


# Evaluating the implementation of the South African National Waste Management Strategy goals by local government

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## **PREFACE AND ACKNOWLEDGMENTS**

The main aim of the National Waste Management Strategy, 2011 (NWMS) and its formulated goals are to positively impact the realisation of the objectives of the National Environmental Management: Waste Act 59 of 2008, which aim to give effect to the waste management hierarchy. This research reflects on the implementation of the NWMS by local government by using the City of Tshwane (CoT) as a case study. Although the results apply to the CoT, the conclusions may be generalisable to metropolitan and local municipalities in South Africa.

I want to thank the Lord God Almighty for His protection and for giving me the ability to complete my studies during this challenging COVID-19 pandemic year. A special thanks to my family and friends, who supported me emotionally throughout my studies. They never allowed me to give up and always encouraged me to complete my studies.

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Be blessed and safe.

## **ABSTRACT**

South African municipalities regularly face challenges with managing waste due to increased population and economic growth and the complexity of waste streams. The National Waste Management Strategy, 2011 (NWMS) was developed to address these growing waste-related concerns. The main aim of the NWMS and its formulated goals are to affect the realisation of the objectives of the National Environmental Management: Waste Act 59 of 2008, which aims to give effect to the waste management hierarchy. It is the responsibility of local government to implement the goals of the NWMS through their integrated waste management plans (IWMPs). This study aimed to evaluate the implementation of the 2011 NWMS goals by the City of Tshwane (CoT) as a case study for local government.

In order to achieve the objectives of the study, a qualitative research methodology was adopted. Primary data was collected through research interviews with waste management employees from the CoT's waste management department. Secondary data was collected from the NWMS, CoT's 2014 IWMP, CoT's 2017 – 2021 Integrated Development Plan (IDP), and supporting documents.

The results revealed that seven of the eight NWMS goals had been incorporated into the CoT IWMP, whilst Goal 7 was not provided for because it does not fall within the mandate of the CoT's waste management department. However, the actual implementation of the NWMS goals still required attention, as evident from the review of documents such as the CoT IDP, Service Delivery and Budget Implementation Plan 2017-2021, and the Waste Management Performance Report 2015-2020. Some challenges exist within the CoT as far as integrated waste management is concerned, which impacted the pace of implementation of the NWMS goals. These challenges include a lack of adequate training among employees in waste management, a shortage of necessary resources such as funding, inadequate law enforcement, which leads to illegal dumping and the lack of awareness of the importance of waste management in communities. The study concludes that even though waste management remains a significant challenge across local governments in South Africa, municipalities such as the CoT are making commendable progress towards attaining the NWMS goals.

**Keywords:** Waste management, National Waste Management Strategy, integrated waste management plan, City of Tshwane, implementation

## ABBREVIATIONS AND ACRONYMS

CoE	City of Ekurhuleni Metropolitan Municipality
CoT	City of Tshwane Metropolitan Municipality
DEA	Department of Environmental Affairs
DEA & DP	Department of Environmental Affairs and Development Planning
DEAT	Department of Environmental Affairs and Tourism
DEFF	Department of Environment, Forestry and Fisheries
DFFE	Department of Forestry, Fisheries and Environment
DSI	Department of Science and Innovation
DST	Department of Science and Technology
DWAF	Department of Water Affairs and Forestry
EMI	Environmental Management Inspectorate
GHG	Greenhouse Gas
IDP	Integrated Development Plan
IP&WM	Integrated Pollution and Waste Management
ISWA	International Solid Waste Association
ISWM	Integrated Solid Waste Management
IWMP	Integrated Waste Management Plan
IWMPlanning	Integrated Waste Management Planning
KPAs	Key Performance Areas
LATS	Landfill Allowance Trading Scheme

MEC	Member of the Executive Council
MRF	Material Recovery Facilities
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste Management
NDWCS	National Domestic Waste Collection Standards
NEM: WA	National Environmental Management Waste Act 59 of 2008
NEMA	National Environmental Management Act 107 of 1998
NGOs	Non-governmental Organisations
NWMS	National Waste Management Strategy
NWU	North-West University
SAWIS	South African Waste Information System
SDBIP	Service Delivery and Budget Implementation Plan
SMEs	Small and Medium Enterprises
SMMEs	Small, Medium and Micro Enterprises
SWM	Solid Waste Management
UK	United Kingdom
UNDESA	United Nations Department of Economic and Social Affairs
UNEP	United Nations Environmental Programme
WMO	Waste Management Officer
WRAP	Waste and Resource Action Programme

## **KEY DEFINITIONS**

### **Environment**

*"Environment" means the surroundings within which humans exist and that are made up of -*

*(i) "the land, water and atmosphere of the earth;*

*(ii) micro-organisms, plant and animal life;*

*(iii) any part or combination of (i) and (ii) and the interrelationships among and between them; and*

*(iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being" (DEA, 2008).*

### **Local government**

*"Local government is that part of the whole government of a nation or state which is administered by authorities subordinate to the state authority, but elected independently of control by the state authority, by qualified persons resident, or having property in certain localities, which localities have been formed by communities having common interests and common history" (Gomme, 1987:1-2).*

### **National Waste Management Strategy**

*"The National Waste Management Strategy (NWMS) is a legislative requirement of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), the "Waste Act". The purpose of the NWMS is to achieve the objects of the Waste Act. Organs of state and affected persons are obliged to give effect to the NWMS" (DEA, 2011).*

### **Waste**

*"Waste" means -*

*(a) "any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to this Act; or*

*(b) any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the Gazette,*

*but any waste or portion of waste, referred to in paragraphs (a) and (b), ceases to be a waste-*

*(i) once an application for its re-use, recycling or recovery has been approved or, after such approval, once it is, or has been re-used, recycled or recovered;*

*(ii) where approval is not required, once a waste is, or has been re-used, recycled or recovered;*

*(iii) where the Minister has, in terms of section 74, exempted any waste or a portion of waste generated by a particular process from the definition of waste; or*

*(iv) where the Minister has, in the prescribed manner, excluded any waste stream or a portion of a waste stream from the definition of waste” (DEA, 2008).*

### **Waste management**

*“Waste management” means engaging in any waste management activity listed in Schedule 1 or published by notice in the Gazette under section 19, and includes -*

*(a) the importation and exportation of waste;*

*(b) the generation of waste, including the undertaking of any activity or process that is likely to result in the generation of waste;*

*(c) the accumulation and storage of waste;*

*(d) the collection and handling of waste;*

*(e) the reduction, re-use, recycling and recovery of waste;*

*(f) the trading in waste;*

*(g) the transportation of waste;*

*(h) the transfer of waste;*

*(i) the treatment of waste; and*

*(j) the disposal of waste” (DEA, 2008).*

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# CHAPTER 1 INTRODUCTION

## 1.1 Introduction

According to Section 24 of the Constitution of the Republic of South Africa (1996), everyone has a right to an environment that is not harmful to their health and well-being and to have the environment protected through reasonable legislative and other measures. The Constitution further mandates local government to provide waste collection services to citizens. In South Africa, waste has been managed by various legislation governed by different government departments, which were often fragmented in nature, resulting in gaps and poor waste management practices (South Africa, 1996). The National Environmental Management: Waste Act 59 of 2008 (NEM: WA) was promulgated in 2009 to consolidate waste-related legal requirements in the country and provide a common goal and understanding of how waste should be managed in South Africa.

Chapter 2 Part 1 of the NEM: WA provides for the establishment of a national waste management strategy (NWMS) towards achieving the objects of the NEM: WA. According to Section 6 of the NEM: WA, the NWMS must include:

- Objectives, plans, guidelines, systems as well as procedures linked to environmental protection, waste generation, including minimisation as well as avoidance, reuse, recycle, treatment, disposal, utilisation and control in order to satisfy the objects of the NEM: WA;
- Mechanisms, systems and procedures which give effect to the South African government's obligations to relevant agreements;
- Practical measures to achieve co-operative governance in waste management matters;
- Guidance on educating society on the impact of waste on health and the environment;
- The methods to be utilised in ensuring compliance with the requirements of the NEM: WA and also monitoring of the compliance to the NEM: WA;
- Any other measures that the Minister may deem necessary to achieve the objects of the NEM: WA; and
- Any targets that have been set in order to achieve waste reduction.

The NWMS, established in terms of the NEM: WA, came into effect in November 2011 [Department of Environmental Affairs, (DEA), 2011]. The NWMS binds all organs of state in all

spheres of government and requires that these organs of state must give effect to the strategy when exercising authority or performing duties in terms of the NEM: WA or any other legislation tasked with regulating waste management (DEA, 2008). The strategy is guided by eight goals, i.e.:

- Goal 1: “Promote waste minimisation, reuse, recycling and recovery of waste”;
- Goal 2: “Ensure the effective and efficient delivery of waste services”;
- Goal 3: “Grow the contribution of the waste sector to the green economy”;
- Goal 4: “Ensure that people are aware of the impact of waste on their health, wellbeing and the environment”;
- Goal 5: “Achieve integrated waste management planning”;
- Goal 6: “Ensure sound budgeting and financial management for waste services”;
- Goal 7: “Provide measures to remediate contaminated land”; and
- Goal 8: “Establish effective compliance with and enforcement of the Waste Act” (DEA, 2011).

In order to achieve these goals at a local level, local municipalities need to align their IWMPs with the goals of the NWMS (DEA, 2011). An IWMP is a document that facilitates the implementation of the NEM: WA and aims to improve waste management and promote sustainable waste management (DEA & DP, 2010).

The development of IWMPs is not unique to South Africa, and the development of similar documents to implement national goals and policies can also be found elsewhere in the world. For instance, the United Nations Environment Programme (UNEP) and the International Solid Waste Association (ISWA) both require the submission of plans as a mechanism for achieving strategic goals (UNEP, 2009). In order to ensure waste management services are streamlined with other essential basic services such as water and sanitation and housing and electricity provision, all municipalities are required to develop Integrated Development Plans (IDPs) and ensure that IWMPs are included as sector plans to these IDPs. This is also explicitly highlighted as part of Goal 5 of the 2011 NWMS (“Achieve integrated waste management planning”), which requires that “*all municipalities have integrated their IWMPs with their IDPs*”. Sections 11, 12 and 13 of the NEM: WA provides the requirements for developing and implementing IWMPs by organs of state. These requirements are elaborated on in **Chapter 3**.

## 1.2 Problem statement and rationale for the study

Currently, South Africa is experiencing increasing quantities of waste due to population growth, economic growth, urbanisation and industrialisation (Nkosi, 2014). The NWMS and IWMPs provide a platform to improve waste management systematically (DEA, 2011).

According to Section 11 of the NEM: WA, every municipality needs to develop and implement an IWMP. Many IWMPs in South Africa have been found to lack the significant technical and financial information required to make informed decisions on infrastructure and operational requirements (Sango *et al.*, 2014). The implementation of such IWMPs is also lacking (Prokic & Mihajlov, 2012). Molaba (2019) has found that the waste management planning process is still in its early stages at small municipalities and will require strong input, including the appointment of competent consultants to prepare the IWMPs, competent staff at local municipalities, and financial resources (which also entails political support). Furthermore, Molaba (2019) indicated that possible future areas of research might focus on the level of expertise of consultants who formulate the waste management plans; the usage of budget allocated for the waste management services; and skills required at local municipalities to ensure improved waste management service rendering, with focus on the implementation of IWMPs.

This study aims to build on the research findings by Molaba (2019) by evaluating the implementation of the 2011 NWMS goals at a local government level. Similar to Molaba's (2019) research, this research focused on determining the alignment of IWMPs with the 2011 NWMS goals. For this purpose, a case study approach was followed. The City of Tshwane Metropolitan Municipality (CoT) was selected as a case study because:

- As a key metropolitan municipality, with continued growth and an increase in waste generation, the existing landfills and the infrastructure are under pressure because waste is produced above the landfill airspace available.
- Ageing waste-related infrastructure within the CoT also creates challenges in securing and operating landfill sites in a compliant manner (South African Cities Network, 2014).
- The CoT is developing a comprehensive waste management strategy, using a phased planning approach to establish a regional landfill site, new cells on the existing landfill sites and new integrated waste facilities; and implement waste diversion, waste minimisation efforts and waste treatment alternatives; as well as introducing suitable waste disposal methods.

The CoT, therefore, provided a suitable context to evaluate the implementation of the NWMS goals at a local level.

The case study selection criteria are further elaborated on in **Chapter 2** of this study.

### **1.3 Research aim and questions**

Given the problem statement provided, this study aimed to evaluate the implementation of the 2011 NWMS goals by local government.

The study focused on a specific case study, namely the implementation of the 2011 NWMS by the CoT through its 2014 IWMP. The following research questions were formulated towards the achievement of the research aim:

1. To what extent are the NWMS goals *incorporated* into the CoT IWMP?
2. To what extent are the NWMS goals *implemented and achieved* by the CoT?
3. What are the *gaps and challenges* identified during the *implementation* of the IWMP by the CoT?

### **1.4 Delineating the scope of the study**

The study focussed on the extent to which the CoT has incorporated the 2011 NWMS goals into its IWMP. This means that the study mainly focused on how the CoT's documented IWMP (dated December 2014) with related implementation plan attempts to attain the NWMS goals and objectives. The study was conducted during the period, January to November 2020. The 2020 NWMS was not yet finalised at the commencement of this research and, thus, not reflected into local government IWMPs; hence these goals are not included in the study.

The study also focussed on exploring the extent to which the CoT implements the NWMS goals. The approach used included studying the CoT's IWMP, comparing it with the NWMS, and interviewing the employees working in the waste management department at the CoT. The study covered the entire municipal area, which falls within the CoT municipal boundaries. The study did not include a critical analysis of the entire IWMP of the CoT. It mainly focused on comparisons with the NWMS goals and identifying whether progress has been made in attaining them.

### **1.5 Assumptions and limitations**

This study assumed incorporating the CoT IWMP into the IDP and 2017-2021 Service Delivery and Budget Implementation Plan (SDBIP) as indicative of potential implementation (i.e., provision being made for specific IWMP actions through further planning and budgeting). This study did not include the follow-up of implementing IWMP actions through means other than evaluating IDP and SDBIP incorporation and evaluating the 2015-2020 Waste Management Performance Report.

The research design assumed that most of the staff members within the CoT waste management department would be willing to contribute to the study and that their responses would be accurate and truthful as the interview responses were based on the perceptions and opinions of the respondents.

The limitations of this study are as follows:

- Face-to-face interviews were changed to telephonic interviews due to the restrictions placed on gatherings due to the COVID-19 pandemic. However, due to the nature and content of the interviews, this is not considered to have influenced the interview responses significantly; and
- The availability of respondents who initially indicated their willingness to partake in the study was a limiting factor since many of the respondents were working from home (due to the COVID-19 pandemic) and were unavailable on their office numbers.

## 1.6 Structure and outline of the study

This study is structured around the following chapters:

- **Chapter 1** sets out the introduction, problem statement and research aim and related research questions.
- **Chapter 2** describes the methodology (which includes a qualitative approach of collecting data from the CoT), the sampling method of interviewing respondents and a fieldwork procedure through which the latter will be applied to the study.
- **Chapter 3** contains the literature review, describing municipal solid waste management (MSWM) strategies in general, internationally, and on the African continent.
- **Chapter 4** provides the results and discussion of results concerning the research questions.
- **Chapter 5** draws conclusions concerning the main aim and research questions and provides practical recommendations related to the research aim and recommendations for further research.

## 1.7 Conclusion

In conclusion, **Chapter 1** indicated the objectives, purposes and significance of the challenges regarding waste management and how local municipalities, specifically the CoT, can deal with

municipal waste management. The government's responsibility is to ensure that these problems encountered are managed as soon as possible to avoid further negative waste impacts. The evolution of waste to be managed sustainably in South Africa means that waste needs to be managed by all spheres of government through IWMPs that incorporates the NWMS goals. **Chapter 2** provides an overview of the methodology followed to address the aim of the research.

# CHAPTER 2 METHODOLOGY

## 2.1 Introduction

This chapter outlines the methodology used in the study, including research design, data collection, processing and data analysis approaches, and ethical considerations and methodological limitations. It will focus on the NWMS goals' implementation by the CoT by studying its IWMP.

## 2.2 Study area

As justified in **Section 1.2**, the CoT was selected as the case study area. The CoT municipal area, located in the Gauteng Province, covers 13 cities and towns. The Limpopo Province borders it to the north, Mpumalanga Province to the east, the Ekurhuleni and City of Johannesburg Metropolitan Municipalities to the south and the North West Province to the west (**Figure 2-1**). It is geographically the largest municipality among the three metropolitan municipalities in Gauteng. The CoT is divided into seven administrative regions (**Annexure 1: Regions of the C**), and its population is approximately 3.31 million residents (CoT Annual Report 2018/19).

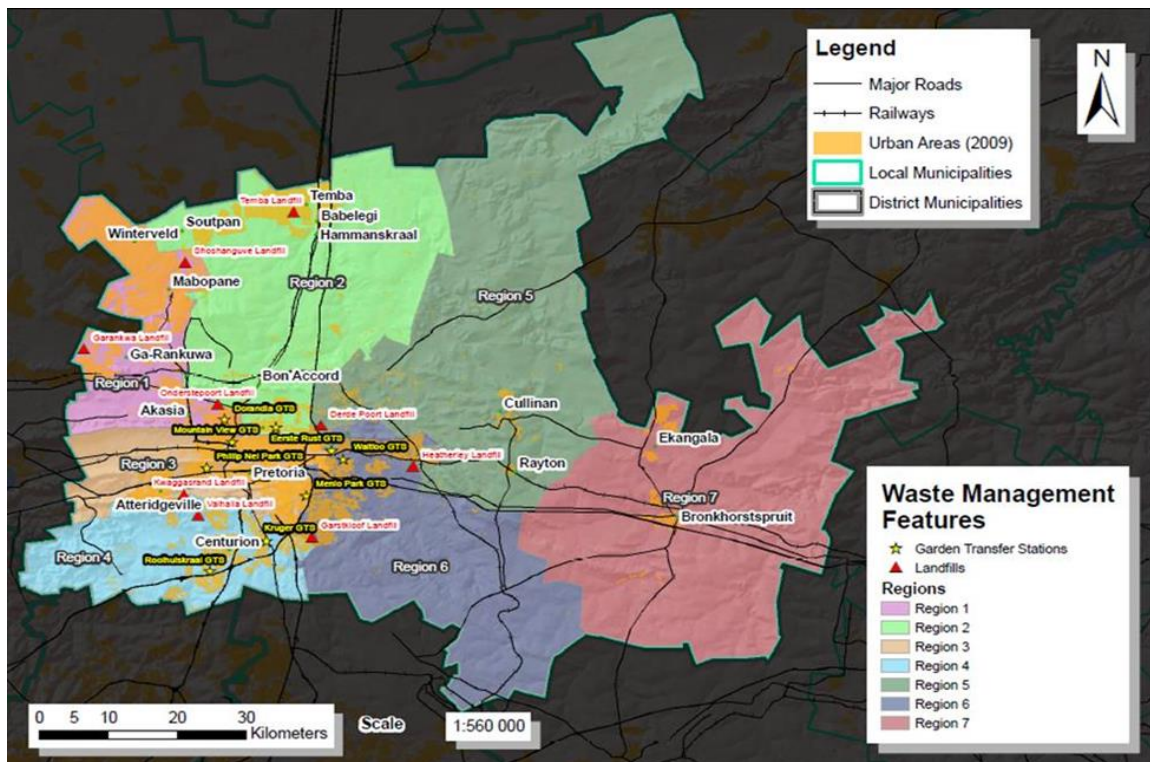


Figure 2-1: City of Tshwane's municipal boundaries (CoT, 2014).

**2.3 Research design**

The research design is the researcher’s idea or plans on conducting the study and obtaining a solution to the research problem (Mouton, 2001). Research designs are thus formulated or originate from the research problems encountered (Babbie & Mouton, 2001). Smith and Firth (2011) explain a research design as a strategic framework for action that serves as a bridge between research questions and the execution or implementation of research. This study adopted a qualitative approach used for conducting research that involves collecting data, processing data and analysing data in a single study. Literature states that it is essential that a researcher establishes indicators that provide evidence that the information generated in the research is trustworthy and believable (Flick, 2018). Ensuring the participation of individuals who possess the relevant knowledge ensures that good quality, reliable, and relevant data is collected.

Data collection is a process by which the researcher collects the information from all the relevant sources to find answers to the research problem, test the hypothesis and evaluate the outcomes (Kabir, 2016). While collecting the data, the researcher must identify the type of data to be collected, the source of data, and the method to be used to collect the data. Also, the researcher should address the answers to the questions who, when, and where the data is to be collected. The choice of data collection methods depends on the research problem under study, the research design and the information gathered about the variable (Kabir, 2016).

Broadly, data collection methods can be classified into two data sets: primary and secondary data. Grbich (2012) explained that primary data represents the researcher's info by using a questionnaire or personal interview or even through observation methods. In addition, Grbich (2012) discussed that on secondary data, the researcher collects information that has already been discovered and processed by other departments or various researchers before it was made available for the interested users. **Table 2-1** outlines the research design and methodology selected for this research.

**Table 2-1: Research design.**

Research objective	Data collection method	Justification
<p><b>Research question 1:</b> To what extent are the NWMS goals incorporated into the CoT IWMP?</p>	<p><b>Document review:</b> Comparison between the NWMS goals and the documented 2014 CoT IWMP.</p>	<p>Comparison is a standard research method with outstanding merit and widespread application (Azarian, 2011). For this research, the CoT IWMP was compared with the NWMS</p>

Research objective	Data collection method	Justification
	<p><b>Semi-structured interviews</b> with CoT officials were further used to determine the incorporation of the NWMS goals into the CoT IWMP.</p>	<p>goals to determine whether these goals have been incorporated into the IWMP and supported by semi-structured interviews.</p>
<p><b>Research question 2:</b> To what extent are the NWMS goals implemented and achieved by the CoT?</p>	<p><b>Document review:</b> Critical analysis of the CoT's Waste Management Performance Report, IDP and SDBIP to evaluate the incorporation of IWMP actions.</p> <p><b>Semi-structured interviews</b> with CoT officials were further used to determine their opinions of NWMS goal implementation by the CoT.</p>	<p>Using secondary data presents researchers with several characteristics of the problem (Hox &amp; Boeije, 2005). Document review and evaluation were utilised to collect data, supported by semi-structured interviews, to evaluate research question 2.</p>
<p><b>Research question 3:</b> What are the gaps and challenges identified during the implementation of the IWMP by the CoT?</p>	<p><b>Semi-structured interviews</b> with CoT officials to determine their perceptions and opinions on the gaps and challenges identified during IWMP implementation.</p>	<p>Interviews provide an understanding of opinions, attitudes, experiences, processes, behaviours or predictions (Rowley, 2012; Alberts, 2014a).</p>

## 2.4 Data collection

**Section 2.4** outlines the process followed for primary- (interviews) and secondary (document review and analysis) data collection during this study. **Section 2.4.1** focuses on primary data

collection through semi-structured interviews, while **Section 2.4.2** outlines the process followed for secondary data collection through the review and evaluation of documentation, such as the NWMS, CoT IWMP, IDP, SDBIP and Waste Management Performance Report.

#### **2.4.1 Primary data collection: Conducting semi-structured interviews**

Primary data was collected by means of conducting semi-structured interviews with selected CoT waste management officials. The sub-sections to **Section 2.4.1** outline the process followed in designing and distributing the semi-structured questionnaire used for guiding the interviews, the preparation for and conducting of interviews, and the demographic profile of the respondents.

##### **2.4.1.1 Designing and distributing the questionnaire**

Questionnaires are useful and easy to administer to collect data from respondents in studies. Therefore, the use of a valid and reliable tool to measure the properties of psych-social-behavioural concepts is an essential part of well-designed studies (Grbich, 2012). A researcher must be aware of the importance of a well-designed questionnaire and whether it measures what it is intended to measure (Song *et al.*, 2015). Consideration should be given accordingly on whether the questionnaire will measure quantitative or qualitative data and what would be its mode of administration (Song *et al.*, 2015).

In this study, a semi-structured questionnaire was designed to guide interviews. The questionnaire focussed on questioning CoT waste management officials (**Annexure 2: Permission to conduct research in the City of Tshwane** by City of T and **Annexure 3: Invitation to participate in research conducted in the C**) about the implementation of the NWMS goals through the CoT IWMP, as well as identifying gaps and challenges with implementation. The questions in the questionnaire (**Annexure 4: Questionnaire for C**) were cascaded from the research questions presented in the first chapter.

Grbich (2012) highlighted that the questionnaire has several advantages, including the anonymity of the respondents being guaranteed, facilitating the collection of vast amounts of data in a relatively short period, and being cheap to administer. Some characteristics of the questionnaire include the following:

- Questions should not be ambiguous;
- Questions must be easily understood;
- Questions should be capable of having a precise answer;

- Questions must not contain words of vague meaning;
- The questionnaire should not be too long; and
- The questionnaire should cover the exact object of the inquiry.

A semi-structured questionnaire is a type of interview where the interviewer asks only a few predefined questions while the rest of the questions are not planned (Ankers, 2016). The researcher emailed questionnaires to the respondents before the interviews.

#### 2.4.1.2 Selection of respondents

Sampling is used to select respondents to a questionnaire because it is unreasonable to cover the entire population (Kannae, 2004). Purposive sampling was used in this research to select the respondents (Leedy and Ormrod, 2013). Purposive sampling is a non-random sampling technique used in exploratory research. The researcher deliberately chooses the respondents to ensure that the sample covers the full range of possible characteristics of interest. In this study, the researcher chose only employees who deal directly with waste management in the seven regions of the CoT to provide the required information, as indicated in **Table 2-2** (Sharma, 2017). Twenty respondents were targeted for inclusion in the research. However, only twelve respondents participated in the research, including operational managers, inspectors, landfill managers, directors and deputy directors of departments responsible for waste management, and environmental awareness officers (**Table 2-2**).

**Table 2-2: Respondent selection.**

Regions	Position	Role of respondents	Number of targeted respondents	Number of actual respondents
Region 1	Operational Manager	Collecting and transporting general waste	1	1
	Inspector	Cleaning public areas and clearing all illegal dumping	1	1
Region 2	Operational Manager	Collecting and transporting general waste	1	1

<b>Regions</b>	<b>Position</b>	<b>Role of respondents</b>	<b>Number of targeted respondents</b>	<b>Number of actual respondents</b>
	Inspector	Cleaning public areas and clearing all illegal dumping	1	1
Region 3	Inspector	Cleaning public areas and clearing all illegal dumping	1	1
	Operational Manager	Collecting and transporting general waste	1	0
Region 4	Operational Manager	Collecting and transporting general waste	1	1
	Inspector	Cleaning public areas and clearing all illegal dumping	1	1
Region 5	Operational Manager	Collecting and transporting general waste	1	0
	Inspector	Cleaning public areas and clearing all illegal dumping	1	0
Region 6	Operational Manager	Collecting and transporting general waste	1	0
	Inspector	Cleaning public areas and clearing all illegal dumping	1	0
Region 7	Inspector	Cleaning public areas and clearing all illegal dumping	1	1
	Operational Manager	Collecting and transporting general waste	1	0
Landfill sites	Landfill Manager	Managing and maintaining landfill sites, garden refuse sites and transfer stations	2	1

Regions	Position	Role of respondents	Number of targeted respondents	Number of actual respondents
Head Office	Director and Deputy Director	Developing and reviewing the waste management policies, strategies, models, and norms and standards	2	2
Head Office	Environmental Awareness Officer	Environmental awareness	1	1
Head Office	Waste Management Officer	Waste management services bylaws	1	0
<b>Total</b>			<b>20</b>	<b>12</b>

#### 2.4.1.3 Conducting the semi-structured interviews

The semi-structured questionnaire was administered as an interview, and the focus was on NWMS incorporation, capacity and resources, which were based on aspects that are prudent for IWMP implementation (**Annexure 4: Questionnaire for C**). The CoT waste management employees were contacted through telephone calls, emails, and meetings to arrange interviews. Upon the interviewee agreeing to the date and time, face to face or telephonic interviews were conducted with the CoT's waste management employees.

The interviews were scheduled for approximately 30 - 45 minutes. All respondents were briefed about the study and what it entailed. They were also briefed about informed consent and that they could withdraw from the study at any time. Interviews were not recorded, and the researcher (manually) captured the responses during the interviews.

#### 2.4.2 Secondary data collection: Document review and evaluation

Data collection may involve studying secondary data, including reports, journals, textbooks, and any other results of studies. The theory states that the other common examples of secondary data include journals, reports and institutional publications (Srivastava & Rego, 2011).

Secondary data was collected through document review and evaluation. To address research question 1, the CoT IWMP was compared to the eight goals of the NWMS to determine the incorporation of these goals into the IWMP. Research question 2, regarding NWMS goal implementation, was addressed by reviewing documents such as the CoT IDP, SDBIP and Waste Management Performance Report (**Table 2-3**). The research assumed that incorporating IWMP actions into the IDP and SDBIP indicates further planning and budgeting for implementation purposes. The Waste Management Performance Report was further used to evaluate the implementation of IWMP actions.

**Table 2-3: NWMS goals and documents evaluated against the criteria.**

NWMS goals	Target/Description	Document(s) evaluated against evaluation criteria
<b>NWMS considerations</b>		
Goal 1: <i>“Promote waste minimisation, reuse, recycling and recovery of waste”</i>	25% of recyclables diverted from landfill sites for re-use, recycling or recovery.	<ul style="list-style-type: none"> <li>• 2014 CoT’s IWMP</li> <li>• CoT’s IDP from 2017 to 2021</li> <li>• CoT’s Annual performance reports from 2015 to 2020</li> </ul>
Goal 2: <i>“Ensure the effective and efficient delivery of waste services”</i>	95% of urban households and 75% of rural households have access to adequate levels of waste collection services. 80% of waste disposal sites have permits.	<ul style="list-style-type: none"> <li>• 2014 CoT’s IWMP</li> <li>• CoT’s IDP from 2017 to 2021</li> <li>• CoT’s Annual performance reports from 2015 to 2020</li> </ul>
Goal 3: <i>“Grow the contribution of the waste sector to the green economy”</i>	69 000 new jobs are supposed to be created in the waste sector. 2 600 additional small, medium and micro enterprises (SMMEs) and cooperatives are expected to	<ul style="list-style-type: none"> <li>• 2014 CoT’s IWMP</li> <li>• CoT’s IDP from 2017 to 2021</li> </ul>

NWMS goals	Target/Description	Document(s) evaluated against evaluation criteria
	participate in waste service delivery and recycling.	<ul style="list-style-type: none"> <li>• CoT's Annual performance reports from 2015 to 2020</li> </ul>
Goal 4: <i>“Ensure that people are aware of the impact of waste on their health, wellbeing and the environment”</i>	80% of municipalities are expected to run local awareness campaigns. 80% of schools are expected to implement waste awareness programmes.	<ul style="list-style-type: none"> <li>• 2014 CoT's IWMP</li> <li>• CoT's IDP from 2017 to 2021</li> <li>• CoT's Annual performance reports from 2015 to 2020</li> </ul>
Goal 5: <i>“Achieve IWMP Planning”</i>	<p>All municipalities must integrate their IWMPs with their IDPs and have met the targets set in IWMPs.</p> <p>All waste management facilities are required to report to the South African Waste Information System (SAWIS) and have waste quantification systems that report information to SAWIS.</p>	<ul style="list-style-type: none"> <li>• 2014 CoT's IWMP</li> <li>• CoT's IDP from 2017 to 2021</li> </ul>
Goal 6: <i>“Ensure sound budgeting and financial management for waste services”</i>	All municipalities that provide waste services must conduct full-cost accounting for waste services and implement cost-reflective tariffs.	<ul style="list-style-type: none"> <li>• 2014 CoT's IWMP</li> <li>• CoT's IDP and SDBIP from 2017 to 2021</li> </ul>
Goal 8: <i>“Establish effective compliance with and enforcement of the Waste Act”</i>	The number of successful enforcement actions against non-compliant activities must be increased by 50%. The three spheres of government must appoint 800 Environmental Management Inspectors (EMIs) to enforce the Waste Act.	<ul style="list-style-type: none"> <li>• 2014 CoT's IWMP</li> <li>• CoT's IDP from 2017 to 2021</li> </ul>

NWMS goals	Target/Description	Document(s) evaluated against evaluation criteria
<b>IDP and SDBIP considerations</b>		
<i>“IWMP inclusion”</i>	Indicates if a specific generation of the IWMP was included in the parallel IDP.	CoT’s IDP and SDBIP from 2017 to 2021
<i>“Yearly IWMP targets in SDBIP”</i>	Determines the inclusion of the yearly IWMP targets into the SDBIP.	CoT’s IDP and SDBIP from 2017 to 2021
<i>“Yearly financial allocation in the IDP”</i>	Indicates the budget allocated to IWMP activities in a given financial year.	CoT’s IDP and SDBIP from 2017 to 2021

#### **2.4.2.1 Review of the National Waste Management Strategy and City of Tshwane Integrated Waste Management Plan**

The 2014 version of the CoT IWMP was reviewed against the eight goals of the 2011 NWMS to determine whether these goals were reflected in the IWMP, i.e. to address research question 1. The IWMP and its goals, objectives and implementation plan were reviewed to evaluate whether the eight goals of the NWMS were incorporated (documented) into the IWMP.

#### **2.4.2.2 Review of the Integrated Development Plan, Service Delivery and Budget Implementation Plan and Waste Management Performance Report**

Further document review and analysis were conducted to determine whether the NWMS goals are implemented through IWMP implementation. This included the review of the IDP and SDBIP 2020/2021 (dated 26 June 2020) and the CoT Annual Report 2018/2019 (dated 27 March 2020). The review's objective was to determine whether the actions identified in the 2014 IWMP were planned for in the IDP and budgeted for in the SDBIP. The Waste Management Performance Report 2018/2019 was further evaluated to determine the implementation of specific IWMP actions or projects. The review of the documents was supported by primary data collection through conducting semi-structured interviews.

## 2.5 Data analysis

Qualitative data analysis is explicitly designed for qualitative researchers interested in understanding and possibly about to pursue the process of analysing data (Grbich, 2012). The word 'data' is flexibly used to include both text and numbers (Grbich, 2012). The process enables the researcher to track decisions that ensure links between the original data and findings are maintained and transparent (Smith & Firth, 2011). This adds to the rigour of the research process and enhances the validity of the findings (Neuman, 2011). This research employed primary- and secondary data analysis, which enhanced the knowledge base and complemented the exploratory research design.

### 2.5.1 Analysis of primary data

Primary data collected from interviews were organised and checked to ensure accuracy, clarity, completeness and uniformity. The thematic analysis of interviews was done manually. This was facilitated by the transcription of the data (both the responses of the interviewer and interviewee) from the interviews into a Microsoft Word document which enabled the researcher to discover whether the data collected aligned with the research objective and research questions. The interview responses were categorised according to themes by clustering similar phrases together, as indicated in **Table 2-4**.

**Table 2-4: Categorisation of interview responses according to themes.**

Theme	Mentioned phrase
Awareness	"Lack of awareness in communities and schools"
Capacity	"Lack of capacity", "staff not enough"
Financial resources	"Partially sufficient financial resources"
Inadequate law enforcement	"Legal misconduct", "monitoring and enforcement is lacking", "non-compliance to law", "weak enforcement of environmental law"
Resources	"Equipment and trucks are not enough", "lack of resources"
Training	"Exists at management level", "non-existent at operation level"

### 2.5.2 Analysis of secondary data

Secondary data analysis is a practical exercise applying the same basic research principles as studies utilising primary data and has a flexible approach that can be utilised in several ways

(Johnston, 2017). Secondary data from other sources like reports and waste documents to address a research objective was used in this regard.

The researcher reviewed the NWMS goals against the CoT IWMP, IDP, SDBIP and Waste Management Performance Report in this study. The researcher used colour coding in **Table 4-1** and **Table 4-3** to illustrate the difference between compliance, i.e. green (compliance), orange (partial compliance) and red (non-compliance). The researcher then evaluated the obtained dataset to ensure the suitability of the research topic through a literature review. The researcher identified other researchers that have conducted related studies and summarised their findings and recommendations, focusing on the challenges of implementing the NWMS goals into IWMPs and opportunities for improvement, where relevant.

## **2.6 Ethical considerations**

According to the North-West University (NWU, 2018), ethical considerations should be acknowledged and considered during research. This study was conducted based on the review of secondary data and semi-structured questionnaires. The study involved human respondents (employees responsible for waste management in the CoT) but did not include any sensitive respondents (i.e., children, persons with disabilities, etc.). The research proposal was submitted for consideration to the Scientific Committee of the Environmental Management Research Group in the Unit for Environmental Sciences and Management of the North-West University, Potchefstroom Campus. The scientific committee has found that the project proposal was in accordance with the scientific method and adhered to the required standards set out in the Academic Rules for Masters and Doctoral Students at the North-West University. The Scientific Committee concluded that the proposed methodology posed a low ethical risk; hence exemption from further ethical approval was recommended for the study (NWU-01195-20-A9).

## **2.7 Methodological limitations**

The study's limitations are those characteristics of design or methodology that impacted or influenced the interpretation of the findings from the research (James & Judy, 2013). The limitations are the constraints on generalisability, applications to practice, and/or utility of findings that are the result of how the researcher initially chose to design the study or the method used to establish internal and external validity of the result of unanticipated challenges that emerged during the study (James & Judy, 2013). For example, this study depends on having access to people, organisations, data and documents and, for whatever reason, access is denied or limited in some way; the reasons for this were described:

- The number of respondents was 12, although the target was set at two (2) respondents from each of the seven (7) regions, four (4) respondents from head office, and two (2) respondents from landfill sites in the CoT. The availability of the employees was restricted since many of them were working from home (due to the COVID-19 pandemic) and were thus unavailable on their office numbers.
- This study was only limited to the implementation of the NWMS goals by the CoT, based on documented information such as its IWMP, IDP, SDBIP and Waste Management Performance Report. No further evaluation of implementation was conducted.
- When the question was asked about how waste management is included in the respondents' mandate [key performance areas (KPA)], documented evidence, such as task/performance agreements, were not verified as some of the interviews were conducted telephonically, and the documents were not available to the researcher at the time of conducting the research.

The assumptions and limitations outlined in **Section 1.5**, due to the delineated scope of the study, should also be taken into consideration.

## **2.8 Conclusion**

In conclusion, this chapter considered the study area, research design, qualitative data collection, processing and analysis, and the methodological limitations to the study. The selected data collection, processing and analysis approaches will be appropriate for the study area. The information gained will be helpful to determine the level of implementation of the NWMS goals by the CoT.

## **CHAPTER 3 LITERATURE REVIEW**

### **3.1 Introduction**

The literature review aims to address the literature that elaborates on the research objectives presented in the first chapter. **Chapter 1** of the study gave background on waste, from being regulated and sustainably managed to preparing IWMPs. This chapter will focus on the importance of international MSWM strategies, i.e. from Taiwan and the United Kingdom (UK), developed countries, to learn from some waste management best practices and India, a developing country, to provide a comparative context to the South African waste management environment. It will also focus on waste management strategies in Africa, i.e. Nigeria and Rwanda, to link the aim of the study with the available literature on the subject, as limited studies have been done on the subject matter in South Africa. The literature review chapter also discusses MSWM strategies in South Africa and the challenges of implementing IWMPs in line with the NWMS goals.

### **3.2 An overview of municipal solid waste management strategies**

The management of municipal solid waste (MSW) is a global challenge in both developing and developed countries. Besides the difference in the quantities of MSW generated, the composition of MSW also differs between developing and developed countries. This variation in the composition of waste generated is also attributed to the consumption pattern of individuals living in developing and developed countries, the lifestyles adopted, and the climates prevailing in various parts of the world. Hence there is a global demand for efficient MSWM, to reduce the environmental impact and increase material and energy recovery.

#### **3.2.1 Municipal solid waste management strategies internationally**

The management of MSW presents a significant challenge for both developed and developing countries. Olukanni & Oresanya (2017) argued that it had been reported that MSW in developing countries largely remains uncollected and that even when it is collected, it is just taken to dumping sites without consideration of the waste hierarchy. However, waste management in developed countries is advanced, although there are still areas of concern. Countries like Taiwan and the UK have developed good waste policies and strategies to manage their MSW.

##### **3.2.1.1 Taiwan**

According to Wong (2007), Taiwan has implemented zero waste policies and strategies to support a green economy, waste minimisation, recycling, and reuse and recovery to promote the effective

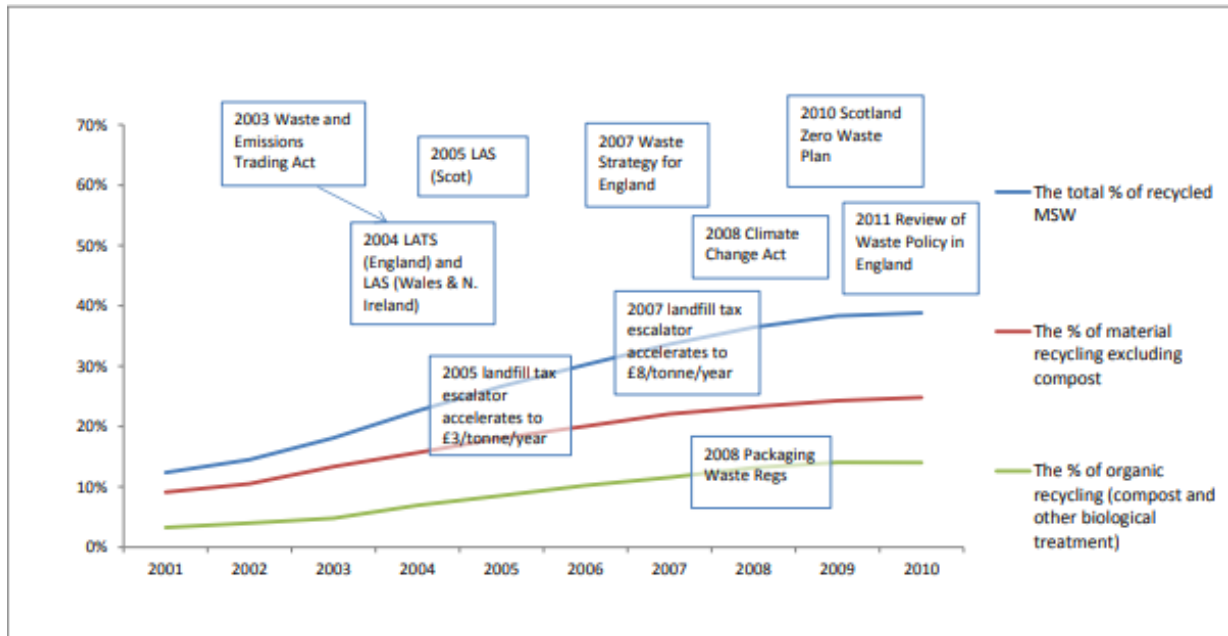
utilisation of resources. Furthermore, the study conducted by Diong (2012) indicated that Kaohsiung City, like many other countries, has also adopted the international waste management hierarchy that strains on the importance of waste reduction at source as the priority in minimising waste generation and reducing unnecessary energy lost in waste treatment. There have been further enhancements in waste governance, regulations, and policies, such as the 2001 *Pay-as-you-throw Regulations*, which forces residents to pay for waste collection based on the amount of waste thrown away (Chen & Hounq, 2004). Another one of Taiwan's waste management policies is based on the notion of a cradle-to-cradle approach which is in line with the zero-waste approach (Su, 2018; Wong, 2017). It contains five major components: sustainable consumption and production, increased resource efficiency, promoted consumer benefits, sustainable management of materials, and waste to energy generation (Su, 2018). The additional waste management measures that the country's waste authorities have also implemented over the past ten years include reduced use of plastics, plastic recycling, MSW incineration, e-waste recycling, and waste to energy projects. These have all positively contributed to successful waste management (Su, 2018; Wong, 2017).

According to a July report issued by Taiwan's Environmental Protection Administration in 2012, the country's rate of properly-treated MSW has reached 99.99%, MSW recycling is over 40%, and enterprise waste recycling is at 84%. This was achieved through an integrated municipal waste management plan that starts with households where waste separation at source is practised in line with the *Keep Trash off the Ground Policy* that makes fair use of every type of waste generated before ending up in a landfill (Diong, 2012). This policy mandates that citizens are not allowed to temporarily keep waste in waste bins outside of premises or throw waste on the ground; otherwise, penalties will be given (Environmental Protection Agency, 1995). The generated and separated waste must be kept inside premises at all times to prevent point of source pollution outside premises (Diong, 2012).

### **3.2.1.2 United Kingdom**

Despite differences in the specifics of policy measures, national priorities for waste have been consistent in aiming to drive action further up the waste hierarchy, thus making a transition from the landfill of waste, towards prevention, re-use and energy recovery, along with a reduction of greenhouse gas (GHG) emissions from waste (Defra, 2010). The UK has successfully developed waste management strategies in all regions. England, Wales, Scotland, and Northern Ireland have each developed a national waste strategy outlining ways of dealing with the waste generated within their jurisdiction. In general, successive waste strategies in each region include the *2000 Waste Strategy, England and Wales; 2007 Waste Strategy, England; 2009 Towards Zero Waste Strategy, Wales; 2010 Zero Waste Strategy, Scotland; and 2013 Waste Management Strategy,*

Northern Ireland. These strategies have tended to establish increasingly ambitious targets for recycling household and municipal waste and diversion of waste from landfills, as indicated in **Figure 3-1** (Defra, 2010).



**Figure 3-1: Policy initiatives for recycling municipal solid waste in the United Kingdom (Defra, 2010).**

The UK’s potential to achieve effective waste management strategy targets has been bolstered by increased recycling and/or separation and landfill legislation (Mühle *et al.*, 2010). According to Defra (2010), the landfill tax introduced has been a key driver in diverting waste from landfills and towards energy and material recovery. Even though in South Africa, landfill taxes are currently in a proposal stage, this will aim to be a disincentive tax to discourage landfill disposal. The Netherlands Ministry of Infrastructure and the Environment (2016) stated that the recycling of packaging waste had been driven by the *Producer Responsibility (Packaging Waste) Regulations* in Northern Ireland which place a burden of responsibility on big companies that produce, sell or import packaging to pay for subsequent recovery and recycling of an appropriate volume of packaging waste as determined by packaging waste recycling targets as per the contents of the *Packaging Waste Directive* (Cave, 2016).

The local authorities in the UK have introduced participation in recycling programmes which has assisted them successfully to reduce waste volumes. The most effective recycling method is to separate waste at the source (Montana, 2018). Another instrument introduced to encourage waste separation by households has been the *Pay as You Throw Charging* for the collection of non-separated wastes (Defra, 2010). The charge is dependent on the amount of waste (Defra,

2010; Cave, 2016). The establishment of the *UK Waste and Resource Action Programme* (WRAP) in 2001 was one important initiative that has contributed to the improvement of recycling rates in that country. This was in response to the *2000 Waste Strategy for England and Wales* (Defra, 2010). It must be noted that WRAP is an enabling organisation whose core objective is to establish voluntary activity partnerships between producers and recyclers of waste and between them and users of products containing recycled materials (Wang *et al.*, 2020). One example of a WRAP initiative is the *Courtauld Commitment*, a voluntary agreement aimed at engaging retailers in reducing food waste and optimising the use and recycling of packaging.

One key policy measure that may have been a major driver for achieving rapid diversion rates is the *Landfill Allowance Trading Scheme* (LATS) launched in England, even though this had been phased out in their region in 2013. However, it has been active in Wales, Northern Ireland and Scotland (Wang *et al.*, 2020). Under this scheme, allowances were allocated to each waste disposal authority at a level that would enable each region to meet its contribution to the UK targets under the *Landfill Directive*. Each waste authority had the freedom to trade allowances with other authorities according to their investment strategies and timescales in alternative facilities for waste (i.e. material recovery, composting or incineration) (Wang *et al.*, 2020). The concept aimed to enable the involved region to meet its obligations in the most cost-effective manner.

### **3.2.1.3 India**

Like most developing African countries, India is also facing major waste management challenges due to inadequate waste collection, transport, treatment, and disposal. The current Indian waste management system cannot cope with the volume of waste generated by an increasing urban population, negatively impacting the environment and public health (Kumar *et al.*, 2017). A major challenge in India is waste disposal due to insufficient landfills (Kausal *et al.*, 2012). Only 6% – 7% of municipal waste in India is diverted from landfills. The rest of the waste is disposed to landfills (Kumar *et al.*, 2017). Many waste categories in India are collectively categorised as urban waste (Syed, 2006). The categorisation emphasises that there is no clear plan and method to separate waste for recycling and reuse. This is not sustainable and exacerbates the landfilling crisis already experienced in India.

Rachel *et al.* (2009) indicated that India's municipalities' continuous disposal of municipal waste to landfills is also accelerated by a lack of capacity and resources, insufficient environmental knowledge among municipal employees, a low level of environmental awareness among society and poor governance. This is also true for South African municipalities. Like India, South Africa is made up of different regions and classes of communities that occupy these regions (Late and

Mule, 2013). The profiles of different regions and classes of communities, i.e., infrastructure, income level, culture, social behaviour, and education, influence the quantity and type of waste generated. Hence, a consistent, diverse, low cost, quality waste management system must be developed for developing countries such as India instead of rolling out the same system used in developed countries such as Taiwan and the UK, since a system used in Taiwan may be impractical and unaffordable for the communities in India, and thus will promote waste disposal to landfills. It can thus be gathered from **Section 3.2.1** that sufficient capacity, environmental education, financial resources, infrastructure and governance are crucial to well-functioning waste management systems, such as in Taiwan and the UK (Kausal *et al.*, 2012).

### **3.2.2 Municipal solid waste management strategies in Africa**

Africa is the world's second-largest continent after Asia, and the African population was estimated at 1.26 billion in 2017 (UNDESA, 2017). Although Africa as a whole has a major development aspiration in the broader context of a global and continental economic development agenda, individual African countries are increasingly facing development challenges (Simelane & Mohee, 2012). Waste management is one of the major challenges that need serious attention. A number of regional waste policies and strategies have been developed to address those challenges, adding to country-specific legislation and policies.

According to the Africa Waste Management Outlook, Africa as a continent has policies that frame waste as a political priority. First is the *African Continental Policies Agenda 2063 (2013)*, which states that the Africa we want is a 50-year strategic socio-economic transformation framework. Its implementation plans (2014 - 2023) set out specific goals that must be achieved during the first ten years, including the expected transformation of waste management. Under Goal 1, African cities should at least recycle 50% of the waste they generate by 2023, but most African cities can only recycle 5 - 9%. Currently, little has been achieved towards this goal in most African cities due to the amount of strain on institutions in Africa, both financially and technically (UNEP, 2018).

According to Simelane & Mohee (2012), large African cities such as Nairobi, Johannesburg, Cairo, Lagos and Dar es Salaam have also been experiencing a population growth trajectory fuelled by high levels of migration. Migration and internal population growth have led to increased generation of waste in these cities, which rendered waste collection systems inefficient and decreased the attractiveness of these cities (Simelane & Mohee, 2012). African cities lack proper sanitary landfills, and as a result, waste is often dumped in a manner that creates heaps of waste. This has given rise to the perception that African cities are dirty and unhealthy (Kadafa, 2017).

The most popular possible approach to waste management strategies adopted in other countries is integrated solid waste management (ISWM) (Mohee & Simelane, 2015). Mohee and Simelane (2015) highlighted that an ISWM system consists of six key functional elements, the first one being waste is generated, handled, separated, stored and processed at its source. The waste is then collected by the appropriate authorities and transported to transfer stations for compaction and then to material recovery facilities (MRF). Here waste is sorted for recycling or composting; or otherwise treated through various waste-to-energy technologies, while the untreated waste fractions are ultimately disposed of in a landfill. According to the Africa Waste Management Outlook report, Nigeria and South Africa, among others, stand out as ‘hot spots’ of MSW generation on the continent, with an estimated MSW generation of 17.45 and 23.21 million tonnes per annum, respectively (UNEP, 2018). On the other hand, Rwanda has earned the position of one of the cleanest cities on the African continent (Kabera *et al.*, 2019). The AWMO report indicated that African countries, including Nigeria and South Africa, could bring about change in waste management by bringing waste under control and harnessing the opportunities of waste as a resource as indicated in **Figure 3-2**.



**Figure 3-2: Controlling waste and harnessing the opportunities of waste plan (UNEP, 2018).**

**3.2.2.1 Nigeria**

According to Bakare (2020), Nigeria has one of the largest populations on the African continent and is also one of the largest producers of solid waste on the continent. Furthermore, Nigeria stands out as a ‘hot spot’ of MSW generation due to overpopulation; hence the management of

MSW has become a major environmental problem, especially for its fastest-growing city, the current federal capital, Abuja, with the waste generation amount constantly increasing (Ezeah and Roberts, 2012). Only 10% of the MSW generated is recycled and diverted; thus, 90% of the waste is landfilled (UNEP, 2018).

Nigeria has many policies and regulations to address waste management, but this has not helped much as waste management remains a headache for the authorities. A study conducted in Nigeria revealed poor waste management by the urban local bodies, contributing to the accumulation of waste in most parts of the urban centres (Misra *et al.*, 2018). The country generates an estimated 32 million tonnes of solid waste annually. Of that amount, only 20% - 30% is collected, meaning that the bulk of it remains uncollected (Banker, 2020). The inefficient collection system leads to MSW being dumped in open dumpsites, creating serious public health and environmental challenges.

As noted, Nigeria has waste management laws and policies, but its waste management initiatives have failed (Afun, 2009). One of the inherent impediments hindering the effective implementation of environmental protection laws and policies is the lack of basic facilities and funds and political willingness (Owolabi, 2003; Uwagbale, 2016). South Africa also has a good waste management legislative framework. Unfortunately, implementation and practice have failed due to non-compliance, enforcement, monitoring, funds and political willingness.

### **3.2.2.2 Rwanda**

Rwanda's capital city, Kigali, has earned the position of one of the cleanest cities on the African continent, owing to an effective waste management system (Kabera *et al.*, 2019). Waste management in Kigali mostly evolved over the past decade. Before 2010, the country did not have a harmonised regulatory framework addressing SWM (Rajashekar *et al.*, 2019). This forced private citizens, communities, non-governmental organisations (NGOs), private sector entities, and district authorities to undertake SWM, but financial resources constrained them. Several factors have shaped the waste management strategy in Rwanda over time, including rapid urbanisation, changing city boundaries, and the emergence of new institutions. The Ministry of Local Government currently manages the waste in Rwanda with private sector companies that assist with waste collection. In Kigali, the city authorities manage waste (Kabera, 2020). According to Kabera *et al.* (2019), the success of Kigali's waste management is governance-related rather than technical.

Kigali has implemented a model known as *Umuganda*, which sets the standard for a clean city and the benefits thereof (Rajashekar *et al.*, 2019). Some of the interventions pursued by Kigali's waste authorities include:

- The Umuganda-model (meaning 'coming together to achieve a common purpose'): Umuganda is a practice undertaken every last Saturday of the month, where all citizens commit time to projects aimed at improving public spaces;
- Robust enforcement of by-laws through community policing committees and other agencies;
- Vigorous education and awareness initiatives;
- Waste-to-energy programmes; and
- Partnership models that put citizens and the private sector at the centre of efforts to keep the environment clean (Rajashekar *et al.*, 2019).

To gain first-hand insight into the functioning of a world-class waste management system, the City of Johannesburg has conducted a benchmarking study tour to Kigali in 2017 (Mashaba, 2017). According to Mashaba (2017), the City of Johannesburg, Pikitup and the Miss Earth South Africa Foundation has sought to emulate some of the interventions from the Rwandan experience. Some of the interventions learned from the Umuganda-model were: the introduction of a monthly clean-up campaign targeting all the regions of the city; revising the waste management by-laws to, among others, make the separation of waste at source mandatory; the introduction of education and awareness waste campaigns and stakeholder involvement programmes; and the development of partnerships guidelines to involve mission-critical stakeholders as active respondents in implementing a new approach to waste management (Mashaba, 2017).

Even though Rwanda is a smaller country with less population than Nigeria and South Africa, it is still possible to draw some lessons from that country because it has been able to implement very successful waste management strategies which are cost-effective and straightforward. For example, Rwanda has made waste separation at source mandatory. Suppose the South African NWMS changes waste separation at source from a voluntary to a mandatory tool (i.e. command and control-related) similar to Rwanda; South Africa may move up the waste management hierarchy.

### **3.2.2.3 South Africa**

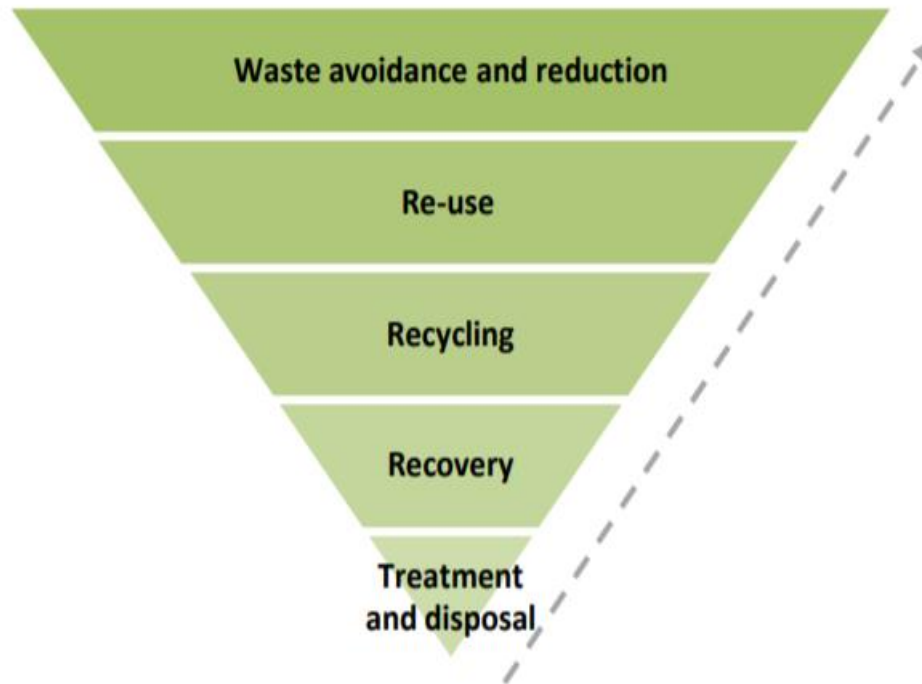
In South Africa, the quantities of MSW are increasing due to population growth, economic growth, urbanisation and industrialisation. In 2011, about 108 million tons per annum of waste was generated, of which 20 million tons were MSW (DEA, 2009; Oelofse, 2014). Of concern is that only 10% of this waste was recycled while 90% was landfilled. Landfilling is the dominant waste

management option in South Africa. However, the reality is that landfills are rapidly running out of airspace. Hence, the traditional method of collecting, transporting, and disposing of waste is no longer efficient. Thus, alternative interventions of waste management are needed (Oelofse & Nahman, 2018).

According to the *White Paper on Integrated Pollution and Waste Management* (IP&WM) and the NWMS, the South African government promotes the concept of waste minimisation, reuse and recycling as an alternative to disposing of MSW in landfill sites. The NWMS also invokes the polluter pays principle, which implies that all waste generators are responsible for paying the cost associated with the waste they generate (Nahman & Godfrey, 2010; Makgae, 2011). The elements of integrated waste management planning (IWMPanning), waste information systems, general waste collection, waste treatment and disposal, capacity building, and awareness are also crucial intervention measures required to promote the efficient use and management of waste in South Africa (Molaba, 2019).

### **3.3 National Waste Management Strategy, 2011**

The NWMS is a legislative requirement of the NEM: WA, which seeks to improve waste management in South Africa systematically. The South African government is committed to sustainable development. It aims to balance the broader economic and social challenges of a developing and unequal society while protecting the environmental resources (DEA, 2011). The government also aims to eliminate the unnecessary use of raw materials, supporting sustainable product design, improved resource efficiency and effective waste prevention (DEA, 2011). The NEM: WA, therefore, promotes IWMPs via IWMPanning through the internationally accepted waste management hierarchy, which is depicted in **(Figure 3-3)**, which deals with the options for waste management during the waste lifecycle. According to the NWMS (DEA, 2011), IWMPs should set targets on how municipalities plan to divert waste from landfills by applying alternative solutions that reduce, reuse, recycle and recover the various waste streams generated in their areas.



**Figure 3-3: Waste management hierarchy (from the NWMS, DEA 2011).**

According to the NWMS, waste management in South Africa faces numerous challenges that hinder waste management according to the waste hierarchy. This includes:

- An increase in the volume of waste generated due to a growing population and economy, putting pressure on the waste management facilities in short supply;
- Urbanisation and industrialisation increase the complexity of waste streams by mixing hazardous waste with general waste;
- A historical backlog in waste services for, especially, informal urban areas, tribal areas and formal rural areas (although 61% of all South African households had access to kerbside domestic waste collection services in 2007, this access remains highly skewed in favour of more affluent and urban communities);
- Inadequate waste services lead to unpleasant living conditions and a contaminated, unhealthy environment;
- A lack of understanding and implementation of national waste policies in the regulatory environment that will actively promote the waste management hierarchy;
- The absence of recycling infrastructure which will enable separation of waste at source and diversion of waste streams to material recovery and buy back facilities;
- Increasing pressure on outdated waste management infrastructure, with declining levels of capital investment and maintenance;

- Waste management suffering from pervasive under-pricing, which means that consumers and industry do not fully appreciate the costs of waste management;
- A lack of landfill sites since waste disposal is still preferred over other management options;
- The availability of too few waste treatment options, rendering them more expensive than landfill costs; and
- Too few acceptable, compliant landfills and hazardous waste management facilities hinder the safe disposal of all waste streams (although estimates put the number of waste handling facilities at more than 20003, a significant number of these are unpermitted).

It must be noted that all spheres of government, depending on their mandate and the private sector, experience the challenges highlighted above. The NWMS's eight goals are structured in such a way to address these challenges. Additionally, the goals serve as a way to repackage, in practical terms, the objectives and provisions of the NEM: WA (the major national waste law in the country) (South Africa, 2008). The target timeline for achieving the NWMS goals had been set for 2016.

**Goal 1: “*Promote waste minimisation, reuse, recycling and recovery of waste*”**

The waste management hierarchy is introduced in NEMA in Section 2(4)(a)(iv) and repeated in the main aim of NEM: WA, i.e. to implement the waste management hierarchy. The objectives under the first NWMS goal pertain to addressing the first four stages of the hierarchy in the general duty created under Section 10 of the NEM: WA, which states that all municipalities have to abide by the waste management prescripts, which involves first and foremost avoidance of waste generation before considering the last alternative of waste disposal (DEA, 2011). The aforementioned general duty of municipalities implies that a municipality is a regulated entity and a local regulator. All South African municipalities are expected to abide by the requirements of the waste hierarchy and are also supposed to comply with the Section 16 general duty in respect of its activities and the regulation of waste management in the area that it serves (Alberts, 2014).

The most significant role of local government in achieving Goal 1 of the NWMS is its implementation and promotion of reuse, recycling or recovery of goods and waste materials. According to the NWMS, this will depend on: the collection and sorting of general recyclable waste materials, supported by a recycling infrastructure, as well as general recyclable waste collection systems, which will be coupled to existing waste collection services; and the establishment of material recovery facilities and buy-back centres along with the provision of space to sort waste into reusable and recyclable wastes. The realisation of Goal 1 further goes hand-in-hand with the

*National Domestic Waste Collection Standards (NDWCS)*, requiring municipalities to encourage the separation of waste at the source (DEA, 2011).

Fiscal instruments also support this goal. These instruments include full-costing accounting, cost-reflective tariffs, cost-recovery, and volumetric charging. The waste generator could be discouraged by consequent increases in disposal fees (DEA, 2011).

### **Goal 2: “Ensuring of effective and efficient delivery of waste services”**

The main aim of Goal 2 is to deliver effective and efficient waste services. Waste services are the Constitutional responsibility of local government. However, providers in the private sector also play a role in the different stages of waste management, including waste service delivery and recycling. The objectives of Goal 2 are to progressively expand access to at least a basic level of waste services and to ensure that waste that cannot be reused, recycled or recovered is disposed of safely and appropriately in permitted landfill sites (DEA, 2011). There is an array of regulatory, planning and fiscal instruments supporting the programme for effective and efficient delivery of waste services, including IWMPs.

Chapter 3 of the NEM: WA, ‘Institutional and Planning Matters’, addresses IWMPs in detail. The primary aim of an IWMP is to integrate and optimise waste management planning to maximise efficiency and minimise associated environmental impacts and financial costs related to improper waste management. In terms of Section 11(4), every municipality must prepare an IWMP and submit it to the Member of the Executive Council (MEC) for approval.

### **Goal 3: “Grow the contribution of the sector to the green economy”**

Effective waste management results in economic, social and environmental benefits, among others. The waste management sector is of great importance to the green economy, and if well-regulated and formalised, this sector can help improve the economy's effectiveness altogether (DEA, 2011).

The objective of Goal 3 of the NWMS is to animate employment creation while expanding the support of small and medium enterprises (SMEs) and marginalised communities in the waste area (DEA, 2011). The policy approach focuses on each individual waste picker through formal employment, to the more systemic approach of waste picker integration, which includes waste pickers and their informal collection system in official programmes in order to expand the collection of recyclables and strengthen and transform the recycling value chain (DEFF & DST, 2020). The government has also committed to guiding municipalities and industry on measures to improve the working conditions of waste-pickers.

In addition to achieving Goal 3 of the NWMS, municipalities are expected to encourage the use of labour intensive, community-based collection methods to provide waste services (DEA, 2011). This approach is encouraged in areas where communities are experiencing difficulties when it comes to accessing waste services through conventional collection methods. The implementation of this method may aid in many instances in the reduction of the burden faced by municipalities in the provision of adequate waste services while at the same time providing sustainable income opportunities for communities needed for purposes of local economic development (Alberts, 2014).

**Goal 4: “Public awareness of the impact of waste on health, well-being and the environment”**

The primary object of Goal 4 of the NWMS is to guarantee that awareness is created of waste management issues among the general population by, for example, adding practical waste projects to essential schooling educational programmes. The NWMS highlights that schools need to execute waste awareness programmes, for example, recycling ventures (DEA, 2011).

Furthermore, the DEA developed the *Waste Awareness Strategic Framework* at a national level in 2016 to assist provincial and local authorities to implement awareness-raising campaigns. In Gauteng, waste awareness and clean-up campaigns aim to promote waste separation and reduce littering and illegal dumping by raising awareness among communities, schools, and construction industries (DEA, 2018).

**Goal 5: “Achievement of integrated waste management planning”**

The NWMS acknowledges that the difficulties confronting waste management in South Africa are, in addition to other things, massive backlogs in waste collection services; maturing waste collection vehicles and equipment; population growth bringing about developing settlements, towns and urban areas, which brings about bigger volumes of waste created; and ever-diminishing airspace in current landfill destinations (DEA, 2009). A planned methodology must be received by every one of the three government spheres to address these difficulties. The chief instrument provided by the NEM: WA to encourage the required coordination is the IWMP (Alberts, 2014).

Goal 5 of the NWMS has two main objectives. The first objective is establishing an effective system of IWMPs, particularly at the local government level. The second objective is the establishment of and maintenance of an information base on waste flows. IWMP planning at each level of government will enable the alignment and integration of the actions of national, provincial and local governments (DEA, 2011). The IWMPs will set targets and describe plans for the three

tiers of government and give practical effect to the policies and instruments set out in this NWMS. IWMPs will importantly link to mainstream budgeting and resource allocation and systems for performance monitoring and reporting (DEA, 2011).

In terms of the Municipal Systems Act 32 of 2000, each municipality must develop an IDP to integrate waste services within broader municipal plans. One IDP element is an IWMP that aims to implement the waste hierarchy in terms of the NWMS (South Africa, 2000). The IDP is considered an important tool for municipal service delivery (DEA, 2011) since municipalities are expected to ensure that the service they provide, such as waste management, is done in a financially and environmentally sustainable way (Radzilani, 2019).

**Goal 6: “*Ensure sound budgeting and financial management for waste services*”**

The aims of Goal 6 are for municipalities to use full-cost accounting and to implement cost-reflective tariffs. Full-cost accounting is used to determine the actual cost of waste service provision. The “*operational and capital expenditure for collection, transportation, landfill development and closure, street cleansing, fee collection, credit control, monitoring and enforcement costs, interest payments and depreciation*” would be included in the cost (DEA, 2011). Full-cost accounting sets a good foundation for financially sustainable waste management services.

Municipalities must establish the charges for waste management services to fund the maintenance and extension of the infrastructure necessary to provide the services. The Department of Forestry, Fisheries and Environment (DFFE) provides efficient guiding principles regarding volumetric charging and the establishment of revenue collection systems. The DFFE and National Treasury must examine and establish economic instruments to ensure that financial allocations increase through the IDP channel of municipal projects while also developing an appropriate capital or financial structure (Alberts, 2014).

**Goal 7: “*Measures to remediate contaminated land*”**

The NWMS indicate that to address the massive build-up of public and private contaminated land in South Africa, Goal 7 of the NWMS will draw upon Chapter 4 (Part 8) of the NEM: WA, which sets out the administrative measures for the management of contaminated land. Contaminated land has generally been under-managed, resulting in, among other things, the absence of information on the number and degree of contaminated sites. Although the management of polluted land fall inside the ambit of the DFFE, municipalities assume a part as possible proprietors or owners of contaminated land (DEA, 2011). Hence, municipalities must conform to the NEM: WA's appropriate provisions and the *Framework for the Management of Contaminated*

*Land* (South Africa, 2008). For instance, all landfill sites that cannot be upgraded to compliant landfills will be managed in accordance with the arrangements in the NEM: WA dealing with the management of contaminated land (DEA, 2011).

Municipalities should be guided by the stated rules, which set out the implications for affected areas and depict the duties and obligations of affected organisations and people, such as municipalities who are the owners of the contaminated land. The objective set by the NWMS is for 80% of the locales on the register of contaminated land to have been surveyed, with 50% of the sites being given endorsed remediation plans (DEA, 2011).

### **Goal 8: “Compliance with and enforcement of the National Environmental Management Waste Act”**

According to Alberts (2014), “*It is common to refer to that regardless of how far-reaching the legitimate structure for waste management in South Africa may be; it is trivial without powerful authorisation in areas where non-compliance with the provisions abound*”. The primary target of Goal 8 of the NWMS is to guarantee efficient monitoring of compliance with the NEM: WA, which incorporates guidelines distributed regarding the Act, licenses, industry waste management plans and IWMPs (DEA, 2012b:33). The second objective of goal 8 is for the government to broaden the current EMI’s ability to enforce the NEM: WA.

A litany of provisions within the Act support municipalities’ enforcement of the NEM: WA. One of the most important provisions is the requirement that a Waste Management Officer (WMO) be appointed (DEA, 2011). The National Environmental Management Act 107 of 1998 (NEMA) additionally states that the responsible Minister may designate an official within the municipality as an EMI (South Africa, 1998). One of the roles of such a position includes enforcing the provisions of the NEM: WA (South Africa, 1998: Section 31). Chapter 7 of the NEM: WA manages offences and penalties and extends certain powers and capacities to WMOs and EMIs to guarantee compliance and enforcement of the Act (South Africa, 1998).

In order to achieve the eight NWMS goals at a local level, municipalities need to align their IWMPs with the goals (DEA, 2011).

### **3.4 Integrated waste management plans as a mechanism of achieving the National Waste Management Strategy goals**

The key intention of the IWMP is to integrate and improve the waste management planning process effectively, with the ultimate goal of improving the standard of living for all by maximising efficiency while reducing the impacts to the environmental and financial costs of managing waste.

Therefore, integrated planning should consider all three (environmental, social and economic) aspects of sustainability. Furthermore, the IWMP is the primary instrument to affect the NWMS and allows for the provision of sustainable and affordable waste management services. It is important to integrate all stakeholders from government departments to the public and other respondents during planning. The requirements for organs of state to prepare the IWMP, the contents of the IWMP, and the challenges of implementing the NWMS goals into the IWMP are discussed below.

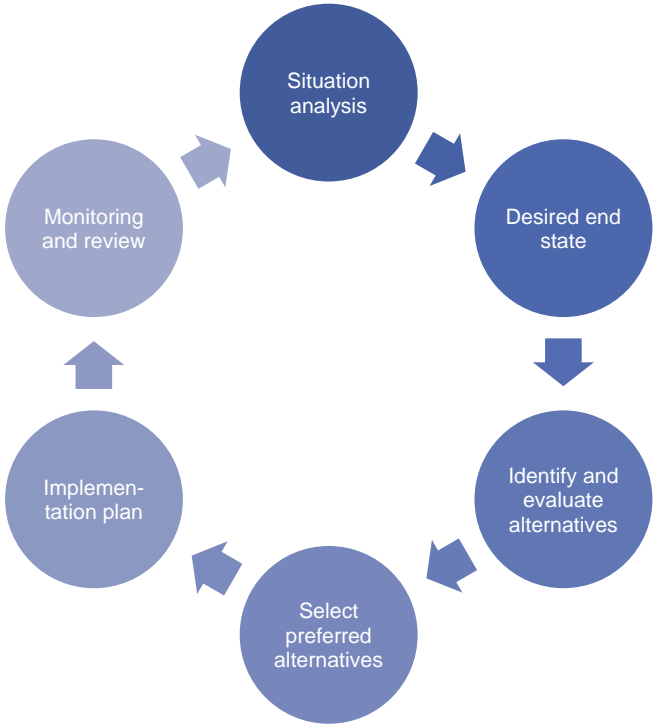
### **3.5 Requirement for organs of state to prepare integrated development plans**

National, provincial and local governments comprise the three spheres of government. The powers and functions of these spheres are captured in the Constitution, whereas the NEM: WA provides each sphere with clear waste management responsibilities (DEA, 2011). The responsibility of local governments (municipalities) is to provide waste management services, as per Schedule 5B of the Constitution, which includes “waste removal, storage and disposal services” (South Africa, 1996). It is also the responsibility of the municipalities to work together with industry and other stakeholders to extend recycling at the municipal level. Municipalities must designate a WMO to coordinate waste management matters and submit an IWMP containing these matters to the MEC for approval (DEA, 2011).

The primary regulatory authority for waste activities is the provincial government, except for the Minister's activities. The provincial government must ensure that the NWMS and waste-related national norms and standards are promoted and implemented (DEA, 2011). They must also designate a provincial WMO responsible for coordinating waste management matters at the provincial level and prepare a provincial IWMP and annual performance report (DEA, 2011 and DEA, 2009). The national government, i.e. DEA, now DFFE, is responsible for ensuring that the NEM: WA requirements are implemented (DEA, 2011). These requirements include establishing and maintaining a national- contaminated land register, IWMP, norms and standards, NWMS and waste information system (DEA, 2011). The overall purpose of the national IWMP is to address non-compliances in the three spheres of government; give effect to the goals and objectives of the NEM: WA and NWMS; improve the sustainability of waste management practices; optimise the waste management hierarchy in handling waste; provide for waste management through annual reporting and streamline waste resources through the integration of the IWMP into the IDP (DEA, 2012:9).

**3.5.1 Contents of integrated waste management plans**

According to the IWMP toolkit, an IWMP must be developed and implemented following the IWMP planning process illustrated in **Figure 3-4** (DEA, 2009). The first step in the IWMP process consists of a situation analysis that sets out how the provincial or local municipality intends to identify the required measures to be implemented to support municipalities to give effect to the objects of the NEM: WA (DEA, 2009). The desired end state follows, in which the municipality must identify waste management-related priorities and goals to be achieved. The desired end state must be formulated based on the findings of the situational analysis and the municipality's financial status and institutional capacity. After that, the municipality must identify and evaluate different alternatives, methods, and approaches to achieve the desired end state (DEA, 2009). After the possible alternatives have been identified and evaluated, whether they are negative or positive in terms of economic and socio-ecological impacts, the municipality must select the preferred alternatives to reach the waste management goals. The fifth step in developing an IWMP is the implementation plan. The plan needs to include goals, objectives and targets for implementation of the waste management goals. The final step in developing an IWMP is the approval, monitoring and review of the IWMP against the goals that have been set (DEA, 2009).



**Figure 3-4: Integrated waste management planning process (adapted from DEA, 2009).**

According to the Department of Environmental Affairs and Tourism (DEAT) (2000), it is important to thoroughly comprehend policy objectives during IWMP planning as this facilitates effective

implementation of the IWMP. Some of the waste policy objectives include the principles mentioned in the NEM: WA, NEMA and NWMS, e.g.: 'accountability', 'cradle-to-grave', 'cost', 'integration', 'transparency', 'access to information, 'participation' and polluter 'pays' (DEAT, 2000:2). The core focus of the IWMP is the promotion of the waste hierarchy through training and awareness and emphasis on resource reduction and waste to resource transition to generate income. The final process of the plan is creating an adaptive tool to facilitate ongoing monitoring and advancement of the IWMP planning system.

### **3.5.2 Challenges of implementing the National Waste Management Strategy goals into integrated waste management plans**

According to a study conducted by Alberts (2014), it was stated that when considering the eight NWMS goals, a challenge that is often raised is one of a lack of resources. It can be noted that resources are often misallocated, and this most often results in operational levels that are crucial in service delivery not getting adequate allocations. The assets that are critical in the delivery of waste management services suffer neglect until such a point that repairs cannot salvage such assets and new assets are acquired. It can also be noted that the eight NWMS goals were set in 2011 and targets needed to be met by 2016, which was not done (Alberts, 2014). Thus, one can conclude that the NWMS is not taken seriously as a tool for waste management regarding compliance.

In addition, Molaba (2019) conducted a study to critically analyse the IWMPs of local municipalities located within the Fezile Dabi District Municipality. The study revealed that although IWMP documents were prepared, important omissions were identified, and these had a bearing on the mandatory impact of IWMPs. The study also revealed that the following NWMS goals: Goal 2, 6, 7 and 8 were not addressed in any of the IWMPs because of their omission in the situation analysis. The targets for implementing these goals were set for 2016, once again indicating that the NWMS was not considered a waste management tool requiring urgent compliance.

Molaba's study further revealed that the identified gaps show there is no knowledge of the content of the IWMPs and the broader waste management legislation. Therefore, the IWMPs are not holistic in matters of the NWMS, which presented the poor level of compliance to legislation at the local government level. The challenges facing local municipalities in the Fezile Dabi District Municipality included inadequate knowledge by waste management officials, insufficient budget provisions to render effective waste management, and the failure to monitor the implementation of the waste management goals by the municipality (Molaba, 2019).

The other study to be discussed was conducted by Mokoena (2019). It was aimed at establishing the extent to which the City of Ekurhuleni Metropolitan Municipality (CoE) had implemented the instruments of the NWMS. The study discovered that the *Waste Classification and Management System* was implemented for waste disposed of at municipal landfill sites through third parties (Mokoena, 2019). The CoE faced several challenges when it came to implementing the instruments of the NWMS. These included policies or strategies not being in place, and the mandate for implementing most of the instruments did not fall under the CoE but a different sphere of government. This gap was identified as impeding the effective implementation of the NWMS instruments and the NWMS goals (Mokoena, 2019). The study has also discovered that the development of the CoE IWMP is still in its draft stage and creates a problem regarding conformance with the NWMS goals (Mokoena, 2019).

### **3.6 City of Tshwane Integrated Waste Management Plan**

The CoT first adopted an IWMP in 2005, which was reviewed after the NEM: WA's promulgation in 2008 to provide for the act's provisions (CoT, 2014). The City's IWMP is aligned to the *Tshwane Vision 2055*, the *CoT's Green Economy Strategic Framework* and the *Gauteng Department of Agriculture and Rural Development Guidelines for the Development of IWMPs for Local Governments*. According to the City's 2014 IWMP, the major challenges faced by the city in the provision of effective waste management are found in the outdated by-laws that lack clarity on waste separation and recycling, with the worst setback emanating from illegal dumping from backyard dwellers and building contractors.

Godfrey *et al.* (2013) note that municipalities face challenges in providing waste management services due to insufficient budgets, lack of resources and lack of waste management knowledge on the part of waste employees and residents. All this, worsened by political interference, exacerbates the situation with little or no priority given to waste management. According to Statistics South Africa, the CoT's access to waste removal in 2011 was slightly lower than the provincial average of 82% (CoT, 2014). According to the CoT's IWMP, waste collection and transportation fall under the operational responsibility of the City's administrative regions. However, it is unfortunate that the CoT's IWMP does not spell out its plan on informal business activities, which have proliferated around the metropolitan area leading to increased waste generation.

### **3.7 Chapter summary**

This chapter provided an overview of MSWM and waste management laws, policies and strategies implemented in response to global and regional waste management challenges. Poor

MSWM practices are rife in developing countries, such as South Africa. Urbanisation and industrialisation are negatively impacting waste management due to more complex wastes being generated, resulting in environmental degradation and threat to human health. Until these challenges are addressed through the effective implementation of IWMPs, South Africa will continue to be subjected to ineffective waste management and the related effects on societal health and the surrounding environment.

A practical and reasonable solution to waste management is an integrated approach that will incorporate consolidated means of managing all waste streams by implementing the NEM: WA, associated regulations and policies and the NWMS. The next **chapter** presents the results and discussion concerning the research questions.

## CHAPTER 4 RESULTS AND DISCUSSION

### 4.1 Introduction

The fourth chapter of the study presents the results, analysis and discussion of those results. The data discussed in this chapter was gathered from document review and semi-structured interviews held with the CoT waste management employees. The results and discussion thereof are presented in accordance with the research objectives:

- To determine the extent to which the NWMS goals are incorporated into the CoT IWMP (research objective 1).
- To determine the extent to which the NWMS goals are implemented and achieved by the CoT (research objective 2).
- To determine the gaps and challenges identified during the implementation of the IWMP by the CoT (research objective 3).

The results presentation, analysis and discussion are done in conjunction with relevant literature presented in **Chapter 3** of the study. Literature that was not presented in **Chapter 3** may also be introduced in some instances for discussion purposes.

### 4.2 Results related to research objective 1

The study's first research objective was to determine the extent to which the NWMS goals are incorporated into the CoT IWMP.

#### 4.2.1 Results of document review

The document review results of the NWMS goals against the CoT IWMP are provided in **Table 4-11**. Colour-coding used in the last column of the table indicates the level of NWMS goal inclusion in the CoT IWMP, where green means that the NWMS goal was incorporated into the CoT IWMP, orange means that the NWMS goal was partially incorporated and red means that the NWMS goal has not been incorporated. The CoT has identified critical areas proposed for prioritised action in 2014-2019. These areas form the basis of the Implementation Strategy and Plan, which aligns with the NWMS.

**Table 4-1: Incorporation of the National Waste Management Strategy goals in the City of Tshwane Integrated Waste Management Plan.**

NWMS Goals	Target	Incorporation of NWMS goals in CoT IWMP
Goal 1: " <i>Promote waste minimisation, reuse, recycling and recovery of waste</i> "	25% of recyclables diverted from landfill sites for reuse, recycling or recovery.	The CoT IWMP incorporates Goal 1. Some of the strategies under this goal include waste separation at the household level and implementation of waste separation in government buildings and major institutions of learning and research (CoT IWMP, 2014:168).
Goal 2: " <i>Ensure the effective and efficient delivery of waste services</i> "	95% of urban households and 75% of rural households have access to adequate levels of waste collection services. 80% of waste disposal sites have permits.	The CoT IWMP mentions that 82% of urban households receive a scheduled waste removal service; however, the City had acknowledged that the contractors need to be viewed in the context of Goal 2 also to cover the rural household (CoT, IWMP 2014:101). According to the CoT's IWMP, all currently operated landfill sites operate with permits (CoT IWMP, 2014:95).
Goal 3: " <i>Grow the contribution of the waste sector to the green economy</i> "	69 000 new jobs are supposed to be created in the waste sector. 2 600 additional SMMEs and cooperatives are expected to participate in waste service delivery and recycling.	Goal 3 mainly is incorporated in the form of waste minimisation through the recycling or recovering of materials. The City also supports the local waste sector through an appropriate public-private partnership as a waste cooperative and SMMEs (CoT IWMP, 2014:162).
Goal 4: " <i>Ensure that people are aware of the impact of waste</i> "	80% of municipalities are expected to run local awareness campaigns.	The CoT IWMP indicates that the City conducts education and awareness directly to residents and schools around

NWMS Goals	Target	Incorporation of NWMS goals in CoT IWMP
<i>on their health, wellbeing and the environment"</i>	80% of schools are expected to implement waste awareness programmes.	the benefits of and the need to reuse, reduce, and recycle waste (CoT IWMP, 2014:139).
Goal 5: " <i>Achieve IWMPPlanning</i> "	All municipalities must integrate their IWMPs with their IDPs and have met the targets set in IWMPs.  All waste management facilities are required to report to the SAWIS and have waste quantification systems that report information to SAWIS.	The CoT's IWMP is included in its IDP (CoT IWMP, 2014:161).  The City does not have a functional waste information system but plans to develop and implement said system (CoT IWMP, 2014:168).
Goal 6: " <i>Ensure sound budgeting and financial management for waste services</i> "	All municipalities that provide waste services must conduct full-cost accounting for waste services and implement cost-reflective tariffs.	Goal 6 is incorporated in the form of a commitment to undertake a complete waste management financial analysis as required by Section 78 of the Municipal Systems Act 32 of 2000 (CoT IWMP, 2014:168).
Goal 7: " <i>Provide measures to remediate contaminated land</i> "	Assessments must be completed for 80% of sites reported to the contaminated land register.  Remediation plans must be approved for 50% of confirmed contaminated sites.	The 2014 CoT IWMP does not provide for this goal, although it is required that municipalities must keep a register of contaminated sites at their disposal.
Goal 8: " <i>Establish effective compliance</i> "	The number of successful enforcement actions	The CoT IWMP provides for the ratification of Environmental Health

NWMS Goals	Target	Incorporation of NWMS goals in CoT IWMP
<i>with and enforcement of the Waste Act"</i>	against non-compliant activities must be increased by 50%. The three spheres of government must appoint 800 EMIs to enforce the Waste Act.	Practitioners and the training of Waste Inspectors into Waste Peace Officers. Although it also provides for the roll-out to ensure that each ward has a Waste Peace Officer, enforcement remains weak (CoT IWMP, 2014:169).

It can be seen that the CoT is making progress on including the NWMS goals in their IWMP, as indicated in **Table 4-1**. Comparing the results of this study to what Molaba found in 2019 for local municipalities in the Fezile Dabi District Municipality, the following similarities can be noted:

- Not all goals and objectives of the NWMS were considered when formulating those of the IWMP;
- Waste service delivery in the local municipalities was cause for concern because rural settlements such as region 7 which includes Bronkhorstspuit, Ekangala and Ekandustria are not (adequately) provided for in the IWMP; and
- Enforcement of the NEM: WA is weak (Molaba, 2019).

The second part of research objective 1 was addressed through semi-structured interviews to determine respondents' understanding and perceptions of the NWMS goals' integration into the CoT IWMP. This was done to generate knowledge and add to the body of research pertaining to waste management in the CoT.

## 4.2.2 Results of semi-structured interviews

### 4.2.2.1 Demographic profile of the interview respondents

The subsections below contain demographic information of the interview respondents, such as their position, highest qualification and years of experience.

#### 4.2.2.1.1 Position in the City of Tshwane

The respondents were asked to share information relating to the positions they occupied in the CoT. The data collected relating to their positions are presented in **Table 4-2**.

The information provided in **Table 4-2** reveals that the respondents are all working in the waste management environment in the CoT. The initial target was 20 respondents, as mentioned in **Table 2-2**, however only 12 of the 20 respondents participated in the study (60% response rate).

4.2.2.1.2 Highest qualification achieved

The respondents were asked to provide the highest qualifications they had achieved. The information is also presented in **Table 4-2**. The table indicates that of the twelve respondents who responded, one possessed a Masters degree (MSc), four had a BSc Honours degree, one had an undergraduate degree, two respondents had a National Diploma, two respondents had matric, and another indicated that he had not gone as far as matric. The results pertaining to the qualifications of the respondents indicate that the majority of the study respondents were adequately qualified for the positions held, and it was therefore highly probable that they would make a positive impact on the quality of the data collected from the interviews.

4.2.2.1.3 Years of experience in the profession

The respondents were also asked to provide the length of time they were working within the waste management environment at the CoT. The results are presented in **Table 4-2**. The results indicate that 2 of the 12 respondents had less than ten years of experience, while the majority (10 of the 12 respondents) had ten years or more experience. The years of experience of the respondent are a good indicator of how much the respondents have experienced within their work environment. Older and more experienced employees indicate institutional knowledge gathered over time (Wang, 2013).

**Table 4-2: Demographic profile of the interview respondents.**

Respondent	Position in CoT	Highest qualification	Years of experience in the profession
<b>Region 1</b>			
Respondent 1	Operational Manager	Undergraduate degree	10 years +
Respondent 2	Inspector	Matric	20 years +
<b>Region 2</b>			

<b>Respondent</b>	<b>Position in CoT</b>	<b>Highest qualification</b>	<b>Years of experience in the profession</b>
Respondent 3	Operational Manager	BSc Honours	10 years +
Respondent 4	Inspector	No Matric	20 years +
<b>Region 3</b>			
Respondent 5	Inspector	Matric	5 years +
<b>Region 4</b>			
Respondent 6	Operational Manager	BSc Honours	10 years +
Respondent 7	Inspector	Matric	10 years +
<b>Region 7</b>			
Respondent 8	Inspector	National Diploma	10 years +
<b>Tshwane Landfill Management</b>			
Respondent 9	Landfill Manager	National Diploma	30 years +
<b>Head Office</b>			
Respondent 10	Director	MSc	10 years +
Respondent 11	Deputy Director	BSc Honours	10 years +
Respondent 12	Environmental Awareness Officer	BSc Honours	7 years

#### **4.2.2.2 Responses of semi-structured interviews**

The questions that were asked in order to achieve the aims of research objective 1 included:

1. The National Waste Management Strategy of 2012 (NWMS) sets out several strategic goals relating to waste management. Are you familiar with these goals?

2. How is waste management included in your mandate [key performance areas (KPA)]?
3. In your opinion, to what extent are the NWMS goals incorporated into the 2014 City of Tshwane IWMP?

#### 4.2.2.2.1 Respondents' familiarity with the NWMS goals

This section contains a discussion on the results pertaining to the respondents' familiarity with the NWMS goals. The majority of the respondents responded that they were familiar with the NWMS goals. However, a few of them indicated that they had never heard or seen a document discussing the NWMS goals as they work at the operational level. This is cause for concern since various organs of state and affected persons are obliged to affect the NWMS to address waste challenges such as the backlog facing waste services, especially in informal settlements, tribal lands and rural areas.

#### 4.2.2.2.2 Inclusion of waste management in respondent's key performance areas

The respondents were asked whether waste management was included in their mandates. The respondents indicated that waste management was part of their mandates and KPAs. The responses gathered from some of the respondents are presented below:

*Respondent 1: "The operational waste management mandate is included in terms of the number and percentage as well as the formal weekly removal of waste which is part of service delivery. It is also included in the percentage and numbers of informal minimal weekly waste removal and the percentage of illegal dumping sites spotted and cleared".*

*Respondent 3: "The waste management mandate is included in several ways, including specifications regarding the number of weekly collections of waste from the communities served by the CoT."*

*Respondent 6: "Waste management is included in our mandates in many ways. Operationally, it is included in the percentage or numbers of formal scheduled weekly waste removal from the communities that constitute service delivery. Secondly, the inclusion is in terms of the percentage and numbers of informal weekly clearing of illegal dumping sites that our officers identify."*

*Respondent 9: "Waste management informs our KPAs. It is also included in terms of the targets of reducing the amount of waste that goes to the landfills and the obligation stemming from the Constitution to provide basic waste services to the communities."*

The responses from the respondents indicated that waste management, as a central focus of their roles in the CoT, was included in their mandates as waste management employees in a variety of ways. Some respondents indicated that it was infused in their mandate as it guided how many times waste was collected and how often this was done. Their waste management mandate also guided the informal weekly clearing of illegal dumping sites. SWM is a challenge in most cities in developing countries, such as South Africa, mainly due to the increasing generation of waste and the burden posed on the municipal budget due to the high costs associated with its management, amongst other factors (Guerrero *et al.*, 2013).

#### 4.2.2.2.3 Incorporation of the National Waste Management Strategy goals in the City of Tshwane Integrated Waste Management Plan

This section provides the 'perceived' incorporation of the NWMS goals, while **Section 4.2.1** reflected on the actual incorporation – as evaluated during this study. The respondents were asked about the extent to which the NWMS goals had been incorporated in the CoT's IWMP. The responses collected from the respondents revealed that the NWMS goals had been incorporated but that more work still needs to be done. The responses also revealed that the City's Waste Management Department was achieving significant progress. Some of the responses collected from the respondents are captured below:

Respondents 1, 5 and 6, who were all Operational Managers from regions 1, 2 and 4, respectively, revealed that they were not knowledgeable about incorporating the NWMS goals into the CoT's IWMP. Respondents 9 and 10 revealed that they were knowledgeable about incorporating the NWMS goals in the CoT's IWMP. This could be attributed to the fact that these were the Director and the Deputy Director from the CoT Waste Management Head Office. The two respondents, 9 and 10, also revealed that of the eight NWMS goals, only Goal 7 was not included in CoT's IWMP. Goal 7 pertains to the provision of the measures to remediate contaminated land.

The national government is committed to achieving all the NWMS goals, especially in cities experiencing rapid urbanisation and industrialisation, such as the CoT (DEA, 2011; Eberhard, 2018a). Incorporating the NWMS goals in the CoT IWMP is a top priority of the City; however, challenges exist, such as inadequate budgets, which has resulted in some goals not being sufficiently incorporated.

### 4.3 Results related to research objective 2

The study's second research objective was to determine the extent to which the NWMS goals are implemented and achieved by the CoT. The discussion of the results of this objective is

subdivided into two sections: results of document review and evaluation and results of semi-structured interviews.

**4.3.1 Results of document review and evaluation**

The evaluation of the CoT's IDP, SDBIP (from 2018 to 2020), and Waste Management Performance Report resulted in evidence of extensive coverage of the IWMP, which is discussed in the sub-sections below.

**4.3.1.1 Review of the City of Tshwane's Integrated Waste Management Plan, Integrated Development Plan and Service Delivery and Budget Implementation Plan**

To determine the extent of implementation of the NWMS goals by the CoT, the CoT IWMP, IDP and SDBIP were evaluated. The main findings related to NWMS goal implementation as reflected in these documents are summarised in **Table 4-3**.

**Table 4-3: Implementation of the National Waste Management Strategy goals by the City of Tshwane.**

NWMS Goals	Target	Implementation of NWMS goals by CoT
Goal 1: " <i>Promote waste minimisation, reuse, recycling and recovery of waste</i> "	25% of recyclables diverted from landfill sites for reuse, recycling or recovery.	<b>Waste minimisation and recycling:</b> Waste minimisation and recycling remain stuck at the pilot level with a very limited full-scale roll-out commensurate with the requirements. However, the City has planned to facilitate waste separation at the household level and implement it at the government buildings and major institutions of learning and research (CoT IWMP, 2014:164). Furthermore, education and awareness will be conducted on waste minimisation, recycling, collection and access to the use of buy-back centres (CoT IWMP, 2014:70).

NWMS Goals	Target	Implementation of NWMS goals by CoT
		<p><b>Infrastructure that supports separation of waste:</b> The development of infrastructure that supports separation of waste needs to be the central philosophy of infrastructure development and investment (CoT IWMP, 2014:70).</p> <p>The IDP of 2017 -2021 indicated that the City would ensure a 20% reduction of waste to landfill sites. Furthermore, separation at source will be implemented at 300 schools and 850 public buildings, and the City will also provide a composting facility and a concrete/aggregate (from building rubble) facility by 2021 (CoT IDP, 2018:58).</p>
<p>Goal 2: "<i>Ensure the effective and efficient delivery of waste services</i>"</p>	<p>95% of urban households and 75% of rural households have access to adequate levels of waste collection services. 80% of waste disposal sites have permits.</p>	<p><b>Service delivery institutional mechanism:</b> The City does not have a coherent institutional mechanism for service delivery guided by a thorough analysis and strategy based on the process outlined in Section 78 of the Municipal Systems Act 32 of 2000 (CoT IWMP, 2014:164).</p> <p>The IDP of 2017 -2021 indicated that the waste management service in line with the Integrated Waste Management Strategy was implemented and finalised in 2017 -18 (CoT IDP, 2018:55). The City has put reasonable measures in place and has supported the waste removal</p>

NWMS Goals	Target	Implementation of NWMS goals by CoT
		<p>service through an efficient and cost-effective fleet (CoT IDP, 2018:55).</p> <p>The IDP of 2021 -2026 further indicated the City will continue to stabilise waste collection services throughout (CoT IDP, 2021:53).</p> <p><b>Management of landfill sites:</b> The existing four landfill sites are in a poor state and do not have proper security, access control and weighbridges. Illegal waste pickers also overrun the sites. However, all currently operated landfill sites are operating according to the <i>Minimum Requirements for Waste Disposal by Landfill</i> as published by the then Department of Water Affairs and Forestry (DWAF). They also have permits (CoT IDP, 2018:95).</p>
<p>Goal 3: "<i>Grow the contribution of the waste sector to the green economy</i>"</p>	<p>69 000 new jobs are supposed to be created in the waste sector. 2 600 additional SMMEs and cooperatives are expected to participate in waste service delivery and recycling.</p>	<p>The procurement process is slow for waste-related green economy initiatives, such as waste to energy facilities (including the possible re-establishment of Rooihuiskraal Power Station as a municipal waste user power plant); recyclable waste material recovery facilities and garden refuse composting facilities (CoT IWMP, 2014:104).</p> <p>The CoT uses private contractors under the <i>Contractor Development Programme</i> (via Tender CB 124/2010) (CoT IWMP, 2014:103). This programme is used to</p>

NWMS Goals	Target	Implementation of NWMS goals by CoT
		<p>provide services in some parts of the CoT whereby small businesses and cooperatives provide waste services in the townships under the guidance of management contractors who are overall in charge of providing service delivery (CoT IWMP, 2014:103).</p> <p>The 2020 CoT IDP has revealed that the City has provided sustainable support to SMMEs through an affordable business infrastructure (CoT IDP, 2020:43).</p>
<p>Goal 4: "<i>Ensure that people are aware of the impact of waste on their health, wellbeing and the environment</i>"</p>	<p>80% of municipalities are expected to run local awareness campaigns. 80% of schools are expected to implement waste awareness programmes.</p>	<p>According to the 2014 IWMP, the CoT is upscaling community education by implementing community liaison, education and awareness programmes (CoT IWMP, 2014:70).</p> <p>According to the IDP of 2021/2026, at the beginning of each financial year, the City ensures a thorough environmental education and awareness plan that will cover various areas of environmental education across the City. The City also ensures that the plan is funded through an operational budget (CoT IDP, 2020:58).</p>
<p>Goal 5: "<i>Achieve IWMPPlanning</i>"</p>	<p>All municipalities must integrate their IWMPs with their IDPs and have met the targets set in IWMPs.</p>	<p>According to the 2014 IWMP, the IWMP is included in the IDP.</p> <p>However, the landfill site and head office respondents indicated that not all of the</p>

NWMS Goals	Target	Implementation of NWMS goals by CoT
	All waste management facilities are required to report to the SAWIS and have waste quantification systems that report information to SAWIS.	CoT's waste management facilities are reporting to SAWIS ( <b>Section 4.3.2.5</b> ).
Goal 6: " <i>Ensure sound budgeting and financial management for waste services</i> "	All municipalities that provide waste services must conduct full-cost accounting for waste services and implement cost-reflective tariffs.	According to the 2014 IWMP, the City will undertake a Section 78 Municipal Systems Act 32 of 2000 process regarding this goal (CoT IWMP, 2014:164). However, the IDP of 2017/2021 stated that the City had implemented an effective waste billing information system. The City has also distributed waste bins and affected billing in areas that are currently not billed for waste. The CoT's <i>Tariffs: Waste Management Services and Incidental Charges</i> document shows the inclusion of solid waste disposal tariffs (CoT, 2020:62).
Goal 8: " <i>Establish effective compliance with and enforcement of the Waste Act</i> "	The number of successful enforcement actions against non-compliant activities must be increased by 50%. The three spheres of government must appoint 800 EMIs to enforce the Waste Act.	According to the 2014 IWMP, the City's current bylaws does not have the necessary impact, as it is feeble on the consequences of transgression (CoT IWMP, 2014:168). The City has a plan to ensure that Environmental Health Practitioners are trained and that Waste Inspectors are trained into Waste Peace Officers, so each ward has a Waste Peace Officer (CoT IWMP, 2014:164).

The CoT has not yet managed to recycle most of the MSW as it is still disposed of/transferred to landfill sites. The CoT's IDP provides for Goal 1 of the NWMS, which talks about waste minimisation; however, it is not budgeted for in the document. In the financial year 2020/2021, there was no budget for operating machines for moving recycling materials in the buy-back centre. The requirement for the allocation of funding for recycling, especially in some regions in the CoT, remained. As a result of the limited operational budget for recycling, it was impossible to cover the whole City in the budget for the financial year 2021/2022. However, to ensure a 20% reduction of waste to landfill sites, the City's 2017/2021 IDP has indicated that the implementation of separation at source in 300 schools and 850 public buildings and the provision of a composting facility and a concrete (from building rubble) facility will be deliverable by 2021 (CoT, 2018:58).

The CoT's waste management department cannot provide adequate service delivery to informal settlements and rural areas concerning waste collection. This culminates in illegal dumping in several townships, informal settlements and rural areas. This is primarily due to budget constraints. Due to limitations in financial resources, the CoT is unable to acquire appropriate equipment. This also leads to restricted access to service areas. However, the CoT 2020/2021 IDP and SDBIP have ensured a budget to expand the participation of private contractors in the waste sector (CoT, 2020:74). There has been some job creation in Ward 87 of Region 5 (CoT, 2020).

The IWMP indicated that the CoT had not performed well in attaining Goal 4 as there is not much facilitation of community participation in waste management. However, some areas under the CoT perform better than others, such as region 6 and some parts of region 4. However, consistent support from political leadership at all levels of government could be the key to achieving sustainable waste education. In addition, the IDP revealed that the public is also complaining about the lack of environmental education and the challenge with cross border problems such as waste runoff and illegal waste discharges. In response, the CoT has indicated that they have a detailed environmental education and awareness plan covering various environments across the City (CoT, 2020). The arrangement is financed through an operational financial plan. The CoT's IDP has revealed that the City will start recruiting environmental-related apprentices and trainees and provide support to beneficiaries in all seven regions; for example, the City will fund 300 apprentices, 200 trainees and 300 bursaries per annum (CoT, 2020:43).

The CoT's IDP has also revealed that some figures on the budget are captured wrongly; for example, a figure of R150 million for a landfill site for Bronkhorstspuit was incorrectly captured. The purpose of this amount was to purchase a landfill site because the CoT's landfill sites are almost filling up (CoT, 2020).

The IDP also revealed that waste reclaimers require more resources and attention, as indicated by the relevant laws. The CoT representatives consulted with waste reclaimers' leadership regarding financial support and regulation of their activities (CoT, 2018). The CoT has appointed 12 EMIs to monitor environmental offences such as waste and cross border environmental issues (CoT, 2020). However, the CoT's IWMP revealed that Goal 8 was not achieved, and the CoT's bylaws are outdated and not in line with the national mandate on recycling as contained in the NEM: WA (IWMP, 2014). The current bylaws do not promote waste separation at the source. Currently, waste separation at the source is considered a voluntary tool (CoT, 2020).

The CoT has developed their IWMP, and it does feed into the IDP and SDBIP. However, based on the review, there is no proper alignment as some goals are not adequately covered, and some are not budgeted for in the documents. Therefore, the CoT still faces financial constraints that hinder it from achieving the IWMP goals as targeted (CoT, 2020).

#### **4.3.1.2 Review of the City of Tshwane's Waste Management Performance Report**

Effective waste management plays a significant role in ensuring that people live in a clean, healthy and habitable environment. The CoT recognises that inadequate waste services lead to unpleasant living conditions and a contaminated, unhealthy environment which breeds all sorts of health hazards to residents. It also acknowledges the complexities of waste management and its role in ensuring effective and efficient delivery of waste services. Waste management in the CoT is compounded by the growing population, the development of new residential areas (both planned and unplanned), and the increased volumes of waste generated by industries. These challenges put pressure on waste management services, which are already in short supply. The CoT's Waste Management Performance Report 2018/2019, dated 27 March 2020, acknowledges the City's challenges in waste management (CoT, 2018). The City's response takes a holistic approach which, amongst other things, prioritises the following:

- Ensuring that there is awareness among residents of the impact of waste on their health, wellbeing and the environment;
- Cleaning of public areas, which comprises of litter picking, prevention and clearing of illegal dumping sites;
- Ensuring attainment of effective and efficient waste service delivery even though there are resource limitations;
- Attaining an IWMPanning approach;
- Waste disposal management;
- Promoting waste minimisation, waste reuse and recycling;
- Promoting and enforcing effective compliance with waste legislation and regulations; and

- Promoting waste practices that are not harmful to the environment.

The collection of waste is executed in a routine that accommodates both households and businesses. Despite the challenges experienced by the CoT in waste management, efforts are always made to ensure that even when waste is not collected as per the schedule, alternative measures are in place (CoT, 2020).

#### **4.3.2 Results of semi-structured interviews**

The question posed to the respondents to achieve the aim of research objective 2 is as follows: To what extent are the NWMS goals implemented and achieved by the CoT? The results are based on 'perceived' implementation.

The responses gathered from the respondents indicated that the City's waste management employees were striving to implement the goals and make considerable progress. The study revealed that even though progress had been made, much work still had to be done. Some of the responses gathered from the respondents per goal on this question are as follow:

##### **4.3.2.1 Goal 1: "Promote waste minimisation, reuse, recycling and recovery of waste"**

Goal 1 has set the following targets, applicable to local government, that were supposed to be met by 2016: 25% of recyclables must be diverted from landfill sites for reuse, recycling and recovery; and all metropolitan municipalities, secondary cities, and large towns must have initiated separation at source programmes (DEA, 2011).

The responses were gathered from regions 1, 2, 4, the landfill site and head office. The responses revealed that all the regions wanted to recycle the recyclable waste. However, they did not have adequate resources to support and facilitate waste minimisation, reuse, recycling, and waste recovery. The respondents from these regions also indicated that they did not even have a waste transfer station. A waste transfer station is where waste is sorted or processed before it is loaded onto bigger trucks and sent to landfill sites (Anon, 2012). They believe that the only solution to this problem is to legislate and regulate the separation of waste at the source so that everyone can adhere to it.

The responses from the head office respondents indicated that recycling was taking place, but they are only able to recycle 5 - 6% of the waste. They also indicated that they provide support to private companies that are recycling through the issuance of permits. The CoT also has recycling facilities, such as buy-back centres that it operates in collaboration with the Department of Forestry, Fisheries and the Environment (DFFE). However, these cannot cover the whole CoT. Furthermore, the respondents indicated they had a facility for material recovery, which operated

for a while as this was one of the strategic approaches from the IWMP. However, unfortunately, the CoT came into a contractual dispute with the private company assisting with that facility and the operations were stopped pending an investigation.

The head office respondents argued that the separation of waste at the source was not a solution that would address all the waste management challenges. They mentioned that the DFFE published regulations and notices regarding extended producer responsibility to ensure end-of-life products' effective and efficient management (DFFE, 2020). The respondents also mentioned that they support extended producer responsibility as it shifts the management of end-of-life products away from the local municipalities to the producers. The head office respondents argued that if the separation of waste at the source and the extended producer responsibility can be implemented simultaneously, it will better manage waste in the CoT.

#### **4.3.2.2 Goal 2: "Ensure the effective and efficient delivery of waste services"**

Goal 2 of the NWMS pertains to the effective and efficient delivery of waste services by ensuring that 95% of urban households and 75% of rural households have adequate waste collection services (DEA, 2011). The responses from all five regions and the head office indicated that all these regions were adequately meeting the requirements of this goal by regularly collecting waste. The collection of waste is part of service delivery in the communities which fall under these regions. The head office respondents also added that the efficient and effective delivery of waste services also reached some parts of rural areas close to the City.

Goal 2 of the NWMS also targets 80% of all waste disposal sites to be permitted. The respondents from all five regions indicated that they were unsure if all current operational landfill sites had permits. Contrary to this, the landfill site and head office respondents indicated that the City currently has four operational landfill sites, and all have permits. A lack of communication exists between the respondents of the regions, landfill site and head office.

#### **4.3.2.3 Goal 3: "Grow the contribution of the waste sector to the green economy"**

The third goal of the NWMS pertains to growing the contribution of the waste sector to the green economy. Respondents from head office indicated that the CoT waste department daily runs expanded public works programmes that allow waste pickers to collect recyclable waste from landfill sites and sell the waste to the buy-back centres.

#### **4.3.2.4 Goal 4: "Ensure that people are aware of the impact of waste on their health, wellbeing and the environment"**

The fourth goal of the NWMS pertains to ensuring that people are made aware of the impact of waste on their health, wellbeing and the environment. The research respondents indicated that the CoT's Waste Management Head Office ensured awareness at schools, businesses, and households through roadshows, even though the awareness programmes are combined with those of the CoT's Environmental Department and do not explicitly focus on waste management only. One of the respondents also indicated that the CoT worked with an e-waste forum known as 'e-waza' on advertising waste recycling on television several years ago. This campaign was aimed at increasing awareness of waste recycling among South Africans. The results further revealed that there was no knowledge regarding how awareness was being conducted at the regional levels.

#### **4.3.2.5 Goal 5: "Achieve IWMPanning"**

The fifth goal of the NWMS is about municipalities integrating their IWMPs with their IDPs and meeting the targets set in their IWMPs. The respondents from head office indicated that the content of the IWMP was included in the IDP and that in terms of IWMPanning, the IWMP objectives were considered.

Goal five of the NWMS also indicates that all waste management facilities must have waste quantification systems that report information to the SAWIS. The respondents indicated that some of their waste management facilities report to the SAWIS; for example, waste disposed of at registered landfill sites with permits is reported. The City also provides waste diversion quantities from landfill sites based on future predictions. The respondents also mentioned that most of their waste reports or related documents are available on the City's website. At the regional levels, respondents indicated that they are unsure if the City reports their waste information to the SAWIS since they only compile their weekly reports and send them to the head office.

#### **4.3.2.6 Goal 6: "Ensure sound budgeting and financial management for waste services"**

The sixth goal of the NWMS pertains to ensuring sound budgeting and financial management for waste services. The respondents from all five regions and head office indicated that the CoT had implemented municipal waste tariffs. The respondents further indicated that the CoT has a billing system, whereby account holders (residential and business) are charged for the waste management service rendered to them. The waste management cost model of billing is based on bin size (240 litres) or the number of bins collected and not the bin's weight. The study conducted by Mokoena (2019) indicated that the model of billing based on the weight of the bin could

encourage people to separate waste at the source (and remove recyclable wastes). This measure could assist in moving waste up the waste management hierarchy since generators will be paying more (by weight) for disposing of more.

#### **4.3.2.7 Goal 7: "Provide measures to remediate contaminated land"**

Goal 7 does not provide specific targets relating to local government, but it focuses on national targets for managing and rehabilitating contaminated land. The efforts made at the local level feed into the overall effort in reaching the targets set, which require that, among other things, remediation plans be approved for 50% of confirmed contaminated sites. The provisions relating to contaminated land are especially applicable to municipal landfill sites (DEA, 2011).

This study did not assess this goal because the respondents from head office and the landfill sites indicated that this goal does not fall within the mandate of the CoT's Waste Management Department. The remediation of contaminated land falls under a sub-division within the environmental department that focuses on waste issues and all environmental issues.

#### **4.3.2.8 Goal 8: "Establish effective compliance with and enforcement of the Waste Act"**

Goal 8 of the NWMS targets a 50% increase in the number of successful enforcement actions against non-compliant waste management activities and an appointment of an additional 800 EMIs to enforce the NEM: WA.

The respondents from all five regions indicated that they knew of the bylaws (drafted under the NEM: WA) that the CoT has passed. The respondents from head office stated that the CoT have bylaws that deal with issues such as illegal dumping, but they faced challenges regarding implementation. The challenge is that the waste department is not authorised to arrest and issue fines for illegal dumping. The respondents stated that the primary enforcement of the City's bylaws comes from the Metropolitan Police Department that has a bylaw enforcement unit. Head office respondents, however, explained that the metropolitan police are overwhelmed with their core work, which involves collecting traffic fines, to have adequate capacity to focus on waste management issues.

Another challenge that impacts waste bylaw enforcement is the lack of adequate human resources especially given the immense size of the CoT. The respondents lamented the need for a unit specifically dedicated to the enforcement of waste bylaws. The respondents also indicated a need for inspectors for waste management related issues only. There are environmental inspectors (a unit known as the '*Environment Green Scorpions*'), but they focus on a range of environmental issues, not waste bylaw enforcement exclusively.

It can be noted that according to the respondents, efforts are being made. Waste management remains a significant challenge across South Africa, but cities such as Tshwane are making commendable progress towards attaining the NWMS goals. According to Sango *et al.* (2014), to address the challenges affecting waste management targets, the IWMP planning processes must be followed.

#### **4.4 Results related to research objective 3**

The results that are presented and discussed in these subsections pertain to the study's third objective. This objective aimed to ascertain the gaps and challenges identified during the implementation of the IWMP by the CoT. In order to achieve the objective, interview respondents were asked to reflect on the following:

1. What are the *gaps and challenges in the implementation* of the IWMP?
2. Does the municipality have the adequate *capacity and necessary resources* to implement the NWMS goals?

The responses to these questions are discussed in **Sections 4.4.1** and **4.4.2** and their subsections.

##### **4.4.1 Gaps and challenges in the implementation of the City of Tshwane's Integrated Waste Management Plan**

The respondents were asked to respond to a question about their challenges regarding implementing the IWMP. The challenges are discussed after some of the responses that came from the respondents have been presented. The responses from the respondents are presented in discussions as per region.

The responses that are discussed first are those from the head office. According to the respondents, the IWMP implementation in the CoT was not successful due to the organisation's transition, which entailed merging the CoT with other areas that had to be catered for in the IWMP document. The respondents also indicated that most people in the newly merged municipalities such as Motsweding, Kholuini and Nokeng did not adequately understand the IWMP. It was further highlighted that the CoT did not have the capacity, resources and budget to sufficiently implement the IWMP.

The other challenge that emerged from the interviews with the head office respondents was that the new municipalities that became part of CoT had insecurities due to change management because they had to adopt the CoT systems upon merging. The CoT also had to standardise

waste management services in order to accommodate all those municipalities. The respondents also argued that the transition in the CoT impacted the implementation of the IWMP. The other challenge that emerged was the presence of political issues that impact decision-making concerning IWMP implementation.

The responses collected from the respondents from regions 1, 2 and 4 indicated complaints about inadequate budget and personnel. The respondents indicated that they were operating with a structure of between 60% - 70%, meaning a vacancy rate of between 30% - 40%. There were several key personnel that the respondents did not mention who was working in an acting capacity.

The respondents from the regions further identified several challenges and gaps, which are discussed in the following subsections. The discussions of the challenges and gaps in CoT's IWMP implementation are divided into themes.

#### **4.4.1.1 Inadequate law enforcement**

The respondents from all the regions revealed that they are aware of the CoT's bylaws. However, the challenge was that no legislation gave them the authority to arrest and give fines for illegal dumping. For all the NWMS goals to be fully achieved, there was a need for support from the CoT's law enforcement arm. The respondents also added that there was utter disregard to municipal bylaws about waste disposal. The failure to obey bylaws culminated in waste disposal in undesignated places. The respondents further revealed that they had observed large heaps of waste in some townships and informal settlements around the CoT. This was seen as a clear indication of the failure of the CoT's law enforcement arm to support the implementation of the City's IWMP.

A study conducted by Nkosi (2014) focusing on the CoT revealed that efficiency in solid waste management (SWM) is negatively impacted by lack of adherence to municipal bylaws and regulations, incorrect perceptions about potential benefits of proper waste disposal and the failure to provide trash bins to communities. The same study by Nkosi (2014) also reported a significant accumulation of solid waste in townships such as Mamelodi and Marabastad generated by commercial businesses. Suggestions to deal with this waste accumulation highlighted environmental health education on primary health care, sanitation, socioeconomic incentives and strict enforcement of municipal waste bylaws. The study also added that an assortment of other regulations was crucial in ensuring environmental health and strengthening waste management in metropolitan municipalities.

As mentioned previously on the implementation of Goal 8, the respondents from head office indicated that the CoT had bylaws that dealt with issues such as illegal dumping, but they faced challenges regarding implementation. The respondents stated that the primary enforcement of the City's bylaws comes from the Metropolitan Police Department that has a bylaw enforcement unit. However, there is a need for the transparent allocation of responsibilities in environmental legislation and enforcement of appropriate bylaws in the municipalities (Mpumalanga Provincial Government, 2015). The enforcement of illegal dumping in most cities remains a challenge. The Metropolitan Police conduct the law enforcement directed at curbing illegal dumping and burning of waste, but this needs to be expanded to other problematic areas which need to be patrolled (Collins & Chetty, 2013).

City authorities have the requisite legislation in place. However, the magnitude of the fines, for example, to address illegal dumping together with the low likelihood of illegal dumpers being caught, means the disincentives for illegal dumping are low (Eberhard, 2018). Visible law enforcement stands to reduce the incidences of illegal dumping and the general flouting of legislation on waste management by corporate citizens and the public.

#### **4.4.1.2 Lack of awareness of the importance of waste management in communities**

The data collection exercise also revealed that people in the communities around Pretoria need to be made aware of the importance of appropriate waste disposal. The respondents from all five regions revealed that there seemed to be a lack of awareness of the importance of appropriate waste management practices around some CoT communities. For example, in some communities, one can see large heaps of waste, usually behind houses or on street corners. These illegal dumping sites indicate the lack of awareness of the potential health impacts of illegal dumping and what constitutes appropriate waste management. These dumping sites usually become playgrounds for children, and they, therefore, present a health hazard to the communities which engage in these illegal dumping practices. However, Zotos *et al.* (2009) suggested that adopting community-oriented tools and campaigns can assist. One example is that there could be some arrangement of long-term volunteer programmes in the cities based on proper screening and training. Application areas could include home composting, reuse events, support in education events, assisting with demonstration gardens, modelling proper recycling practices, and helping friends and relatives set up waste diversion activities to avoid illegal dumping.

The fourth goal of the NWMS pertains to ensuring that communities are aware of the impact of waste on their health, wellbeing and the environment (DEA, 2011). A study conducted in Mpumalanga indicated that one of the challenges facing implementing IWMPs was promoting environmental awareness regarding illegal dumping and littering (Mpumalanga Provincial

Government, 2015). This is also true for the CoT. There is a shortage of awareness programmes in the City. Awareness programmes will lead to more progress being made towards the attainment of its IWMP. The issue of awareness regarding waste management can also be viewed as a national issue that needs the national government to raise awareness.

In order to address environmental awareness issues, particularly those relating to waste management, the Department of Environment, Forestry and Fisheries (DEFF) launched the *Goods Deeds Programme* in 2019 (DEFF, 2019). The programme involves working in collaboration with influential leaders, waste ambassadors and volunteers. The selected ambassadors support the programme's initiatives and other environmental events and activities across the provinces (DEFF, 2019). The work of the Good Deeds ambassadors revolves around inspiring, educating and influencing communities to change their attitudes and behaviour towards waste and its management as well. They also help South African citizens better understand and know proper waste management (DEFF, 2019).

#### **4.4.1.3 Provincial and national government support**

The research interviews also revealed that provincial and national governments played a critical role in waste management in the CoT. The respondents from head office also indicated that they obtained support from DFFE and other government departments. The support or assistance also came in the form of these governments assisting with funding. Training has emerged as one of the most crucial interventions that the CoT's Waste Management Department needs. Provincial and national governments are constitutionally obliged to support municipalities in executing their functions (DEA, 2011). This means that over and above the CoT Waste Management Department's resources, it can still get assistance from these governments to ensure effective waste management in the City. It must also be noted that if waste management in the CoT were well supported by all levels of government and other stakeholders, it would contribute positively to the economy through several aspects, which include job creation, poverty reduction, conservation of natural resources and protection of the environment as well as in empowering grassroots investment (Sentime, 2014). Sentime (2014) argues that governments and other stakeholders can also support the CoT with innovation by ensuring that other opportunities are born from waste management. Government support at both provincial and national levels are needed to support waste minimisation initiatives. In the future, the governments may support the CoT's IWMP by establishing a plant to minimise the haulage distance for potential waste reclaimers.

#### **4.4.2 Capacity and resources to implement the National Waste Management Strategy goals**

The questions pertaining to establishing the adequacy of the capacity and resources were as follows:

1. *In your own opinion, does the municipality have adequate capacity to comply with the NWMS goal's requirements?*
2. *Is there a Waste Management Officer appointed in the municipality?*
3. *Are the staff/personnel equipped with the necessary knowledge and training (i.e., workshops etc.) to perform the waste management function and use waste management tools effectively?*
4. *Does guidance for training exist?*
5. *Has a skills gap analysis been done?*
6. *Does a scarce skills policy exist to retain experienced and skilled personnel?*
7. *Does your municipality have community awareness programmes on, amongst others, waste management, generation, recycling and recovery?*
8. *Does your municipality specifically encourage waste awareness programmes in schools in your area?*
9. *Does the municipality have sufficient financial resources to give effect to their waste management mandate?*

The responses to these questions are discussed in **Sections 4.4.2.1 to 4.4.2.10**.

##### **4.4.2.1 Capacity to comply with the National Waste Management Strategy goals**

The question that was posed to the respondents was as follows: *"In your own opinion, does the municipality have adequate capacity to comply with the NWMS goal's requirements?"* The results are discussed in the paragraph below.

All the respondents from head office and regions 1, 2 and 4 indicated that their respective municipalities only possessed the partial capacity to comply with the NWMS goals' requirements. The results, therefore, indicate that the majority of the respondents feel that there is not 100% capacity to comply with the NWMS goals' requirements, but there is some form of capacity. In the presence of capacity constraints such as budget and personnel challenges, the CoT cannot achieve its IWMP goals. One way to ensure that waste management is appropriately carried out is to reallocate resources between sister departments or directorates, which is currently not taking place in most local governments (Collins and Chetty, 2013). IWMP planning requires an adequate

budget; it must be clarified which financial resources are required to affect the waste management plan and identify the sources of finance (Eberhard, 2018).

#### **4.4.2.2 Appointment of Waste Management Officers**

The following question was asked to the respondents: *"Is there a Waste Management Officer appointed in the municipality?"*

All the respondents from regions 1, 2 and 4 indicated that they were unsure of a WMO in their municipalities. The head office respondents added that a WMO vacancy had been created but had not yet been filled (at the time of questioning, interviews were done with potential WMOs). It must also be noted that all seven regions report to the head office. The appointment of a WMO is a requirement of the NEM: WA (Eberhard, 2018). The job of the WMO is to coordinate matters that relate to waste management activities within the municipality. A WMO is an essential component in the implementation of an IWMP. The WMO plays a critical role in developing an IWMP, and he or she ensures that there is constant communication between all three spheres of government in implementing the NEM: WA (DFFE, 2020).

#### **4.4.2.3 Personnel equipped with knowledge and training to perform the waste management function**

The following question was asked: *"Are the staff/personnel equipped with the necessary knowledge and training (i.e., workshops etc.) to perform the waste management function and use waste management tools effectively?"*

The head office respondents answered "Yes" to the question posed above. This indicated that respondents had received the necessary knowledge and training to execute their duties related to waste management. However, the respondents from regions 1, 2 and 4 answered "No", showing that they did not receive the knowledge and training needed to execute their waste management duties. The results essentially showed that those from the head office received the training and knowledge they needed whilst those from the regions that report to the head office were not receiving any training. According to the respondents from the head office, training is only given to those in charge of drafting the IWMP and IDP. The training is therefore concentrated at the head office. Even though the training is done in the CoT's Waste Management Department, training is not available to operational-level employees.

According to Collins and Chetty (2013), giving appropriate training to all personnel is one factor that forms the basis of implementing the IWMP in any municipality. Training and development and the possession of sufficient levels of knowledge are therefore critical for all the personnel that

deal with waste management in the CoT; it is one crucial way of ensuring the achievement of IWMP goals. It is important that besides the training being relevant, it needs to be frequent.

#### **4.4.2.4 Existence of guidance for training**

The following question was posed to the respondents: *"Does guidance for training exist?"* The respondents were asked whether there was guidance for training within the CoT. The interviews revealed that respondents from regions 1, 2 and 4 indicated that guidance for training was non-existent. The results from the head office revealed that guidance for training did exist. The results indicated that the respondents from the head office were the only ones that received guidance for training as they were the only ones that indicated that they received training. The head office respondents also indicated that personnel were sent to attend training workshops and that the NWMS is given to employees to acquaint themselves.

Guidance for training is important for waste management personnel to develop a profound understanding of implementing the NEM: WA. According to Eberhard (2018), personnel training is something that is desperately needed. In the absence of proper and relevant training, the personnel working in the Waste Management Department will not be adequately equipped with the skills they need to ensure the effective implementation of the CoT's IWMP. Barbara Creecy (Minister of Environment, Forestry and Fisheries) delivered a speech at the 2020 WMO's Khoro in Pretoria in which she highlighted that in order for the City to achieve waste management goals, training needed to be enhanced (South African Government, 2020).

#### **4.4.2.5 Skills gap analysis**

The following question was posed to the respondents: *"Has a skills gap analysis been done?"* The results pertaining to the question above are reflected in the paragraph below.

The head office respondents indicated that a skills gap analysis had been done within the CoT's Waste Management Department. The head office respondents also stated that Section 78 of the Municipal Systems Act 32 of 2000 processes inform the authorities in the CoT on how the City's structure should look. The respondents from regions 1, 2 and 4 revealed that a partial skills gap analysis had been done within their municipality. Therefore, a sufficient skills gap analysis has not yet been done to fully ascertain what skills are needed in the municipality. The available skills must be known to address the skills that are still missing within the personnel.

A skills gap analysis assists in identifying the various competencies that are lacking (Alston & Millikin, 2016). According to Mariotti (2010), a skills gap analysis gives a critical overview of the organisation. It allows management to determine if employees possess the necessary skills to

meet the organisational objectives or achieve a change in strategy. The skills gap analysis should focus on technical skills and the soft skills needed to accomplish the work at hand. A skills gap analysis must be done in order for the CoT to prioritise their training resources and to guide recruitment and training.

#### **4.4.2.6 Existence of scarce skills policy to retain talent**

The following question was posed to the research respondents: *"Does a scarce skills policy exist to retain experienced and skilled personnel?"* The results are presented in the paragraph below.

The respondents from regions 1, 2 and 4 revealed that there was no scarce skills policy to retain the experienced and skilled personnel with the waste management department. Contrary to the results from regions 1, 2 and 4, the head office indicated that they had a scarce skills policy. It is clear that the head office is well catered for when it comes to talent retention, and there was nothing of that nature in the other regions as per the results collected from the interviews. However, head office respondents stated that even though a skills retention policy document existed, it had not been implemented.

Without a clear retention policy, an organisation's top talent will just leave even after millions of Rands have been spent in training and development initiatives. When top talent in the CoT's Waste Management Department leaves, it derails the achievement of the NWMS goals. It is important for organisations, in their management strategies, to treat critical skills as extremely valuable, exceptional, and irreplaceable and for the managers to be well equipped to support the strategies engaged. It is thus essential that appropriate retention strategies be crafted to meet the needs at the individual level (Ngoma, 2016).

#### **4.4.2.7 Municipality doing enough with its available resources in waste management**

The following question was posed to the respondents: *"In your opinion, is your municipality doing enough within its available resource capacity to effectively deliver waste management services?"* Head office respondents stated that they believed that they were doing enough in terms of waste management with the available resources. The respondents from regions 1, 2 and 4 did not respond to this question, which could be because they did not have adequate knowledge to respond to this particular question. Based on the results from the head office to which seven regions report, it can be concluded that despite the lack of knowledge about the utilisation of available resources by the other regions, it can be stated that the CoT is doing all it can in terms of waste management and aligning its efforts with its IWMP with the resources at its disposal.

#### **4.4.2.8 Existence of community and schools' awareness programmes**

The following question was posed to the respondents: *"Does your municipality have community awareness programmes on, amongst others, waste management, generation, recycling and recovery?"* The results are presented in the paragraph that follows.

The respondents from the head office indicated that they had community awareness programmes focussing on waste management, waste generation, recycling and waste recovery. The respondents from regions 1, 2 and 4 indicated that they were not sure of any community awareness programmes within their municipality. It can be concluded that since the respondents from the regions were not aware of any awareness programmes, it was highly likely that such programmes were non-existent. If they were present, the respondents from regions 1, 2 and 4 would have been aware of such programmes. It can be concluded that community awareness programmes exist, but they are not adequate or at the desired levels. The NWMS requires that municipalities engage in community awareness programmes to achieve the requirements of the NEM: WA.

#### **4.4.2.9 Municipality encourages waste awareness programmes in schools in the area**

The following question was posed to the respondents: *"Does your municipality specifically encourage waste awareness programmes in schools in your area?"* The results of this question are presented in the following paragraph.

The CoT head office respondents indicated that the CoT encouraged waste awareness programmes in schools in the areas that they served. The respondents did not mention the schools in which they had waste awareness programmes currently running. When the respondents from regions 1, 2 and 4 were asked the same question, they indicated that they were unsure if waste awareness programmes were running within their jurisdictions. The results, therefore, show that the head office was encouraging waste awareness programmes in schools. However, the other regions reporting to the head office did not have a clear idea of school waste awareness programmes. In order to mitigate key risks in waste management, there must be more extensive education and awareness campaigns for waste reuse and recycling in the schools and other sectors of society (Collins and Chetty, 2013). A target was set through the NWMS to ensure that 80% of schools in the country implement waste awareness programmes, such as recycling projects, by 2015 (DEA, 2011).

#### **4.4.2.10 Existence of sufficient financial resources**

The following question was posed to the respondents: *"Does the municipality have sufficient financial resources to give effect to their waste management mandate?"* The results are presented in the paragraph below.

When asked the above question, the CoT head office respondents indicated that they had partially sufficient financial resources to meet their waste management mandate. The respondents from regions 1, 2 and 4 also indicated that they had partially sufficient financial resources to meet their waste management mandate. The results indicate that the CoT's head office and its other seven regions faced financial or budget constraints that inhibited their ability to meet their waste management mandate fully. The CoT, just like any other local government, does not have unlimited financial resources to invest in waste management in order to achieve its IWMP goals. In order to ensure that financial resources are adequate all the time, the political will must also be there on the part of the councillors in the municipality (Collins & Chetty, 2013). One of the eight goals of the NWMS is to ensure sound budgeting and financial management for waste services (Eberhard, 2018). It is therefore important that budgeting be appropriately done as financial resources are not unlimited.

#### **4.5 Conclusion**

This chapter presented the results obtained from the primary study conducted through interviews with officers working in the CoT's waste management services. It contained a presentation of the qualitative and quantitative results and an analysis and discussion. The summary of findings presented as per research objectives are summarised below:

- The first research objective pertained to determining the extent to which the NWMS goals were incorporated into the CoT's IWMP. The CoT has made considerable progress concerning the incorporation of the NWMS goals into the IWMP. Regarding goal 1, the CoT's IWMP has incorporated and aligned with goal 1, and some strategies such as waste separation at the household level have been implemented in some parts of Tshwane. The study revealed that even though the CoT has made efforts to align with all other NWMS goals in its IWMP, no provision has been made regarding goal 7.
- The second research objective was to determine the extent to which the CoT has achieved the NWMS goals. The research results revealed that concerning goal 1, the CoT has not been able to implement effective recycling across its five regions, and this was due to the absence of the necessary resources required. The CoT head office indicated that recycling was occurring at a small scale, and support was also given to private companies involved

in waste recycling. Waste service delivery occurs as there is a regular collection of waste across households in the CoT. Concerning goal 3, the CoT had contracted some private contractors to assist with waste collection and waste separation. About goal 4, the research results revealed that only the head office respondents indicated that awareness programmes were being run whilst all the other regions' respondents were not aware of any such awareness programmes. The study results also revealed that concerning goal 7, there were specific targets relating to local government. The targets falling under goal 7 do not fall under the CoT's Waste Management Department.

- The third research objective focussed on the determination of gaps and challenges identified in the implementation of the IWMP. The primary study revealed that the CoT's newly merged municipalities, namely Motsweding, Kholuini and Nokeng, lack adequate understanding of the IWMP. A lack of capacity, resources, and a sufficient budget was also identified as impediments to implementing the CoT's IWMP. The lack of adequate personnel to perform waste management work in the CoT was also highlighted from the primary study. The other challenges included inadequate law enforcement with people not respecting the City's bylaws as observed by the illegal dumping which continues to take place. There is an apparent failure by law enforcement to support the CoT's waste management objectives. The CoT's five regions' respondents also highlighted the lack of awareness regarding the importance of appropriate waste disposal as a key challenge. The study, however, revealed that the national government was offering support to the CoT.

The next chapter presents the conclusions and recommendations from the study.

## **CHAPTER 5 CONCLUSIONS AND RECOMMENDATIONS**

### **5.1 Introduction**

The fifth and final chapter presents the conclusions and recommendations from both the study. The study aimed to evaluate the implementation of the NWMS goals by the CoT. The research objectives were as follows:

1. To determine the extent to which the NWMS goals are incorporated into the CoT IWMP;
2. To determine the extent to which NWMS goals have been implemented and achieved by the CoT; and
3. To identify the gaps and challenges identified during the implementation of the IWMP by the CoT.

### **5.2 Conclusions and recommendations**

The discussion on the conclusions is done per the research objective mentioned in the introduction. This section is, therefore, divided into three subsections.

#### **5.2.1 Incorporation of NWMS goals into the CoT IWMP**

In addressing the study's first objective, data was collected through evaluation of the 2014 CoT IWMP, supported by semi-structured interviews conducted with the CoT's Waste Management Department. The findings from the study revealed that the respondents from the CoT head office knew about the incorporation of the NWMS goals into the CoT's IWMP. According to the CoT head office respondents, it had made fair progress concerning the incorporation of the NWMS goals in its IWMP, despite facing challenges that included budget and human resources constraints. The study revealed that seven of the eight NWMS goals had been incorporated into the CoT's IWMP. Goal 7 was not incorporated because it fell outside the City's waste management mandate.

Furthermore, the incorporation of Goal 8 (compliance and enforcement) was still a challenge. The study by Molaba (2019) also found that incorporating Goal 8 into the IWMPs of local municipalities of the Fezile Dabe District Municipality was challenging. The interviews also indicated that the other respondents from the CoT Waste Management Department (i.e. the five regions that report to the head office) did not know about incorporating the NWMS goals into the IWMP.

## 5.2.2 The extent of NWMS goal implementation by the CoT

The study's second objective was to determine the extent to which the CoT's NWMS goals have been implemented and achieved. In determining the extent to which the CoT had implemented and achieved the NWMS goals, data was collected from document review of the CoT's IWMP, IDP, SDBIP and Waste Management Performance Report, once again supported by interviews.

The respondents' responses indicated that they perceived the goals of the NWMS to be partially implemented by the CoT, meaning that there is still more work to be done. The research results revealed that concerning goal 1 (the realisation of the waste management hierarchy), the CoT had not implemented effective recycling across its five regions. This was due to the lack of the necessary resources required. The CoT head office indicated that recycling was occurring on a small scale, and support was also given to private companies involved in waste recycling.

The order of priority of waste management is illustrated by the waste management hierarchy, with prevention as the most favoured option, followed by reuse, recycling, recovery, and disposal as the least favoured option. It is clear from the literature review that developing countries such as South Africa currently does not give sufficient attention to waste minimisation. Developing countries still divert 90% of their waste to landfill sites, a severe setback for waste minimisation efforts and targets. However, developed countries such as Taiwan have managed to recycle more than 40% of their MSW (Diong, 2012). This was achieved by developing and implementing a municipal waste IWMP, where waste separation at source is practised in line with the *Keep Trash off the Ground Policy* that makes fair use of waste generated before ending up in a landfill (Environmental Protection Agency, 1995).

Concerning goal 3 of the NWMS, waste service delivery occurs as a regular collection of waste across households in the CoT. The City contracted some private contractors to assist with waste collection and waste separation. About goal 4, the research results revealed that only the head office respondents indicated that awareness programmes were being run whilst all other regions' respondents were not aware of any such awareness programmes. The study results also revealed that concerning goal 7; contaminated land management targets were set. However, the achievement of these targets does not form part of the mandate of the CoT's Waste Management Department.

The IDP and SDBIP evaluation revealed that the actual implementation of the NWMS by the CoT highlighted some areas for improvement, such as growing the contribution to the green economy. The CoT has developed its IWMP, and it does feed into the IDP and SDBIP.

The Waste Management Performance Report acknowledged the importance of effective waste management as critical in creating a clean city. The report further mentions the impact of waste management on the health and wellbeing of the City's residents. However, it highlights that the challenges facing the delivery of waste management have been exacerbated by the growing population and by planned and unplanned developments. On the positive side, the Waste Management Performance Report indicates that the CoT has planned to adopt a holistic approach to waste management, and it will prioritise, amongst others, awareness creation of the impact of waste among communities and ensure effective waste service delivery.

### **5.2.3 Identification of gaps and challenges in the implementation of the IWMP by the CoT**

The third objective of the study was to identify gaps and challenges in the implementation of the IWMP by the CoT. The study revealed that the respondents perceived the CoT to face several challenges regarding IWMP implementation (and ultimately achieving the goals of the NWMS). The challenges included inadequate law enforcement, inadequate training, lack of awareness about the importance of waste management in communities, and shortage of the necessary resources crucial to attaining waste management goals. This is common in numerous other South African municipalities. Similar findings have been reported by *Godfrey et al. (2013)*, indicating that South African municipalities are faced with challenges in providing waste management services due to insufficient budgets and the lack of resources and waste management knowledge on the part of waste employees and residents. Studies conducted by *Alberts (2014)* and *Molaba (2019)* on the challenges faced by local municipalities in the North West Province and the Fezile Dabi District Municipality also revealed similar challenges, namely the failure to monitor the implementation of the waste management goals by municipalities, inadequate waste management knowledge of waste management officials, and insufficient budget provisions to render effective waste management.

The waste management officials interviewed from the five regions of the CoT highlighted that they had not received adequate training, which compromised their ability to effectively and efficiently discharge their waste management duties. The training that employees need pertain to a thorough comprehension of the contents of the NEM: WA, the NWMS goals and the CoT's IWMP. This finding implies that the CoT has to implement training and development initiatives to close this skills gap. These initiatives must be identified through a skills audit. The results also revealed that the training that was offered was not well attended.

The shortage of resources, primarily financial and human resources, was identified as a significant hindrance derailing the attainment of the NWMS goals in the CoT. The study revealed that in

some parts of the CoT, people did not adhere to municipal waste management laws, especially those concerning illegal dumping. This was due to the inadequate visibility of the metropolitan police tasked with enforcing the waste bylaws. There is, therefore, a need to improve waste bylaw enforcement.

The results also revealed a lack of awareness of the importance of waste management in some CoT communities. The issue about awareness requires the CoT Waste Management Department to strengthen its work with the *Good Deeds Programme*, which aids with educating communities and influencing their attitudes on waste management. It is recommended that the CoT address these gaps to better position them to implement the NWMS goals through its IWMP.

### **5.3 Recommendations for further research**

Recommendations for further research to possibly address the waste management challenges identified in this study include:

- An evaluation of the implementation of the 2020 NWMS by local government;
- Development and implementation of a *Keep Trash Off the Ground Policy* for South Africa; and
- Engagement with all spheres of government on how to better deal with waste management compliance challenges, by, for example, including waste separation at source as a command and control measure in the NWMS.

## BIBLIOGRAPHY

African Union Commission (AUC) (2013). Agenda 2063: The Africa we want. [https://au.int/sites/default/files/pages/3657-file-agenda2063\\_popular\\_version\\_en.pdf](https://au.int/sites/default/files/pages/3657-file-agenda2063_popular_version_en.pdf).

Afun, S. 2009. Government regulations and legislations will ensure sustainable waste management in Nigeria. *Solid Waste Management Services Limited*. [https://scholar.google.com/scholar?hl=en&as\\_sdt=0%2C5&q=Government+regulations+and+legislations+will+ensure+sustainable+waste+management+in+Nigeria&btnG=](https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=Government+regulations+and+legislations+will+ensure+sustainable+waste+management+in+Nigeria&btnG=) Date of access: 30 March 2020.

Alberts, R.C. 2014. Municipal Solid Waste Management in the North West Province: Governance. Potchefstroom: North West Province. (Mini-dissertation - MSc).

Alston, F. & Millikin, E.J. 2016. Guide to Environment Safety and Health Management: Developing, Implementing, and Maintaining a continuous improvement program. Boca Raton: CRC Press.

Azarian, R. 2011. Potentials and limitations of comparative method in social science. *International Journal of Humanities and Social Science*, 1:113-125.

Babbie, E. & Mouton, S. 2001. The Practice of Social Research. Cape Town: Oxford University press.

Banker, W. 2020. Solid waste management in Nigeria. <https://www.bioenergyconsult.com/solid-waste-nigeria/#:~:text=Nigeria%2C%20with%20population%20exceeding%20170,of%20solid%20waste%20in%20Africa.&text=Nigeria%20generates%20more%20than%2032,and%20choking%20of%20water%20bodies> Date of access: 12 November 2020.

Cave, S. 2016. Background paper on Waste Management in Northern Ireland. Northern Ireland: Northern Ireland Assembly.

Chen, H.-W. & Houn, H. 2004. Toward a zero waste society in Taiwan. *WIT Transactions on Ecology and the Environment*, 78:1-10.

City of Tshwane (CoT). 2014. Integrated waste management plan. Pretoria.

City of Tshwane (CoT). 2018. 2018/19 Review of the 2017- 2021 Integrated Development Plan (IDP). Pretoria.

City of Tshwane (CoT). 2020. City of Tshwane Annual Report 2018/2019. Pretoria.

City of Tshwane (CoT). 2020. City of Tshwane Integrated Development Plan: Revision for 2020/21 and Service Delivery and Budget Implementation Plan (SDBIP). Pretoria.

City of Tshwane (CoT). 2021. City of Tshwane 2021-2026 Integrated Development Plan, 27 May. Pretoria.

Collins, T. & Chetty, S. 2013. Assessment of alternatives and implementation plan: IWMP.

Department for Environment, Food and Rural Affairs (Defra). 2010. Waste Strategy for England 2007. England.

Department of Environment, Food and Rural Affairs (2012) Landfill Allowance Trading Scheme. <http://www.defra.gov.uk/environment/waste/local-authorities/landfill-scheme>. Date of access: 10 April 2021.

Department of Forestry, Fisheries and Environment (DFFE) (South Africa). 2020. National Environmental Management: Waste Act 2008 (Act 59 of 2008): Regulations Regarding Extended Producer Responsibility. Pretoria.

Department of Forestry, Fisheries and Environment and Department of Science and Innovation (DFFE & DST). 2020. Waste picker integration guideline for South Africa: Building the Recycling Economy and Improving Livelihoods through Integration of the Informal Sector. Pretoria.

Department of Forestry, Fisheries and Environment (DFFE). 2019. Good Green Deeds Programme. Pretoria.

Department of Environmental Affairs (DEA) (South Africa). 2009. National Environmental Management: Waste Act (Act no. 59 of 2008). (Notice 278). Government Gazette, 3200, 10 March.

Department of Environmental Affairs and Development Planning. 2010. Provincial Integrated Waste Management Plan for the Western Cape Draft [https://www.westerncape.gov.za/other/2011/1/wc\\_provincial\\_iwmp\\_draft\\_21.pdf](https://www.westerncape.gov.za/other/2011/1/wc_provincial_iwmp_draft_21.pdf) Date of access: 16 May 2021.

Department of Environmental Affairs and Tourism (DEAT). 2000. White Paper on Integrated Pollution and Waste Management. Pretoria.

Department of Environmental Affairs. 2009. Guidelines for the development of integrated waste management plans (IWMP'S).

[https://www.environment.gov.za/sites/default/files/legislations/integratedwaste\\_management\\_guidelines\\_0.pdf](https://www.environment.gov.za/sites/default/files/legislations/integratedwaste_management_guidelines_0.pdf) Date of access: 10 March 2020.

Department of Environmental Affairs. 2011. National Waste Management Strategy. *Department of Environmental Affairs. Pretoria.*

Department of the Environment, Transport and the Regions. 2000 Waste Strategy, England and Wales. <http://www.isonomia.co.uk>. Date of access: 12 April 2021.

Department of the Environment. 2013. 2013 Waste Management Strategy, Northern Ireland. [www.doeni.gov.uk](http://www.doeni.gov.uk). Date of access: 12 April 2021.

Diong, K. 2012. Integrated Waste Management in Kaohsiung City. Taiwan.

Eberhard, R. 2018. Waste management in South Africa's cities. Pretoria.

Environmental Protection Agency, 2012. *Waste Transfer Stations: A manual for decision-making*, Washington, DC: US Environmental Protection Agency.

Environmental Protection Agency. 1995. Keep Trash off the Ground Policy. Taiwan.

Flick, U., 2018. *Managing Quality in Qualitative Research*. 2nd ed. Thousand Oaks: Sage Publications.

Godfrey, L. 2019. SU 4.2 A life cycle perspective on integrated waste management: Waste to value. Potchefstroom: NWU.

Grbich, C. 2012. *Qualitative data analysis: An introduction*: Sage.

Guerrero, L.A., Maasa, G. & Hogland, W. 2013. Solid waste management challenges for cities in developing countries. *Waste Management*, 33(1):220-232.

Hox, J.J. & Boeijs, H.R. 2005. Data collection, primary vs secondary. *Encyclopedia of social measurement*, 1(Utrecht University, The Netherlands):593-599.

James, H. & Judy, M. 2013. Research Limitations and the Necessity of Reporting Them. *American Journal of Health Education*, 35:2.

Johnston, M. P. 2017. Secondary data analysis: A method of which the time has come. *Qualitative and quantitative methods in libraries*, 3, 619-626.

Kabera, T. 2020. *Solid Waste Management in Rwanda: Status and Challenges*. Hershey: IGI Global.

Kabera, T., Wilson, D.C. & Nishimwe, H. 2019. Benchmarking performance of solid waste management and recycling systems in East Africa: Comparing Kigali Rwanda with other. *Waste Management & Research*, 37(1):58-72.

Kabir, S. 2016. *Methods of data collection*. p. 201-275).

Kadafa, A.A. 2017. Solid waste management practice of residents in Abuja Municipalities (Nigeria). *IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)*, 11(2):87-106.

Kausal *et al.*, (2012) R.K. Kausal, G.K. Varghese, M. Chabukdhara: Municipal waste management in India current state and future challenges: A review of *Inter J Eng Sci Technol* 4:1473 - 1489.

Korstjens, I.M., A. 2018. Series: practical guidance to qualitative research. Part 4: trustworthiness and publishing. *European Journal of General Practice*, 24(1):120-124.

Kumar, S., Smith, S., Fowler, G., Velis, C., Kumar, S.J., Arya, S., Rena, Kumar, R. & Cheeseman, C. 2017. Challenges and opportunities associated with waste management in India. *Royal Society open science*, 4(3):160764.

Late and Mule, (2013) A. Late, M.B. Mule Composition and characterization study of solid waste from Aurangabad city Univ. *J. Environ. Res. Technol.*, 3 (1) (2013), pp. 55–60.

Makgae, M. 2011. Key areas in waste management: A South African perspective. *Integrated waste management* (Vol. 2. pp. 69-82): InTech.

Mashaba, C. 2017. A Re Sebeteng-City visits Kigali to study word class waste management system (pp. 2). Johannesburg: City of Johannesburg.

Misra, G.P., Kaushal, P., Bhaskarwar, A.K. & Grover, P., 2018. Requirement of Pre-processing in Waste to Energy (WTE) plant based on Indian Municipal Solid Waste. *Journal of Solid Waste Technology and Management*, 44(2).

Mohee, R. & Simelane, T. 2015. A Comparative Analysis of Solid Waste Management in Developed and Developing Countries. (*In* Mohee, R. & Bundhoo, M.a.Z., eds. *Future Directions of Municipal Solid Waste Management in Africa*. South Africa: Africa Institute of South Africa. p. 7).

- Mokoena, T. 2019. Waste management in Ekurhuleni: Evaluation against the instruments of the National Waste Management Strategy. Potchefstroom: North West University. (Mini-dissertation - MSc).
- Molaba, L.M. 2019. A critical analysis of the integrated waste management plans of local municipalities within Fezile Dabi district municipality. Potchefstroom: North West University. (Mini-dissertation-MSc).
- Montana. 2018. Integrated Waste Management Plan. The State of Montana.
- Mouton, J. 2001. How to succeed in your Master's and Doctoral studies. Pretoria: Van Schaik publishers.
- Mpumalanga Provincial Government, 2015. *Waste Management Summit*. Nelspruit, Department of Agriculture, Rural Development, Land and Environmental Affairs.
- Mühle, S., Balsam, I. & Cheeseman, C. 2010. Comparison of carbon emissions associated with municipal solid waste management in Germany and the UK. *Resources, Conservation and Recycling*, 54(11):793-801.
- Nahman, A. & Godfrey, L. 2010. Economic instruments for solid waste management in South Africa: Opportunities and constraints. *Resources, conservation and recycling*, 54(8):1-31.
- Netherlands Ministry of Infrastructure and the Environment. 2016. *A circular economy in the Netherlands by 2050*. [www.government.nl/circular-economy](http://www.government.nl/circular-economy) Date of access: 20 October 2020.
- Neuman, W.L. (2011). *Social Research Methods: Qualitative and Quantitative Approaches*. Toronto: Pearson.
- Ngoma, Z. 2016. The importance of retention of critical skills.
- Nkosi, L.F. 2014. An evaluation of the municipal solid waste management system within Tshwane Metropolitan municipality, in Mamelodi East Township, Gauteng, South Africa. Pretoria: University of Pretoria.
- North West University (NWU). 2018. Research Ethics Policy. North-West University.
- Oelofse, S. 2014. Waste vs Resource Management. Paper presented at the Business brief.

Oelofse, S.H. & Nahman, A. 2018. Waste as a resource opportunities in Africa. Pretoria: Waste for Development Research Group, Natural Resources and the Environment, Council for Scientific and Industrial Research.

Owolabi, A.A. 2003. An examination of the legal framework for the control and management of pollution in Nigeria. *Journal of the Indian Law Institute*, 45(1):38-61.

Prokic, D. & Mihajlov, A. 2012. Contaminated sites. Practice of solid waste management in a developing country Serbia. *Environment Protection Engineering*, 38(01):83.

Rachel, G., Damodaran, N., Panesar, B., Leatherwood, C., & Asnani, P. U. (2007, September 5–7). Methane to markets and landfill gas energy in India. In *Proceeding of the International Conference on Sustainable Solid Waste Management* (pp. 519– 525). Chennai.

Rajashekar, A., Bowers, A. & Gatoni, A.S. 2019. Assessing waste management in services in Kigali: Centre, I.G.

Rowley, J. 2012. Conducting research interviews. *Management Research Review*, 35(Department of Information and Communications, UK):260-271.

Sango, T., Bassoon, S., Bassoon, L. & Munganga, G. 2014. Development of the Waste Economy in the Western Cape: A Decision Support Tool for Integrated Municipal Waste Cape Town: The Green Cape sector development agency.

Scottish Government, Edinburgh. 2010. 2010 Zero Waste Strategy, Scotland. The Scottish Government.

Sentime, K. 2014. The impact of legislative framework governing waste management and collection in South Africa. *Journal African Geographical Review*, 33(1):81-93.

Simelane, T. & Mohee, R. 2012. Future Directions of Municipal Solid. Pretoria.

Smith, J. & Firth, J. 2011. Qualitative data analysis: the framework approach. *Nurse researcher*, 18(2):52-62.

Song, Y., Son, Y. & Oh, D. 2015. Methodological issues in questionnaire design. *Journal of Korean Academy of Nursing*, 45(3):323-328.

South Africa. 1996. Constitution of the Republic of South Africa Act 108 of 1996.

South Africa. 1998. National Environmental Management Act (NEMA), Act No.107 of 1998.

Srivastava, T.N. & Rego, S. 2011. *Business Research Methodology*. New Delhi: Tata McGraw-Hill Education.

Su, M.-C. 2018. Taiwan's Circular Economy: A New era For Waste Management. *Taiwan Insight*. <https://taiwaninsight.org/2018/01/31/taiwans-circular-economy-a-new-era-for-waste-management/> Date of access: 7 April 2020.

United Nations Department of Economic and Social Affairs (UNDESA). (2017). *World Population Prospects: The 2017 Revision, Key Findings and Advance Tables*. Working Paper No. ESA/P/WP/248. [https://esa.un.org/unpd/wpp/Publications/Files/WPP2017\\_KeyFindings.pdf](https://esa.un.org/unpd/wpp/Publications/Files/WPP2017_KeyFindings.pdf).

United Nations Environment Programme (UNEP). 2009. *Developing integrated solid waste*.

United Nations Environment Programme (UNEP). 2018. *Africa Waste Management Outlook*. Nairobi, Kenya.

Uwagbale, E.-E.D. 2016. Hazardous waste management and challenges in Nigeria. *Public Health International*, 1:1, 2.

Wang, D., Tang, Y., T, Long, G., Higgitt, D., He, J. & Robinson, D. 2020. Future improvements on performance of an EU landfill directive driven municipal solid waste management for a city in England. *Waste Management*, 102:452-463.

Wang, M. 2013. *The Oxford Handbook of Retirement*. England: Oxford University Press.

Welsh Assembly Government. 2010. *2009 Towards Zero Waste Strategy*, Wales.

Wong, N.W.M. 2017. The road to environmental participatory governance in Taiwan: Collaboration and challenges in incineration and municipal waste management. *Journal of Environmental Planning and Management*, 60(9-10):1726-1740.

Zotos, G., Karagiannidis, A., Zampetoglou, S., Malamakis, A., Antonopoulos, I.S., Kontogianni, S. & Tchobanoglous, G. 2009. Developing a holistic strategy for integrated waste management within municipal planning: challenges, policies, solutions and perspectives for Hellenic municipalities in the zero-waste, low-cost direction. *Waste Manag*, 29(5):1686-1692.

## ANNEXURES

### 6.1 Annexure 1: Regions of the City of Tshwane

Seven regions of the CoT	Names of regions
Region 1	<ul style="list-style-type: none"> <li>• Akasia</li> <li>• Beirut</li> <li>• Bodibeng</li> <li>• Ga-Rankuwa</li> <li>• Mabopane</li> <li>• Soshanguve</li> </ul>
Region 2	<ul style="list-style-type: none"> <li>• Hammanskraal</li> <li>• Sinoville</li> <li>• Temba</li> </ul>
Region 3	<ul style="list-style-type: none"> <li>• Atteridgeville</li> <li>• Fortsig</li> </ul>
Region 4	<ul style="list-style-type: none"> <li>• Centurion</li> <li>• Laudium</li> <li>• Olievenhoutboch</li> </ul>
Region 5	<ul style="list-style-type: none"> <li>• Cullinan</li> <li>• Rayton</li> <li>• Roodeplaat</li> </ul>
Region 6	<ul style="list-style-type: none"> <li>• Eesterust</li> <li>• Mamelodi</li> </ul>
Region 7	<ul style="list-style-type: none"> <li>• Ekangala</li> <li>• Zithobeni</li> </ul>

## 6.2 Annexure 2: Permission to conduct research in the City of Tshwane by City of Tshwane



### City Strategy and Organizational Performance

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My ref: **Research Permission/ P.Thobejane**  
Contact person: **Pearl Maponya**  
Section/Unit: **Knowledge Management**

Tel: 012 358 4559  
Email: [PearlMap3@tshwane.gov.za](mailto:PearlMap3@tshwane.gov.za)  
Date 20 May 2020

**Ms Palesa Thobejane**  
6995 Mafuno  
Olievenhoutbosch  
0157

Dear Ms Thobejane,

#### **RE: EVALUATING THE IMPLEMENTATION OF THE SOUTH AFRICAN NATIONAL WASTE MANAGEMENT STRATEGY GOALS BY LOCAL GOVERNMENT.**

Permission is hereby granted to Ms Palesa Thobejane, Master Degree Candidate in Environmental Management at the North-West University (NWU), to conduct research in the City of Tshwane Metropolitan Municipality.

It is noted that the main aim of the study is to evaluate the implementation of the National Waste Management Strategy goals by local government at Tshwane Metropolitan Municipality. The City of Tshwane further notes that all ethical aspects of the research will be covered within the provisions of NWU Research Ethics Policy. You will be required to sign a confidentiality agreement with the City of Tshwane prior to conducting research.

Relevant information required for the purpose of the research project will be made available as per applicable laws and regulations. The City of Tshwane is not liable to cover the costs of the research. Upon completion of the research study, it would be appreciated that the findings in the form of a report and or presentation be shared with the City of Tshwane.

Yours faithfully,

PEARL MAPONYA (Ms.)  
DIRECTOR: KNOWLEDGE MANAGEMENT

### **6.3 Annexure 3: Invitation to participate in research conducted in the City of Tshwane**

**Title: To evaluate the implementation of the National Waste Management Strategy goals by local government. The study focuses on a specific case study, namely the implementation of the NWMS by the City of Tshwane**

My name is Palesa Masuenyane Thobejane, I am a post-graduate student engaged in a study on the above-mentioned topic at the North-West University, Potchefstroom Campus under the supervision of senior lecture Dr. Claudine Roos. This research forms part of my Masters studies in Environmental Management (with specialization in Waste Management). The research aims to evaluate the implementation of the National Waste Management Strategy goals by local government. The study will focus on the implementation of the NWMS by the City of Tshwane.

#### **Invitation to participate**

You are invited to participate in a study to evaluate the the implementation of the National Waste Management Strategy goals by the City of Tshwane. You are the relevant candidate to provide a clear description on how municipality waste is managed and what are the challenges within your area of work.

#### **Process Involved.**

The researcher will be conducting semi-structured interview with key respondents in order to obtain a clear understanding at what extent are the NWMS goals incorporated into the City of Tshwane IWMP and the gaps and challenges identified during the implementation of IWMP. The interview process will take about half an hour and you are free not to answer all the questions.

#### **Risks**

There no risks involved in participation in this study all results will be anonymously presented.

#### **Rights as participant**

Participation to this study is voluntary and you may withdraw at any time from the study

#### **Benefits**

This study is striving for implementation of the National Waste Management Strategy goals by local government. As a participant, you will however not personally benefit from the interview.

#### **Confidentiality**

All information collected will be kept confidential and no names will be included in the report.

#### **Ethical Approval**

The permission to conduct the study was obtained from the North-West University' ethics committee, a copy of the approval letter is available for reference.

**Contact details of researcher**

Please contact me directly on: 0813078010 or [pmthobejane@hotmail.co.za](mailto:pmthobejane@hotmail.co.za)

For further information you can contact my supervisor, [Dr. Claudine Roos](#) on: 018 299 1477 or [claudine.roos@nwu.ac.za](mailto:claudine.roos@nwu.ac.za)

## 6.4 Annexure 4: Questionnaire for City of Tshwane

### Demographic-related questions

**(N.B please provide documentary evidence where possible for all questions)**

#### 1. Biographical information

<u>Municipality</u>	
<u>Position</u>	
<u>e-mail address (optional)</u>	

#### 2. Your highest qualification

- No education
- Prior Learning
- Matric
- Short Courses
- Diploma
- Degree (3 years)
- Degree (Honours)
- Degree (Masters)
- Degree (Doctoral)

#### 3. Years of practice in your profession

- Less than 1 year
- 1-3 years
- 3-5 years
- 5 to 10 years
- More than 10 years

**Operational-related questions**

1. What is your general understanding of the National Waste Management Strategy of 2012 (NWMS)?

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2. How is waste management included in your mandate (KPI/KPA)

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3. To what extent are the NWMS goals incorporated into the City of Tshwane IWMP?

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4. To what extent are the NWMS goals implemented and achieved by the City of Tshwane?

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5. What are the gaps and challenges identified during the implementation of the IWMP by the City of Tshwane?

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6. How effective is the monitoring processes/arrangements (if there are any)? Elaborate and if possible, provide examples of monitoring reports (regarding waste management).

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7. Has waste management improved in the past five years

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8. Is there adequate capacity for compliance, enforcement and monitoring?

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**Resources-related questions (Please justify your answer)**

1. In your own opinion does the municipality have adequate capacity to comply with the NWMS goals requirements?

YES	NO	Partial
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2. Is there Waste Management Officer appointed in the municipality?

YES	NO
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3. Are the staff/personnel equipped with necessary knowledge and training, (i.e workshops etc) to perform the waste management function and use waste management tools effectively?

YES	NO	Partial
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YES	NO	partial
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4. Do Guidance for training exists?

YES	NO	Partial
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5. Has a skills gap analysis been done?

6. Does a scarce skills policy exist to retain experienced and skilled personnel?

YES	NO
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7. In your opinion, is your municipality doing enough within its available resource capacity, to effectively deliver waste management services?

YES	NO
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8. Does your municipality have community awareness programs on amongst others waste management, generation, recycling and recovery?

9. Does your municipality specifically encourage waste awareness programs in schools in your area?

Please explain and if possible, provide an indication (%) of schools in your area running such programs

10. Does the municipality have sufficient financial resources to give effect to their waste management mandate?

YES	NO	Partial
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11. Which types of training are offered (relevant training) to personnel involved in waste management?

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12. Please indicate the main problems, if any which makes your ay-to-day execution of waste management task difficult within CoT

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13. Do the designated institutions have sufficient resources to enable them to function efficiently? Do they have approved budgets that allocated sufficient funds?

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**Communication-related questions**

1. Do you know whether your municipality currently reports to the South African Waste Information System?

If yes, please provide a brief indication of how your waste quantification system, which is used to generate the reported data works.

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2. Do your municipality receive support from provincial and national government with regard to any of its waste management services, programmes or initiatives?

If yes, please stipulate the forms of support.

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3. What challenges do the municipality experience in addressing complaints with other departments with regard to waste management issues?

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4. How is the intergovernmental relation between the municipality and other departments?

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5. How does the reporting structure influence decision making with regards to waste management issues?

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