaps with contractors.	4	3	7	Short
	Use radio communication with fleet drivers.	3	3	6	Short
	Contract management is only there to fill gaps and to prepare tender specifications.	5	3	8	Short
<b>Enforcement and by-law requirements</b>					
<b>Illegal &amp; permitted sites</b>	Obtain necessary environmental and waste permits & ensure that permitted sites are compliant.	5	3	8	Short – Medium
	Investigate closure permits and rehabilitation of abandoned/ old sites to ensure compliance with NEM:WA.	5	3	8	Short – Medium

		<b>Risk to Humans</b>	<b>Waste Minimisation</b>	<b>Priority (A+B)</b>	<b>Timeframe</b>
		1- Exposure to hazardous materials			
		2-Interaction with landfill activities or operations			
<b>Identified gaps</b>	<b>Action items</b>	3-Costs to consumer	1 - Promotional	1-3 = Low	< 3yrs Short
		4-Disease vectors	2 - Livelihoods	4-6 = Medium	3 - 4yrs Medium
		5-Aesthetics and social degradation	3 - Financial benefit	7-9 = High	>5yrs Long
		6-Pollution of soil, air and water			
<b>Poor compliance and enforcement</b>	Bi-annual second party permit compliance audits.	<b>3</b>	<b>2</b>	<b>5</b>	<b>Short – Medium</b>
	Quarterly first party permit compliance audits.	<b>3</b>	<b>2</b>	<b>5</b>	<b>Short – Medium</b>
<b>Outdated by-laws</b>	Revised integrated waste management by-laws required at the local level which follow the principles of the NEM:WA.	<b>5</b>	<b>3</b>	<b>8</b>	<b>Short – Medium</b>
<b>Absence of an IWM Policy</b>	IWM Policy required outlining the goals, objectives and scope of an IWM Plan.	<b>5</b>	<b>3</b>	<b>8</b>	<b>Short – Medium</b>
<b>Education and awareness</b>					
<b>Lack of marketing success and awareness internally and in public</b>	Liaison with internal marketing and communication department personnel within the CoT.	<b>4</b>	<b>1</b>	<b>5</b>	<b>Short</b>
	Ongoing communication with other departments.	<b>4</b>	<b>3</b>	<b>7</b>	<b>Short</b>
	All successful projects must be circulated and communicated through the internal and external media such as municipal accounts, billboards, news papers and radio shows.	<b>4</b>	<b>2</b>	<b>6</b>	<b>Short</b>
<b>Illegal dumping or burning of waste</b>	Conduct awareness and educational campaigns in schools and community organisations.	<b>5</b>	<b>1</b>	<b>6</b>	<b>Short</b>

		<b>Risk to Humans</b>	<b>Waste Minimisation</b>	<b>Priority (A+B)</b>	<b>Timeframe</b>
		1- Exposure to hazardous materials			
		2-Interaction with landfill activities or operations	1 - Promotional	1-3 = Low	< 3yrs Short
<b>Identified gaps</b>	<b>Action items</b>	3-Costs to consumer	2 - Livelihoods	4-6 = Medium	3 - 4yrs Medium
		4-Disease vectors	3 - Financial benefit	7-9 = High	>5yrs Long
		5-Aesthetics and social degradation			
		6-Pollution of soil, air and water			
	Signboards should be erected in places where illegal dumping takes place.	4	3	7	Short
<b>Failure to adhere to law enforcement specifically the Waste Management by-laws</b>	Dedicated Metro Police Officers for law enforcement.	4	3	7	Short
<b>Failure to include waste strategies in the IDP</b>	Alignment of internal processes.	4	3	7	Short – Medium
	Establish a working group.	3	3	6	Short
<b>No Educational Awareness Team</b>	Team should include the regional and waste management structures.	4	1	5	Short
	Adopt a spot programme, for example, the EPWP projects like <i>Vat Alles</i> and informal parks or and vacant properties.	5	2	7	Short
<b>Waste Information System</b>					
<b>Lack of waste generation records</b>	Establish a framework for the operators to complete and submit once a month.	3	3	6	Short
<b>Lack of industry waste generation records</b>	Obtain industry waste generation records.	3	3	6	Short
<b>Absence of an integrated waste information system</b>	Develop an integrated waste information system (WIS).	3	3	6	Short
<b>Require a model to estimate per capita waste generation information</b>	Commission the development of the model.	3	3	6	Short - Medium
<b>Need to translate the database statistics into a Waste Information System</b>	Develop the WIS and align with IPWIS and SAWIS.	3	3	6	Short - Medium

		<b>Risk to Humans</b>	<b>Waste Minimisation</b>	<b>Priority (A+B)</b>	<b>Timeframe</b>
		1- Exposure to hazardous materials			
		2-Interaction with landfill activities or operations			
<b>Identified gaps</b>	<b>Action items</b>	3-Costs to consumer	1 - Promotional	1-3 = Low	< 3yrs Short
		4-Disease vectors	2 - Livelihoods	4-6 = Medium	3 - 4yrs Medium
		5-Aesthetics and social degradation	3 - Financial benefit	7-9 = High	>5yrs Long
		6-Pollution of soil, air and water			
<b>Capability and skills for collection and collation of data</b>	Train staff and conduct regular checks on waste data at waste disposal sites. Implement standard measurement tools aligned with SAWIC framework.	<b>3</b>	<b>3</b>	<b>6</b>	<b>Short</b>
<b>Waste collection and asset management</b>					
<b>Insufficient waste collection taking place to meet the level of service at the community</b>	Provide under-served communities with the basic material and equipment they need to become part of the municipality's waste collection system.	<b>5</b>	<b>3</b>	<b>8</b>	<b>Short</b>
	Create opportunities for under-served communities to become active participants in the management of their own waste.	<b>5</b>	<b>3</b>	<b>8</b>	<b>Short</b>
<b>Growing need for additional waste collection equipment</b>	Increase maintenance of the existing infrastructure to increase its life.	<b>5</b>	<b>2</b>	<b>7</b>	<b>Short</b>
	Consider purchasing or leasing additional modern equipment to support the existing infrastructure.	<b>5</b>	<b>1</b>	<b>6</b>	<b>Long</b>
	Outsource collection to private service providers where appropriate.	<b>2</b>	<b>1</b>	<b>3</b>	<b>Short</b>
<b>Insufficient budget for modernisation of infrastructure</b>	Municipality finds alternative sources of funding to support effective waste collection.	<b>2</b>	<b>3</b>	<b>5</b>	<b>Short - Medium</b>

		<b>Risk to Humans</b>	<b>Waste Minimisation</b>	<b>Priority (A+B)</b>	<b>Timeframe</b>
		1- Exposure to hazardous materials			
		2-Interaction with landfill activities or operations			
<b>Identified gaps</b>	<b>Action items</b>	3-Costs to consumer	1 - Promotional	1-3 = Low	< 3yrs Short
		4-Disease vectors	2 - Livelihoods	4-6 = Medium	3 - 4yrs Medium
		5-Aesthetics and social degradation	3 - Financial benefit	7-9 = High	>5yrs Long
		6-Pollution of soil, air and water			
	Invest in cheaper alternative options for waste minimisation and collection for reducing the need for collection.	5	3	8	Short
<b>Qualified waste management staff with the knowledge and experience of developing the required systems and processes</b>	Hire more qualified personnel with the requisite experience.	5	3	8	Short
	Provide further training to current personnel.	5	3	8	Short
<b>Lack of incentives to lower staff turnover</b>	Provide better incentives to retain highly qualified staff.	3	3	6	Short
<b>Waste minimisation, re-use, recycling and disposal</b>					
<b>Closure of existing waste disposal sites and limited airspace availability of remaining waste disposal sites</b>	Separation of waste at the source as part of a waste minimization strategy; with the provision of 130 litre wheelie bins.	3	3	6	Medium – Long
	Public Private Partnerships: Small enterprises to be appointed for collection of waste and support of waste minimization strategies.	5	3	8	Short – Medium
	Materials Recovery Facility, to support waste minimisation strategies.	5	3	8	Medium
	Organic composting and promoting biomass (methane gas projects), to support waste minimization strategies and waste-to-energy projects.	2	3	5	Medium



Identified gaps	Action items	Risk to Humans	Waste Minimisation	Priority (A+B)	Timeframe
		1- Exposure to hazardous materials 2-Interaction with landfill activities or operations 3-Costs to consumer 4-Disease vectors 5-Aesthetics and social degradation 6-Pollution of soil, air and water	1 - Promotional 2 - Livelihoods 3 - Financial benefit	1-3 = Low 4-6 = Medium 7-9 = High	< 3yrs Short 3 - 4yrs Medium >5yrs Long
	Organic (green) waste from Parks Department to be used for composting	1	3	4	Medium
<b>Legislation (National Waste Act, 2008) does not speak to the waste disposal site air space</b>	Investigate air space assessment approach as a measure of landfill remaining capacity assessment.	4	3	7	Medium – Long
<b>Insufficient waste minimization strategies</b>	Tenders should be developed specifically for waste to energy solutions.	3	3	6	Short
	Incentives for support of minimization strategies by the public include a reduction in waste tariffs.	4	3	7	Medium
	The recovery of coal ash, which can be used for other projects such as road construction.	3	3	6	Medium
	The use of wood instead of coal for cooking or heat in rural households.	4	2	6	Medium
<b>Lack of permits, or management according to permits</b>	Assess permit conditions and redirect waste to appropriate existing sites.	5	2	7	Short
<b>Lack of alternative waste disposal sites</b>	Redirect waste to existing sites.	5	2	7	Short
	Consider viable use of waste as resource(s).	5	3	8	Short - Medium
	Invest in new transfer stations at regional level.	5	1	6	Long

Identified gaps	Action items	Risk to Humans	Waste Minimisation	Priority (A+B)	Timeframe
		1- Exposure to hazardous materials 2-Interaction with landfill activities or operations 3-Costs to consumer 4-Disease vectors 5-Aesthetics and social degradation 6-Pollution of soil, air and water	1 - Promotional 2 - Livelihoods 3 - Financial benefit	1-3 = Low 4-6 = Medium 7-9 = High	< 3yrs Short 3 - 4yrs Medium >5yrs Long
Lack of garden refuse transfer sites	Integrate transfer sites within the greater network of waste minimisation strategies, such as composting.	5	3	8	Short - Medium
	Increase the capacity of existing transfer sites.	5	1	6	Long
Need to promote waste-to-energy	Promote waste to energy alternatives projects.	3	3	6	Short – Medium
Need to promote clean combustion	Plastics and tyres should be used for fuel manufacturing for own use and agriculture.	4	2	6	Short – Medium
Need to promote organic composting	Promote organic composting.	2	3	5	Short – Medium
Need to promote biomass and inorganic composting	Promote projects that convert biomass to gas.	2	3	5	Short – Medium
Informal recycling driven by scavenging	Create awareness programmes in schools and communities.	1	1	2	Short
	Support of informal recycling by the CoT.	4	2	6	Short
	Increase budget of Buy Back Centres.	3	2	5	Medium – Long
	Establish a Buy Back centre in each Region.	3	3	6	Long
	Formalized recycling by the CoT, with Buy Back Centres.	4	2	6	Medium – Long
No formal recycling	Rehabilitated waste disposal sites must be converted to transfer stations.	2	3	5	Long

Identified gaps		Action items	Risk to Humans	Waste Minimisation	Priority (A+B)	Timeframe
			1- Exposure to hazardous materials 2-Interaction with landfill activities or operations 3-Costs to consumer 4-Disease vectors 5-Aesthetics and social degradation 6-Pollution of soil, air and water	1 - Promotional 2 - Livelihoods 3 - Financial benefit	1-3 = Low 4-6 = Medium 7-9 = High	< 3yrs Short 3 - 4yrs Medium >5yrs Long
	Dedicated personnel and create a special section or unit for recycling.		4	3	7	Short
	Each region must have dedicated drop off location for recyclable material.		4	3	7	Short – Medium
	Each region must have transfer stations for the types of waste mostly generated in those regions.		4	3	7	Medium – Long
	Compensation or incentive for undertaking recycling at source.		3	3	6	Long
Co-mingling of waste	New developments must include recycling stations as one of the requirements for approval.		2	3	5	Short
	Implement recycling at source, e.g. 2 bag system.		3	3	6	Medium

## 6 Conclusion

This Assessment of Alternatives and the Waste Management Implementation Plan together with the comprehensive Status Quo report constitutes the Integrated Waste Management Plan for the City of Tshwane 2013. The integrated nature of the plan has investigated all aspects of waste management: institutional, financial, engineering, transport, landfill, environmental and societal. The plan has considered each aspect in line with best practice in waste management. The previous IWMP for CoT was reviewed in the process of preparing this plan. The current IWMP has identified gaps and challenges and has systematically responded in terms of developing strategies and action plans through a consultative process to address these gaps. The resolution of these gaps will result in a process of continual improvement in waste management in the CoT.

The IWMP for CoT is forward looking and practical. The primary purpose of the plan is to set direction for the next five years as required by national waste management legislation. It is very responsive to the national waste management discourse and legislative imperatives of waste minimisation and advocating the three Rs: reduce, recover and recycle.

The IWMP also views waste management as an opportunity to advance the green economy in terms of waste to energy, waste material recovery, job creation and income generating opportunities. It is not just public cleansing and waste collection services that has a responsibility for sustainable waste management, indeed it is an overarching and cross cutting theme requiring input from policy and strategy formulation, sustainable economic development, energy management, health and social services, human settlements and engineering services such as wastewater management. It is proposed that CoT facilitates a strategic dialogue in terms of the most practical strategy to consider in diverting waste from landfill and maximising its potential benefits such as biogas, compost, recovered materials, etc.

This plan must be revisited annually in terms of the proposed actions and there must be a strategic review and update every 5 years. The challenge for the short term is to reach consensus on a few strategic priorities for improved waste management. The IWMP offers a starting point. It is estimated that about 3 million tons of waste material is disposed to landfills in the CoT. A goal must be set to achieve at least a 20% reduction in waste to landfill over the next 5 years. The focus on strengthening the waste information management system will lay an objective basis to realise this goal. With the support of the political leadership and commitment of its workforce, it is possible for City of Tshwane to showcase itself as a centre of excellence in sustainable waste management.

# Appendix A: Gap Analysis Workshop

## IWMP WORKSHOP ON ASSESSMENT OF ALTERNATIVES: OBJECTIVES, STRATEGIES AND PLANS

4 APRIL 2013

### NOTES FROM THE DISCUSSION GROUPS

Theme: Recycling and waste minimisation	
Gaps and/or challenges identified:	Possible solutions:
Informalised recycling, scavenging, buy back	Formalized recycling by the CoT on a bigger scale Create awareness programmes in schools and communities
Insufficient transfer stations	Support of the informal recycling by the CoT
Co-mingling of waste	Recycling at source
Proposed Action Plans:	Limitations/ potential risks:
Increase budget of Buy Back centres	Limited budget
Dedicated personnel and create a special section or unit for recycling	Communication problem between the department No fleet assigned to do collection of recyclable waste
Each and every region within the CoT must have Buy Back centres	Lack of funds and personnel
Branding action	Lack of funds and personnel Poorest of the Poor will not afford to buy the colour coded bags, the CoT has no budget no finance this
Each region must have dedicated spot for recyclable material drop centre (non compliance with legislation)	Carbon footprint is a non compliance
Questions:	Responses:
Why is law enforcement only limited to metro police?	There is a regional dedicated person in place already. In the new financial year foot soldiers must be appointed per region and this must be done in accordance with the metro by law enforcement.
Why not train regional officers as peace officers?	
Additional comments/ concerns/ action plans:	
Sustainability of the provision of service and infrastructure by CoT	
New developments in the township layout should include recycling stations as one of the requirements for approval	
Compensation or incentive for doing recycling at source	
Underground system into the new development must be part of the layout plan, for example, sorting of waste at source	
Roles and responsibilities are not clearly defined with in the CoT waste management department. There needs to be a way forward which consists of the regionalisation.	
There should be a "Customer call back" system with an email submission of photos as evidence. This is	

**Theme: Recycling and waste minimisation**

already in place in some regions and it will be rolled out to other regions as well.

It is recommended that a report from region 3 be used as an example of how this is addressed. Perhaps this can be used as a case study.

**Theme: Education and Awareness**

**Gaps and/or challenges identified:**

**Possible solutions:**

Marketing success and awareness internally and in public

Liaison with an internal marketing personnel within the CoT

All successful projects must be circulated and communicated through the internal and external media such as the water and lights accounts, billboards, news papers and radio shows

Illegal dumping or burning of waste

Conduct awareness and educational campaigns in schools

No dumping of waste sign boards should be erected in places where illegal dumping takes place

Failure to adhere to law enforcement specifically the Waste Management by-laws

Dedicated person for metro police for enforcement

**Proposed Action Plans:**

**Limitations/ potential risks:**

Waste strategies should be included in the IDP

There should be a dedicated team that deals with educational awareness. This team should include the regional and waste management structures

Lack of personnel and funds

Adopt a spot programme, for example, the EPWP projects like *Vat Alles* and informal parks or vacant properties

There must be ongoing communication with other departments

Management decisions are not well communicated to the other regions and vice versa

Each region should have transfer stations for the types of waste mostly generated in those regions

Budget constraints

**Additional comments/ concerns/ action plans:**

Rehabilitated Waste Disposal site must be converted to transfer stations

<b>Theme: Institutional Arrangements</b>	
<b>Gaps and/or challenges identified:</b>	<b>Possible solutions:</b>
Vacancies	Employ appropriately skilled employees
Lack of human resources	
Lack of training	Identify job specific training requirements and ensure regular training is undertaken by all personnel
Lack of communication of decisions made by corporate	There must be monthly management meetings by the deputy director and all the staff at director level, these decisions should then be communicated to the rest of the staff
<b>Proposed Action Plans:</b>	<b>Limitations/ potential risks:</b>
Some actions plans in place till end of June	Lack of political support and funding
Only qualified skilled personnel will be considered	Inappropriate personnel filling vacancies resulting in delays or failure to deliver Form a training committee specific for waste management
Selective placement must take place and not placing people only for the sake of filling seats	Job specific compulsory training must be given to all staff
<b>Additional comments/ concerns/ action plans:</b>	
None.	

<b>Theme: Office Resources and Equipment</b>	
<b>Gaps and/or challenges identified:</b>	<b>Possible solutions:</b>
Lack of political support	Conduct bank feasibility studies to demonstrate viability of proposal and benefit to CoT
Clear roles and responsibilities and rationalisation	Hiring of appropriate staff and ensuring appropriate and regular training
Operational service delivery	Conducting workshops and placing appropriate employees in vacancies Allocate fleet per regional requirements or regional routes
Public private partnerships	Identify potential projects and partnerships (maybe by tender) with green economy theme
<b>Proposed Action Plans:</b>	<b>Limitations/ potential risks:</b>
Improved communication	
Fleet requirements have been assessed already	
Determine beats or routes to be taken and fill gaps with contractors	
Fleets must be appropriate to service requirements	
Contract management is only there to fill gaps and prepare tender specifications	Communication is important and input from managers to see if things are functioning and decisions made have been practical e.g. the size of vehicles, rural areas not being accommodated, vehicle requirements to change if recycling moves towards source collection.
<b>Additional comments/ concerns/ action plans:</b>	
Not all personnel have offices in the regions nor phones, computers or internet connection	
Other challenges that are experienced are that there is no funding for tender process, not having computers makes it hard to process the tender procedure	
Reallocation of resources between sister departments/directorates is not taking place	
Internet and cable theft continue to be a problem	
Regional Managers to address the issue of office accommodation and office equipment (particularly computers)	
Use radio communication with fleet drivers. There are no solutions identified to the technical problems yet.	
Current contracts need to be scrutinized by the legal team, a clause indicating the immediate termination of services when a court case is opened should be clearly stipulated in contracts.	
Development of contractors servicing rural areas. Waste Officers need to be included when drafting tenders and contracts e.g. illegal dumping, it is not clear on how this should be dealt with. Personnel on ground level should be consulted at all times.	



<b>Theme: Waste Information System</b>	
<b>Gaps and/or challenges identified:</b>	<b>Possible solutions:</b>
Processing of collected data	
Lack of personnel trained to handle this kind data	
Weighbridges are not efficient or manageable	Categorizing waste and getting weekly information from waste disposal sites for example how much waste is taken in per week etc.
<b>Proposed Action Plans:</b>	<b>Limitations/ potential risks:</b>
Training personnel	Human resources
Upgrading equipment and offices	Theft
Access to stationary such as computers or laptops on site and having data transmitter logging systems	Lack of offices and equipment
<b>Additional comments/ concerns/ action plans:</b>	
Problems associated with weigh bridges such as cost implications, maintenance, harsh conditions (rain, mud and dust), calibration and lightning	
Domestic compaction of loose, builders rubble, soil, garden refuse, industrial, tyres, other municipal departments, private contractors, builders rubble payable, recycling material (reclaimers) and the CoT contractors specifically waste management contractors.	

<b>Theme: Green Economy</b>	
<b>Gaps and/or challenges identified:</b>	<b>Possible solutions:</b>
Waste to energy	Promote waste to energy alternatives projects
Clean combustion	Plastics and tyres should be used for fuel manufacturing for own use and agriculture
Organic composting	Promote organic composting
Biomass and un-organic composting	Promote projects that convert biomass to gas
<b>Proposed Action Plans:</b>	<b>Limitations/ potential risks:</b>
Use of existing power plants such as Pretoria West and Rooiwal to be converted with new technology	Funding and planning gaps and the political willingness to facilitate the process
Revisit waste to energy projects and create and awareness for the public	Knowledge and expertise gaps
Partnerships with private sector is encouraged	Funding and planning gaps and the political willingness to facilitate the process
<b>Additional comments/ concerns/ action plans:</b>	
Comments on the power stations: EIA already in place, no cost to council, clean production and combustion system, waste for fuel, cheap electricity, existing rights to put electricity on the grid, two power stations immediately available, reduce waste disposal site costs, reduce transport cost, reduce pollution of water and air, saves 1000 m <sup>3</sup> + airspace on existing waste disposal sites.	
CoT produces +- 3 mil tons/ m <sup>3</sup> of waste annually.	

<b>Theme: Waste Disposal Sites airspace</b>	
<b>Gaps and/or challenges identified:</b>	<b>Possible solutions:</b>
Limited airspace	Separation of waste at the source, waste minimization, and provision of 130l wheelie bins
Legislation (National Waste Act, 2008) does not speak to the waste disposal site air space	Investigate air space assessment approach as a measure of landfill remaining capacity assessment
Pollution	Organic composting and promoting biomass (methane gas projects)
Political buy-in	
<b>Proposed Action Plans:</b>	<b>Limitations/ potential risks:</b>
Small enterprises should be appointed for collection of waste and back	Lack of management participation and planning
The CoT should have 2 bin system and collection	Improvement in the CoT by-laws
Organic (green) waste from Parks Department to be used for composting	
Tenders should be developed specifically for waste to energy solutions	Political buy-in
There should be a reduction in waste tariffs to stimulate waste minimization behaviour	
<b>Additional comments/ concerns/ action plans:</b>	
The recovery of coal ash, which can be used for other projects such as road construction	
The use of wood instead of coal for cooking or heat in rural households- wood can be sourced from projects such as the Working for Water Programme, it was indicated that rural regions with agricultural projects will benefit greatly from composting projects.	



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