

A quality review of waste management measures in EIA reports for developments in protected areas

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PREFACE AND ACKNOWLEDGMENTS

“Waymaker, miracle worker, promise keeper, light in the darkness, my God, that is who you are”
– Isaiah 42:16

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ABSTRACT

The Environmental Impact Assessment (EIA) process is a legislative requirement to authorise certain developments in South Africa. The process is aimed towards environmental protection by identifying and mitigating potential environmental impacts. This is especially important for developments in protected areas, focusing on biodiversity conservation and environmental protection. Waste management is a challenge globally as well as in South African towns and cities; therefore, in all likelihood, waste issues will also be present in other environments such as rural communities, farms, and protected areas. As part of development projects in protected areas, the generation and management of waste may result in pollution, environmental degradation, and negative socio-economic impacts. These waste-related impacts may be mitigated as part of the EIA process. However, limited research has been conducted on the quality of the waste management component. This research aimed to review the quality of waste management measures included in EIA reports for developments in protected areas in South Africa. The Department of Environmental Affairs' EIA database was consulted, and the EIAs were screened against a selection criteria. An adapted version of the Lee and Colley review package (consisting of seventeen key performance indicators) was used to evaluate the quality of six EIA reports for developments in protected areas, focusing specifically on waste management measures. Waste management measures were generally poorly and inadequately addressed in the majority of the cases. Waste management measures related to particular activities conducted as part of the project development-, operation- and decommissioning phases were not addressed at all. Where waste management measures were addressed, it mainly focused on disposal to landfill as the most favourable option. The South African legislative framework has a strong focus on implementing the waste management hierarchy, where the disposal of waste should be the last resort. Limited measures to address waste avoidance, reduction, re-use, recycling or recovery were proposed; and no circular economy initiatives were suggested.

Keywords: Developments, Environmental Impact Assessment (EIA), Protected Areas (PAs), South Africa (SA), Waste Management, Quality Review

ABBREVIATIONS AND ACRONYMS

BA	Basic Assessment
BPEO	Best Practicable Environmental Option
CA	Competent Authority
ECA	Environment Conservation Act 73 of 1989
EIA	Environmental Impact Assessment
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
DEAT	Department of Environment and Tourism
IAIA	International Association of Impact Assessment
ITAC	International Trade Administration Commission
PA	Protected Area
SANParks	South African National Parks
SAWIS	South African Waste Information System
SDGs	Sustainable Development Goals
ISWM	Integrated Sustainable Waste Management
IWM	Integrated Waste Management
KPA	Key Performance Area
KPI	Key Performance Indicator
GNR	General Notice Regulation
NEMA	National Environmental Management Act
NEM: BA	National Environmental Management Biodiversity Act

NEM: PAA	National Environmental Management Protected Areas Act
NEM: WA	National Environmental Management Waste Act
NEM: AQA	National Environmental Management Air Quality Act
NPAES	National Protected Areas Expansion Strategy
NWMS	National Waste Management Strategy

KEY DEFINITIONS

Environment	The NEMA (107 of 1998) defines the concept of the “Environment” as 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 that influence human health and well-being (South Africa: 1998).
Circular Economy	The circular economy initiative promotes integrated sustainability through clean energy generation (wind, solar, biofuels, wave and tidal), sustainable transport (electrical vehicles, technologically advanced transportation infrastructure), green buildings (building with eco-friendly material or recycled material), green manufacturing (sustainable consumers and producers), green tourism practices, sustainable waste management (reduce, reuse and recycle) altogether contributing to job creation (The Green Jobs Initiative, 2012:8-11).
Sustainable Development	The concept of “sustainable development” is defined by the National Environmental Management Act (107 of 1998) as the integration of social, economic, and environmental factors into the entire development lifecycle, planning, implementation, and decision-making to ensure that the needs of present and future generations can be met.
Protected Area	“Geographical spaces, recognised, dedicated, and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values” (Dudley, 2008: 8).

TABLE OF CONTENTS

PREFACE AND ACKNOWLEDGMENTS	I
ABSTRACT	III
ABBREVIATIONS AND ACRONYMS	IIIV
KEY DEFINITIONS	VI
TABLE OF CONTENTS	VII
LIST OF TABLES	VII
LIST OF FIGURES.....	VII
CHAPTER 1 - INTRODUCTION.....	1
1.1 Background	1
1.2 Problem statement	3
1.3 Research aim and question	4
1.4 Scope of the research	4
1.5 Contribution of the research.....	4
1.6 Structure and outline of the dissertation	5
1.7 Chapter conclusion	5
CHAPTER 2 - LITERATURE REVIEW	6
2.1 Introduction	6
2.2 Waste Management	6

2.2.1 Defining and understanding sustainable and integrated waste management (IWM) as well as associated environmental management approaches.....	7
2.2.2 Waste-related Multilateral Environmental Agreements (MEAs) and Sustainable Development Goals (SDGs)	9
2.3 The current state of waste in South Africa	11
2.4 The South African legal framework and waste-related legislation.....	12
2.4.1 The Constitution of the Republic of South Africa (1996).....	12
2.4.2 The National Environmental Management Act (NEMA) No.107 of 1998	13
2.4.2.1 The NEMA EIA Regulations.....	14
2.4.2.1.1 The EIA process overview	14
2.4.2.1.2 The importance of the content of EIA reports.....	15
2.4.3 The National Environmental Management Waste Act (NEM: WA) No. 59 of 2008	15
2.4.3.1 Waste-related Regulations in terms of NEM: WA No. 59 of 2008	17
2.4.3.2 Waste-related National Norms and Standards in terms of the NEM: WA No. 59 of 2008	18
2.4.4 The National Waste Management Strategy	19
2.4.4.1 The Circular Economy	20
2.5 Protected areas and waste management.....	22
2.5.1 The protected area system in SA.....	22
2.5.2 Importance of waste management in PAs (issues from literature)	23
2.6 The role of EIA in waste management.....	24
2.6.1 How EIA can contribute to waste management (specifically in PAs)	24
2.6.2 Findings from EIA quality reviews	25

2.7	Conclusion.....	27
	CHAPTER 3 - METHODOLOGY.....	28
3.1	Introduction	28
3.2	Research design.....	28
3.3	Data collection	28
3.4	Documentation review	30
3.5	Description of review protocol	30
3.5.1	The original Lee and Colley review package.....	31
3.5.2	The adapted Lee and Colley review package	32
3.6	Data analysis.....	34
3.7	Ethical consideration	35
3.8	Limitations of the research.....	35
3.9	Conclusion.....	35
	CHAPTER 4 - RESULTS AND DISCUSSION.....	36
4.1	Introduction	36
4.2	Case-by-case analysis and discussion.....	38
4.2.1	Results related to Case study # 1	38
4.2.2	Results related to Case Study # 2	40
4.2.3	Results related to Case Study # 3	40
4.2.4	Results related to Case Study # 4	41
4.2.5	Results related to Case Study # 5:	42
4.2.6	Results related to Case Study # 6:	43

4.3 Cross-case analysis and discussion	43
4.3.1 KPA 1: Waste-related information.....	44
4.3.2 KPA 2: Implementation measures of the waste management hierarchy	45
4.3.3 KPA 3: Pollution prevention measures.....	45
4.3.4 KPA 4: Circular economy initiatives	46
4.4 Conclusion.....	47
 CHAPTER 5 - CONCLUSIONS AND RECOMMENDATIONS	 50
5.1 Introduction	50
5.2 Conclusions.....	50
5.3 Recommendations and areas of future research	52
 BIBLIOGRAPHY	 53

LIST OF TABLES

Table 3-1:	Summary of selected case studies within South African protected areas	29
Table 3-2:	The adapted Lee and Colley review package	33
Table 3-3:	Evaluation scores for the adapted Lee and Colley review package	34
Table 3-4:	Colour groupings for evaluation scores.....	34
Table 4-1:	Meta-matrix indication performance scores across KPIs	37

LIST OF FIGURES

Figure 2-1:	The Resolve Framework (adapted from: Ellen MacArthur Foundation, 2015:9)	22
Figure 3-1:	Location of the PAs of the selected EIA case studies.....	30
Figure 3-2:	The original assessment pyramid for EIA reports (Lee & Colley, 1992; Lee <i>et al.</i> , 1999)	31
Figure 3-3:	The adapted assessment pyramid for EIA reports	32

CHAPTER 1 - INTRODUCTION

1.1 Background

Waste management not in accordance with legislation and guidance poses a threat to public health and results in not only environmental degradation and pollution worldwide, but also has damaging social-economic effects (Bosman *et al.*, 2018; Wilson & Rogero, 2015). Globally, waste generation is intensified by population growth, rapid development, the fast-growing middle class, increased consumption and production trends, as well as the advent of international waste trade and trafficking (UNEP, 2018). Waste management has subsequently become a global concern in which all countries have a part to play. Specifically, the African continent faces various complex waste management problems, mainly driven by an increase in population growth at 3.5 % per annum (UNEP, 2018) and the ineffective implementation of sound and sustainable waste management practices. This reality is also true for South Africa, where many local governments struggle to manage landfill sites (DEA, 2011) effectively. Waste is often disposed of without proper consideration of the surrounding environment (UNEP, 2018).

However, South Africa has shown its intent to improve on matters such as the above by adopting the 2030 Agenda for Sustainable Development and its associated Sustainable Development Goals (SDGs) (UNDP, 2021) which aims to balance the need for economic growth while also protecting environmental resources (DEFF, 2020). Waste management plays an essential role in achieving the SDGs, and this means reusing waste materials where there is potential value from products through recycling, composting, or energy recovery when they reach the end of their life span (DEFF, 2020). Zero waste disposed to landfills may not be entirely feasible, however it should be possible, by implementing the waste management hierarchy (reuse, recycling, recovery, and treatment), instead of disposal to landfill sites (DEFF, 2020). The reality, however, is that disposal still dominated the South African waste management landscape over recent years, as is evident from the national waste information baseline (NWIB), which state that of the approximately 108 million tons of waste generated annually, only 10% is recycled, while the remaining 90% is disposed to landfills (Godfrey & Oelofse, 2017). This includes, amongst others, waste from industries, mines, businesses, municipalities as well as general garden waste (Bosman *et al.*, 2018). One reason for this is because alternative waste management options are usually more expensive than landfilling (Earth, 2020), while another is that municipalities in South African often face challenges regarding the delivery of waste services (Earth, 2020). Waste management challenges are, however, not only limited to towns and cities but also extend to rural communities, farms, and protected areas (PAs). Although these areas all fall within municipalities, many don't have direct

access to waste collection services, waste management infrastructure and landfill sites, which means that waste related impacts might be even more significant, especially within environmentally sensitive areas such as protected areas.

Protected areas are defined as: “Geographical spaces, recognised, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values” (Dudley, 2008:8). According to the 2016 National Protected Areas Expansion Strategy (NPAES) of South Africa, protected areas are formally safeguarded by legislation and primarily managed for biodiversity conservation (DEA, 2016). Protected areas play a significant role in ecological sustainability, climate change adaptation, ecological infrastructure networks, and preserving the ecosystems that provide essential ecosystem services to communities (DEA, 2016).

For example, the airspace of protected areas may be impacted by low flying aeroplanes, helicopters, drones, or hot-air balloons, which may lead to litter being wind-blown into the environment (Dudley, 2008). Additionally, neighbouring mining activities may impact protected areas regarding the water quality, air quality, excessive noise levels, odour or visual impacts (Dudley, 2008). Waste may be released into water sources resulting in water, air and soil pollution or unpleasant odours (Dudley, 2008). Furthermore, activities associated with protected areas may impact aquatic resources and biodiversity, for example, illegal fishing, hunting, and wildlife trafficking (Dudley, 2008).

According to principle 17 of the 1992 Rio-declaration on Environment and Sustainable Development, EIA should be the tool of choice for achieving sustainable development (Devuyst, 2000; Roos *et al.*, 2020), while the African Waste Management Outlook (WMO) recognises EIA as an assessment tool that plays a key role in preventing and minimising waste impacts (UNEP, 2018). The EIA process is practised globally, with approximately 200 countries having associated legislation regarding the process (Bosman *et al.*, 2018). The EIA process identifies, predicts, evaluates, and mitigates the biophysical, social, and other relevant effects of development proposals before major decisions are taken, and commitments are made (IAIA, 2021). EIAs have been conducted historically since the 1970s and are acknowledged as one of the most influential environmental management instruments of the 20th century (Kidd *et al.*, 2018; Morgan, 2012; Roos *et al.*, 2020; Sandham *et al.*, 2020). When the EIA process was first introduced in South Africa in the 1970s, it was conducted voluntarily (Bosman *et al.*, 2018). However, following the promulgation of the first South African EIA regulations in September 1997 in terms of the Environment Conservation Act (ECA) 73 of 1989, the EIA process became compulsory for certain listed activities (Kidd *et al.*, 2018) or within specific types areas.

1.2 Problem statement

Waste management is only superficially considered in EIAs, and this has a particularly serious impact on PAs. This is however not reflected in EIAs. Various developmental needs and human-related impacts may result in unwanted effects within PAs (Dudley, 2008).

A particular challenge for protected areas is the impacts associated with tourism-related activities (Whyllie *et al.*, 2018). Travelling and recreation form a vital part of the modern individual's life, and these activities are a common source of waste generation (Dunjić *et al.*, 2017). Tourism is in many ways undetachable from protected areas which means that the environmental impacts associated with tourism-related activities are unavoidable (Przydatek, 2019). One of these impacts relates to waste, which some authors have cited as one of the most significant impacts in protected areas (Steg & Vlek, 2009; Clark *et al.*, 2003). According to the United Nations Environment Program (UNEP), tourists produce an estimated 4.8 million tonnes of solid waste annually (Dunjić *et al.*, 2017). Waste-related impacts in protected areas can include littering by visiting tourists, waste generated by permanent or temporary staff, sewage effluent from ablution facilities, hazardous waste in the form of hydrocarbons (oil, grease, fuel), and food waste from tourists, kitchens or restaurants (South Africa, 2003). In the Kruger National Park, improper waste management resulted in visual impacts that affected the tourist experience and aquatic and terrestrial environments due to the hazardous properties of some waste types (Mabibibi *et al.*, 2021). It is, therefore, essential that waste is managed responsibly in protected areas. One way of ensuring this is through proper planning. As new tourism-related infrastructure is often developed in protected areas, the processes that guide development can identify possible waste impacts and properly plan for their mitigation and management. One such process is the environmental impact assessment (EIA) process.

Protected areas (PAs) are one of these types of areas where development proposals are often subjected to an Environmental Impact Assessment (EIA) process (Alberts *et al.*, 2021). As the EIA process includes a waste management component focussed on the management and mitigation of waste, it can make a significant contribution to the effective management of waste impacts in PAs. However, the extent to which this is achieved is still largely unknown. Although various studies have been conducted to establish the overall quality of EIA reports (Linde, 2006), the quality of specific components of EIA reports, the quality of reports within different sectors (Thorpe, 2014; Boshoff, 2013; Van der Vyver, 2008; Hoffmann, 2007; Van der Vyver, 2008; Kruger, 2020) as well as within specific contexts such as protected areas (Huysamen, 2019; Sandham *et al.*, 2020; Whyllie *et al.*, 2018) none have explored the quality of waste management measures in EIA within the PA context specifically. However, some studies have noted waste management considerations and the evaluation of impact significance related to

waste to be questionable in EIAs within the protected area context (Wylie *et al.*, 2018; Sandham *et al.*, 2020). There is, therefore, both cause and scope for exploring the quality of waste measures in EIAs within protected areas.

1.3 Research aim and question

The aim of this research is, therefore, to review the quality of waste management measures in EIA reports for developments in protected areas within South Africa.

The related research question is: *What is the quality of waste management measures in EIA reports for developments in protected areas within South Africa?*

To achieve the research aim, the following research objectives are set:

Objective 1: To conduct a documentation review of the EIA sample.

Objective 2: To evaluate the quality of the waste management measures in a sample of EIA reports for protected area developments, using an adapted Lee and Colley review package.

1.4 Scope of the research

The research focused on the manner and extent to which waste management measures were considered in EIAs compiled in terms of the NEMA No. 107 of 1998. A sample of six EIA's (completed between 2016 and 2017) for tourism-related developments within formally protected areas in South Africa (representing more than one province with various role-players) was used. The implementation of waste management measures (effectiveness) was, however, not evaluated as the focus of the research was on documentation quality review, i.e. to evaluate the manner in which waste management measures were dealt with in EIA documents such as Environmental Impact Assessment (EIA) Reports, Environmental Management Programme Reports (EMPRs) and Records of Decision (RODs).

1.5 Contribution of the research

This research contributes to the existing literature on the quality of EIA reports in South Africa. It further proposes a review protocol tailored to the evaluation of waste management measures in EIA reports. It finally provides insights into the manner in which these measures are considered in EIA reports conducted specifically for projects within protected areas.

1.6 Structure and outline of the dissertation

The research is presented across five (5) Chapters which are structured as follows. Chapter 1 introduces the research study, and covers the background, problem statement and research

aim. Chapter 2 reviews existing literature related to the key concepts dealt with in the study. Chapter 3 presents the methodological design paying specific attention to data collection and data analysis, but also ethical considerations, assumptions and limitations. In Chapter 4, the findings are presented, first on a case-by-case basis, followed by a cross-case analysis. Finally, Chapter 5 covers the conclusions as well as the recommendations for future research based on the quality of waste management measures of EIA reports of PAs within South Africa.

1.7 Chapter conclusion

Chapter 1 presented the background and problem statement against which the research aim was framed. The research scope indicating what was included and excluded in the study was further explained. The chapter finally reflected on the contributions made by the study. The information contained in this chapter was derived from Literature Review presented in Chapter 2.

CHAPTER 2 - LITERATURE REVIEW

2.1 Introduction

The literature review reflects on available research related to waste management; from defining and understanding the role of waste management; international guidelines related to waste management; the current state of waste management in South Africa; and legislation related to waste within SA. Protected areas are also discussed, focusing on the importance of waste management in PAs and the protected area system in SA. The extent to which the EIA process can contribute to waste management, and findings from previously conducted quality reviews are finally considered.

2.2 Waste Management

Anthropogenic activities result in different types and quantities of wastes such as discarded materials, emissions, effluents, and residues (Bosman *et al.*, 2018; UNDP, 2021). Furthermore, available data suggest that the amount and hazardous nature of waste generated in a country are almost directly related to its economy (Bosman *et al.*, 2018). A few examples of waste-related issues experienced globally, but which are also particularly relevant to the South African context, are discussed below. First, the production and use of plastics, especially single-use plastics, have a devastating effect on the planet and its inhabitants (Lenkiewicz, 2016). For example, almost all the beaches in the world carry the remains of plastics, fishing nets, and cigarette butts that result in marine animals washing up on shore dead due to plastic consumption (Lenkiewicz, 2016). In addition, hazardous waste types can contain mercury, asbestos, fly ash, waste oil, or sewage sludge, which generate many toxins that are dangerous to the environment and human life (AWARD, 2019). Therefore, these waste issues require correct management to protect the surrounding environment.

The waste management process was introduced to adequately address the challenges discussed above and ultimately reduce harm to the environment and human health (Cunningham & Maria, 2021). However, for many years, the waste management process only focused on solid waste management, not addressing all concerns discussed and largely focussing on waste disposal, and to some extent, reduction (Cunningham & Maria, 2021). Therefore, waste disposal is still the dominant waste management solution in South Africa (Godfrey & Oelofse, 2017) but is affected by constraints related to the availability of landfill space and the operating and decommissioning of landfill sites (DEFF, 2020). To address this issue and improve overall waste management practices an integrated waste management (IWM) approach was proposed and introduced in the country in 1996 (Seadon, 2006).

2.2.1 Defining and understanding sustainable and integrated waste management (IWM) as well as associated environmental management approaches

For many years, it was acceptable to bury waste or discharge it onto the ground, into water sources, or as gaseous emissions released into the atmosphere (Seadon, 2006). However, as societies developed, more organised waste management practices were introduced to deal with the various waste types and the increases in waste volumes (Seadon, 2006). For example, one of the earliest records indicates that Mahenjo-Daro, situated in Southern Pakistan, and Harappa, located in Crete, implemented organised solid waste management practices (de Feo *et al.*, 2014) while King Edward issued an order to ban the burning of soft coal in kilns in London to counteract the degradation of air quality (Molak, 1997). However, as time passed, populations and their waste generation still increased, while landfill space decreased. The need for novel and more integrated approaches to waste management arose, leading to the introduction of the integrated waste management (IWM) approach in 1996 (Seadon, 2006).

IWM is a reference framework for the development and application of new waste management systems and analysing and enhancing current systems (UNEP, 1996). The IWM system effectively combines a variety of strategies for both waste management and waste reduction options, such as reusing, recycling and composting (Cunningham & Maria, 2021). It is essentially the process of making the most sustainable decisions to deal with a specific type of waste (Bosman *et al.*, 2018). Therefore, IWM starts with the classification of all waste materials that pose a threat to the surrounding environment, avoidance of waste production, consideration of various waste management options, focussing specifically on the land-based disposal of waste, the remediation of land contaminated by historical or ongoing waste handling practices as well as establishing and implementing Integrated Waste Management Plans (IWMPs) (Bosman *et al.*, 2018). Typically, and most often in developed countries, the command and control-based and fiscal-based approaches are risk-averse, mainly used to prevent pollution (water, soil, air) and implement waste management objectives and targets, and include enforcement of legislation (environmental law, regulations, authorisations and permits or licencing, norms and standards, and local government by-laws) as well as compliance thereof (Bernstein, 1995).

The South African government prescribes an IWM approach, as is evident from the various waste management approaches available through the country's waste legislation (DEA, 2011). These approaches are discussed in the National Waste Management Strategy and can be applied to reach the objectives of the NEM: WA No. 59 of 2008. In addition, there are various waste management measures to manage the challenges of particular waste streams (Roos, 2020b). However, the most common environmental instruments utilised to achieve IWM in

South Africa are the command and control-based, fiscal-based and civil-based approaches as stipulated in the 2011 National Waste Management Strategy (Roos, 2020b).

The National Waste Management Strategy specifically supports implementing “command and control-based approaches” (Roos, 2020b), such as waste classification and management systems, waste management licencing, industry waste management plans, priority wastes and norms and standards. For example, the NEM: WA provides that some waste management activities trigger the EIA process to obtain a waste management licence (WML) set out in Categories A and B regulated by authorities. At the same time, Category C requires conformance with the National Norms and Standards.

Many technologically advanced countries implement the fiscal-based approach to support the command and control-based approach by introducing more practical pollution and waste management alternatives at much lower costs to the polluter (Bernstein, 1995). Pollution avoidance decreases the financial implications of waste management and clean-up actions and expenses relating to health problems and environmental damage (EPA, 2021). Polluters choose their fate associated with a monetary consequence (incentives or disincentives, levies, taxes, budgeting, penalties and rewards, subsidies, or ecosystem valuation) (Bernstein, 1995).

Fiscal instruments in South Africa are enforced and regulated by employing regulations, norms and standards, permits and licences, by-laws (Roos, 2020b). In South Africa, the National Waste Management Strategy (NWMS) supports implementing the fiscal-based approach that has a financial implication for the polluter. For instance, the extended producer responsibility (EPR) acknowledges that the producer takes responsibility beyond the point of sale for products that may result in waste management challenges, notably where voluntary waste management measures have (South Africa, 2008). Some mechanisms have been employed to implement EPR in South Africa successfully (Roos, 2020b), such as “Deposit refund schemes”, where a monetary incentive is provided to the consumer for returning the packaging of a product (e.g. glass bottles) (Roos, 2020b). South Africa has recently published the Section 18 Regulations to the NEM: WA on 5 November 2021, which refers to the Extended Producer Responsibility (Plastics SA, 2021). It is now law for producers to produce responsibly (command and control-based approach), and producers can collect voluntary fees (fiscal-based approach) from their customers using the generated revenue to support the waste management hierarchy (Plastics SA, 2021).

The third approach that is often applied is the civil-based approach. The civil-based approach enhances measures regarding awareness of environmental issues, for example marketing campaigns, eco-labelling, reporting of enterprise performance, and small-scale enterprise

incentive schemes (Roos, 2020b). For instance, in South Africa, the civil-based approach generally protects or benefits the community at large, such as public participation of stakeholders during the EIA process as a requirement of a waste management licence application (Roos, 2020b). In essence, the civil-based approach empowers civil society to become stakeholders and actively participate in decisions that may impact the environment, human health, and well-being (Toxopeüs & Kotzé, 2017). In addition, society can also benefit from IWM through recycling, reuse of waste material.

Finally, the agreement-based approach is used when organisations voluntarily adopt a system or a standard to improve business processes, comply with prospective customers' needs, or have an advantage in a competitive industry (Du Plessis, 2015). For example, many organisations in South Africa voluntarily adopt the ISO14001: 2015 standard to prove sustainable waste management practices to international customers (Chauke *et al.*, 2017). Therefore, the agreement-based approach will not master sustainable development single-handedly but instead in conjunction with other environmental approaches (Du Plessis, 2015).

The implementation of these different environmental management approaches can assist with achieving the outcomes of Multilateral Environmental Agreements and the global Sustainable Development Goals.

2.2.2 Waste-related Multilateral Environmental Agreements (MEAs) and Sustainable Development Goals (SDGs)

Multilateral Environmental Agreements (MEAs) complement national legislation and support in achieving the Sustainable Development Goals (SDGs) (Gway & Sebego, 2014). In addition, MEAs form the overarching international legislative basis for globally accepted efforts to address possible harm to the environment and human health (Gway & Sebego, 2014). The conventions and treaties discussed below share the common aim of protecting human health and the environment from hazardous chemicals and wastes (UNEP, 2021). The Rio Earth Summit 1992 and Agenda 21 set a series of multilateral environmental agreements (MEAs) in motion concerning hazardous substances and waste (DEA, 2011). Listed below are some MEAs that South Africa is a party to and committed to:

- South Africa adopted the Basel Convention in 1994, which addressed the need to control the transboundary movement of hazardous wastes and their disposal (DEA, 2011). The Basel Convention was established to protect human health and the environment against the adverse effects resulting from the generation, transboundary movements and management of hazardous waste throughout their lifecycles, from

production or manufacturing and transport to final use and disposal (Gway & Sebegu, 2014). If no control were exercised, hazardous waste could have been shipped unregulated into South Africa, damaging the environment and placing the health and safety of humans at risk (Roos, 2020a). Hazardous waste is defined as any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment and includes hazardous substances, materials or objects within business waste, residue deposits and residue stockpiles (South Africa, 2014).

- South Africa has been a signatory to the Stockholm Convention on persistent organic pollutants (POPs) since 2001 (DEA, 2011). This global treaty was established to protect human health and the environment from hazardous, long-lasting chemicals by restricting and ultimately eliminating their production, use, trade, release and storage (Gway & Sebegu, 2014). In response to the convention requirements, South Africa promulgated the prescribed requirements for the phase-out of PCB materials and PCB contaminated materials to ensure that impacts or potential impacts on health, wellbeing, safety and the environment are prevented or minimised (Roos, 2020a). In addition, South Africa set timeframes in which PCB holders must have completely phased out the use of PCB materials and PCB contaminated materials after 2023 and dispose of all PCB waste in their possession after 2026 (Roos, 2020a).
- South Africa became a signatory to the Rotterdam Convention on the prior informed consent procedure for international trade in certain hazardous chemicals and pesticides in 2002 (Oelofse, 2020). This global treaty was established to promote and enforce transparency in importing hazardous chemicals (Oelofse, 2020). The Rotterdam Convention enables parties to alert each other of potentially dangerous chemicals and pesticides (Roos, 2020a). Additionally, providing an initial warning to Governments who might not know that such chemicals may require further assessment of their adverse effects on the environment and human health (Roos, 2020a).

The Multilateral Environmental Agreements (MEAs) discussed above can assist in achieving the global Sustainable Development Goals (SDGs) as these waste-related MEAs can bring South Africa closer to achieving the 2030 SDGs that are applicable to waste management. For example, the Basel, Stockholm and Rotterdam Convention link to the SDGs, which emphasise the need for proper waste management when referring to Goal 12 (responsible consumption and production), Goal 13 (climate action), Goal 15 (life on land) and goal 15 (life below water). Therefore, accepting and implementing the waste-related Multilateral Environmental

Agreements (MEAs) through IWM can take South Africa a step closer to achieving the 2030 SDGs applicable to waste management.

2.3 The current state of waste in South Africa

In South Africa, as the population, income, and urbanisation increase, so too does the amount of waste generated (DEA, 2018). The history regarding poor waste services, poor waste infrastructure and limited enforcement of waste-related legislation poses a risk (Zhakata *et al.*, 2016) as poor waste management can significantly impact the environment, human health, and the economy (DEA, 2018). South African is seen by most as a developing country, however, the majority of the country's larger enterprises are rooted in cutting edge technology bringing about 'developed world' waste, which usually contains large volumes of hazardous substances that can potentially pose a threat to both human and environmental health (Strydom & King, 2018). Therefore, legislative measures are needed to maintain these natural resources' integrity and protect them against the harmful contaminating effects of waste disposal, discharge, and emissions. Approaches must subsequently be more creative in South Africa than in developed countries in order to maintain the balance between economic growth and the protection of human health and resources against environmental degradation (Strydom & King, 2018). Typically, waste disposal at uncontrolled landfill sites dominates in developing countries such as South Africa (Godfrey & Oelofse, 2017).

In 2012, the then Department of Environmental Affairs (DEA) published the third national baseline report on waste (DEA, 2018). The report showed that South Africa produced approximately 108 million tons of trash in 2011 (DEA, 2018). After investigation, it was established that of the 108 million tonnes, 59 million tonnes were general waste, 1 million tonnes were hazardous waste, and 48 million tonnes were "unclassified" (DEA, 2018). In 2017 it was determined that only 11% of all general waste were actually being diverted from landfills (DEFF, 2020). In the same year, South Africa generated almost 67 million tonnes of hazardous waste of which over 93% was landfilled (DEFF, 2020). Misclassification could be a reason for the increase in hazardous waste when comparing waste statistics from 2012 and 2017.

South Africa further faces several compliance challenges, whereby municipalities have issues regarding technical capacity and compliance of municipal landfill sites to waste licence conditions (Roos, 2020a). Furthermore, a general non-compliance has been noticed when adhering to timeframes to rectify contamination, or report waste management data on the South Africa Waste Information System (SAWIS) (Roos, 2020a). In addition, South African citizens in general are often not complying to waste management legislation (Roos, 2020a) further escalating the problem.

The improper management of waste can result in downstream costs, often resulting in higher remedial costs than initially following the correct waste management measures (DEA, 2018). Therefore, it is crucial to acknowledge the importance waste volumes generated in South Africa and the volumes of waste recycled, treated, landfilled, and exported (DEA, 2018). Furthermore, because of lacking aggressive waste avoidance strategies, volumes of waste produced will increase (DEFF, 2020). Therefore, South Africa will require an improved effort for the diversion of waste from landfills as landfill limits are exhausted, which is already acknowledged as unsustainable (DEFF, 2020). The following section will reflect on the legal context within which the aforementioned can be achieved.

2.4 The South African legal framework and waste-related legislation

South Africa is rich in natural resources and internationally known for its unique landscapes and biodiversity (Toxopeüs & Kotzé, 2017). Therefore, legislative measures are needed to maintain these natural resources' integrity and protect them against the harmful contaminating effects of waste disposal, discharge, or emissions (Strydom & King, 2018). The legal framework will now be discussed, beginning with the Constitution and then focussing on waste management related acts and regulations.

2.4.1 The Constitution of the Republic of South Africa (1996)

The constitutional era brought about many changes and transformations within South African communities, amongst which is the right to a clean environment, as stated in Chapter 2 of the Constitution, laying the foundation for effective and sustainable waste management frameworks (Zhakata *et al.*, 2016).

Section 24 of Chapter 2 (Environment) of the Constitution of the Republic of South Africa No.108 of 1996, states that: *"Everyone has the right - a) to an environment that is not harmful to their health or wellbeing; and (b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that; (i) prevent pollution and other degradation, (ii) promote conservation; and (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development"* (South Africa, 1996).

In South Africa, waste management falls under the auspices of the Department of Forestry, Fisheries and the Environment (DEFF, 2020). Accordingly, the DEFF published policies, legislation, strategies, and programs concerning waste management to give effect to their mandate as stated in the Constitution (1996) (DEFF, 2020). Examples of important policies, legislation, strategies, and programs are the National Environmental Management Act 107 of

1998, the National Environmental Management: Waste Act 59 of 2008, and the National Waste Management Strategy (NWMS) of 2011 and 2020 which is a legal requirement of the National Environmental Management Waste Act (DEFF, 2020). The various acts and policies are now discussed in more detail.

2.4.2 The National Environmental Management Act (NEMA) No.107 of 1998

In 1998 the National Environmental Management Act (NEMA) No. 107 was adopted as South Africa's principal environmental framework legislation (Oosthuizen *et al.*, 2018). The NEMA aims to regulate the governance of the environment cooperatively in three ways. Firstly, Chapter 1 of the NEMA provides South African law's general environmental management principles to guide all official environmental decisions (Oosthuizen *et al.*, 2018). Secondly, Chapter 2 aims to promote co-operative governance of the environment (Oosthuizen *et al.*, 2018). It provides the constitutional principle of cooperative management to ensure state powers' effective and informed exercise (Oosthuizen *et al.*, 2018). Additionally, in Section 2 of the NEMA No.107 of 1998, a few guiding principles of sustainable development were introduced to South Africa, including the life-cycle approach to waste management, producer responsibility, the cradle-to-grave principle, the precautionary principle, and the polluter pays principle (Zhakata *et al.*, 2016). Thirdly, Chapter 3 defines functions and processes to coordinate their environmental operations through state organs (Oosthuizen *et al.*, 2018).

Due to the criticality of waste management in South Africa, specific legislation that deals directly with waste management was developed (Zhakata *et al.*, 2016). Therefore, the second purpose of NEMA is to provide for the development of Specific Environmental Management Acts (SEMA) as specified in Chapter 9, and ensure the enforcement and compliance thereof through Chapter 7 (Oosthuizen *et al.*, 2018). Chapter 7 provides the duty of care to prevent and remediate significant pollution, control environmental impacts during incidents and emergencies, enforce the NEMA and Sectoral Environmental Management Acts (SEMA) by the environmental management inspectorate, and finally prosecute environmental offenders (Oosthuizen *et al.*, 2018). The NEMA No. 107 of 1998 makes provision for various Specific Environmental Management Acts (SEMA) some of which are;

- National Environmental Management: Air Quality Act (NEM: AQA);
- National Environmental Management: Biodiversity Act (NEM: BA);
- National Environmental Management: Waste Management Act (NEM: WA); and
- National Environmental Management: Protected Areas Act (NEM: PAA).

Finally, the third purpose refers to the implementation of IWM through Chapter 5, meeting obligations in terms of international agreements (Chapter 6), and the empowerment of state organs to enter into environmental management co-operation agreements with private parties (Oosthuizen *et al.*, 2018). Chapter 5 of NEMA supplies tools to ultimately achieve integrated waste management in South Africa (DEA, 2011). In Chapter 7, the NEMA places a duty of care on anyone who may cause significant pollution or degradation of the environment (DEA, 2011). The EIA process requires them to establish measures to either avoid pollution or remedy the pollution or degradation where it cannot practically be avoided (DEA, 2011).

2.4.2.1 The NEMA EIA Regulations

The Environmental Impact Assessment (EIA) process has been conducted voluntarily both Internationally and in South Africa, dating back to the early 1970s and is acknowledged as one of the most successful policy interventions of the 20th century (Kidd *et al.*, 2018; Morgan, 2012; Roos *et al.*, 2020; Sandham *et al.*, 2020). The EIA process was initially perceived as an environmental tool to protect and conserve the biophysical environment (Kidd *et al.*, 2018; Roos *et al.*, 2020). Furthermore, it is argued that the EIA process is not a decision-making instrument but rather a decision-aiding instrument that provides information to decision-makers on the consequences of their decisions, thereby authorising actions in the full knowledge of their environmental impacts (Kidd *et al.*, 2018). The EIA process became compulsory in South Africa in 1998 (Kidd *et al.*, 2018).

2.4.2.1.1 The EIA process overview

In South Africa, the Environmental Impact Assessment (EIA) process is applicable to the listed activities described in the EIA Regulations, most recently updated in 2017 (Sandham *et al.*, 2020). The regulations contains three listing notices, namely Listing Notice 1 (GNR) to 3. Listing Notice 1 contains those activities that require the basic assessment process to be followed (South Africa, 2014). Listing Notice 2 (GNR) lists the activities for which the scoping and environmental impact assessment procedure is needed and is seen as activities likely to have a significant impact on the surrounding environment, thus necessitating an additional intensive assessment (South Africa, 2014). Listing Notice 3 applies where environmental authorisation, following the basic assessment process, is required before an activity can take place in specific geographical areas (South Africa, 2014). For instance, the development of communication towers in specified protected areas, such as the Free State, Limpopo, Mpumalanga and the Northern Cape is a listed activity on Listed Notice 3 (Kidd *et al.*, 2018).

2.4.2.1.2 The importance of the content of EIA reports

Appendixes 1 to 3 of the EIA Regulations of 2017 stipulate the basic requirements for environmental assessment reports which include basic assessment reports, scoping reports, and environmental impact assessment reports. It is stated that the environmental outcomes, impacts and residual risks of the proposed activity must be set out in the assessment report. In addition, the regulations require the Environmental Assessment Practitioner (EAP) to include the following information in the scope and content of the relevant assessment report (herewith, a few examples of data to be included but are not limited to):

- Details and expertise of EAP;
- Location of the proposed development area (location map, coordinates, 21 digit surveyor-general code);
- Detailed scope and plan of the proposed developments (listed activities);
- Motivating the proposed activity, preferred location and project alternatives;
- Full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity;
- Assessment of each identified potentially significant impact and risk;
- Summary of the findings and impact management measures identified in any specialist report;
- An environmental impact statement; and finally a
- Description of any assumptions, uncertainties, and gaps in knowledge related to the proposed assessment and mitigation measures (South Africa, 2017).

The assessment report must include the necessary information (as indicated above) for the competent authority to consider the application and decide whether to approve or reject the application (South Africa, 2017). In addition to Appendix one, two and three, appendix four covers the contents of the Environmental Management Programme report (EMPr), some of which are similar to the information required for the assessment report. The content of reports and the manner in which they adhere to the requirements set in the regulations provide the basis for a quality review. Research has shown the importance of report quality as it can affect the quality of decisions taken and subsequently the effectiveness of an environmental assessment (Sandham *et al.*, 2008).

2.4.3 The National Environmental Management Waste Act (NEM: WA) No. 59 of 2008

In the past, uncoordinated development of legislation resulted in the promulgation of various separate laws pertaining to waste management (Bosman *et al.*, 2018). These laws and

regulations contained contradictory requirements regarding how specific waste must be dealt with, often resulting in incorrect disposal or discharge of such waste (Bosman *et al.*, 2018).

Some examples of historically fragmented legislation that regulated waste management in South Africa and which is still fragmented to some extent (Zhakata *et al.*, 2016), will now be discussed. The first legislation with a pollution-control component was the Public Health Act of 1919, which prohibited sewage discharge into streams (Bosman *et al.*, 2018). South Africa built on this understanding by acknowledging that the water quality would deteriorate due to pollution, and water shortages would surface, resulting in the promulgation of the Water Act No. 56 of 1956 (Bosman *et al.*, 2018).

In an attempt to address the fragmented legislation in South Africa dealing with waste management the NEM: WA No. 59 of 2008 was promulgated as a Specific Environmental Management Act focussing on the management of waste (Oosthuizen *et al.*, 2018). The NEM: WA No. 59 of 2008 is currently the main instrument guiding waste management in South Africa and offers a more holistic approach to waste management regulation (Bosman *et al.*, 2018). Section 16 of the NEM: WA focuses on responsible waste management, and Section 17 of the NEM: WA No. 59 of 2008 focuses on the waste management hierarchy (South Africa, 2014). The core of both section 16 and 17 is based on the Internationally adopted waste management hierarchy, which requires generators (government, private enterprises and the community) to manage their waste according to the waste management hierarchy by first avoiding and minimising, reusing, recycling, treating and lastly disposing of waste (Taiwo *et al.*, 2008).

The disposal of waste should, therefore, be considered as a last resort and waste prevention interventions are now the most preferred option (Roos, 2020a). Section 27 of the NEM: WA No. 59 of 2008 focuses on littering and states that the landowner must provide containers to ultimately prevent pollution and environmental degradation due to littering (South Africa, 2014).

Furthermore, the NEM: WAA (as amended) September 2014 define 'waste' as follows (South Africa, 2014)

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 reused, 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 reuse, recycling, or recovery has been approved or, after such approval, once it is, or has been reused, recycled, or recovered;
- (ii) where approval is not required, once waste is, or has been reused, 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” (South Africa, 2014).

In addition, the NEM: WA No. 59 of 2008 developed regulations as a regulatory tool with legal standing to ensure compliance with the act's objectives. Therefore, the waste-related regulations will be discussed in the following section.

2.4.3.1 Waste-related Regulations in terms of NEM: WA No. 59 of 2008

The Waste Management Regulations are regulated by the NEM: WA 59 of 2008 to ensure that individuals and organisations conduct certain waste management activities according to the legislative requirements. The following Government Notice Regulations (GNR) were developed in terms of the National Environmental Management Waste Act No. 59 of 2008:

- GNR. No.921 dated 29 Nov 2013: NEMWA – List of waste management activities that have or are likely to have a detrimental effect on the environment;
- GNR. No. 922 dated 29 Nov 2013: Amendment to environmental impact assessment regulations listing notice 1 of 2010;
- GNR. No. 923 dated 29 Nov 2013: Amendment to environmental impact assessment regulations listing notice 2 of 2010; and
- GNR. No. 625 of 13 August 2012: Waste Information Regulations.

The following discussion reflects on a few of these as examples of regulations contributing to the management of waste under NEM: WA:

- The development of the National Waste Management Strategy (GNR. No. 344) was focused on assisting South Africa in achieving the objectives of the NEM: WA (DEA, 2011). The National Waste Management Strategy will be discussed in more detail in section 2.4.4 that focuses mainly on the NWMS.

Section 20 of the NEM: WA provides three lists of waste management activities (Category A, B and C) in GNR No. 921 that have or are likely to have a detrimental effect on the environment (Bosman *et al.*, 2018). Activities listed in Category A only requires a Basic Assessment report as part of the EIA process, while activities listed in Category B requires a complete Scoping and EIA report as part of the EIA process before a waste management licence can be applied for (Bosman *et al.*, 2018). Lastly, activities listed in Category C do not require an EIA but must be conducted and managed according to the national norms and standards relevant to the particular activity. The national norms and standards were developed to give effect to the Polokwane Declaration, Waste Management legislation and support these regulations and will be discussed in the following section.

2.4.3.2 Waste-related National Norms and Standards in terms of the NEM: WA No. 59 of 2008

Norms and standards are a guideline provided by the NEM: WA No. 59 of 2008 to ensure that individuals and organisations conduct certain waste management activities according to the best practice standard. In terms of the National Environmental Management Waste Act No. 59 of 2008, the following Norms and Standards were developed (but not limited to):

- National domestic waste collection standards (GN 21 GG 33935 of 21 January 2011),
- Standards for the storage of waste (GR 926 GG 37088 of 29 November 2013),
- National norms and standards for the assessment of waste for landfill disposal (GR 635 GG 36784 of 23 August 2013),
- National norms and standards for disposal of waste to landfill (GR 636 GG 36784 of 23 August 2013),

The norms and standards apply to some listed activities in Category C of the NEM: WA No. 59 of 2008 (Bosman *et al.*, 2018). The individual that undertakes the specific waste management activity must apply to the Department of Forestry, Fisheries, and the Environment to be registered for norms and standards (Bosman *et al.*, 2018)

The waste-related norms and standards can assist in achieving the set targets set out in documents such as the National Waste Management Strategy and the Polokwane Declaration. For example, protected areas can potentially operate more sustainably in terms of waste management by sorting, shredding, grinding, crushing, screening, or baling of general waste (GR 1093 GG 41175 of 11 October 2017) on their property, which is more economically feasible and can divert waste away from landfills. However, many organisations believe that the effort and cost associated with a waste management licence application for activities like these are

not worthwhile and, as a result, continue to dispose of waste (Roos, 2020a). Therefore, if national norms and standards cover these activities, it will encourage companies to implement waste management measures to divert waste from landfills (Roos, 2020a). In addition, the national norms and standards provide a guideline against which companies can self-regulate (Roos, 2020a). Thus overall, the National Norms and Standards potentially simplify the implementation of the waste management hierarchy.

To give effect to the Waste Management legislation and support GNR. No. 344, the National Waste Management Strategy was established and will be discussed in the following section.

2.4.4 The National Waste Management Strategy

The National Waste Management Strategy (NWMS) is a legislative requirement of the National Environmental Management: Waste Act (NEM: WA) No. 59 of 2008 (DEA, 2011) and was established to achieve the objectives of the NEM: WA (DEFF, 2020). A strategy determines the primary long-term goals and objectives, adopting courses of action and allocating resources to carry these goals (Chandler, 1962). The National Waste Management Strategy (NWMS) suggested several solutions to address South Africa's waste challenges (Zhakata *et al.*, 2016). The Internationally adopted waste management hierarchy requires generators (government, private enterprises and the community) to manage their waste according to the hierarchy of waste management by first avoiding and minimising, reusing, recycling, treating and lastly disposing of waste (Taiwo *et al.*, 2008).

How waste is managed by a country is an essential gauge of the extent of the communities' functionality and how sustainable that society is managed (DEFF, 2020). Therefore, the establishment and implementation of the 2011 and revised 2020 National Waste Management Strategy must positively impact the livelihood of all South Africans through joint social-economic growth and development (DEFF, 2020). Furthermore, the NWMS of 2020 is in line with and reactive to the Sustainable Development Goals (SDGs) of Agenda 2030 adopted by all United Nations (UN) member states and the National Development Plan (NDP) (DEFF, 2020).

In addition, the revision of the NWMS has also considered the outlined national and Medium Term Strategic Framework (MTSF) priorities (DEFF, 2020). The "circular economy" is the foundation on which the NWMS of 2020 is based on (DEFF, 2020). According to the NWMS of 2020, the circular economy is defined as an method to reduce the environmental impact of economic activity to reuse and recycle materials to reduce: (a) the need to abstract unprocessed materials from the environment; and (b) the necessity to dispose waste materials to landfills (DEFF, 2020). The circular economy promotes innovative approaches in product

design, manufacturing, wrapping, and usage (DEFF, 2020). The South African government visualises zero waste being taken to disposal sites, cleaner societies, adequately managed and financially steady waste services, and non-negotiable human behaviour for pollution, litter, and illegal dumping of waste (DEFF, 2020).

The 2020 NWMS is established on three (3) supportive pillars: (i) waste reduction; (ii) practical and sustainable waste services; (iii) compliance, enforcement, and awareness (DEFF, 2020). The 2020 NWMS revision is built on the eight (8) overarching goals of the 2011 NWMS (DEFF, 2020). The eight (8) goals of the 2011 NWMS is as follows; 1) Promote waste minimisation, reuse, recycling, and recovery of waste, 2) Ensure the effective and efficient delivery of waste services, 3) Grow the contribution of the waste sector to the green economy, 4) Ensure that people are aware of the impact of waste on their health, well-being and the environment, 5) Achieve integrated waste management planning, 6) Ensure sound budgeting and financial management for waste services, 7) Provide measures to remediate contaminated land, 8) Establish effective compliance with and enforcement of the Waste Act (DEA, 2011).

The circular economy is the heart of the National Waste Management Strategy as it promotes diverting waste from landfills.

2.4.4.1 The Circular Economy

The National Norms and Standards can simplify the implementation of the circular economy initiatives; therefore, achieving the objectives and targets of the Polokwane Declaration and that of the National Waste Management Strategy will be more likely. Furthermore, due to the improved implementation of the Waste Management Hierarchy, South Africa will be more likely to achieve the waste-related Sustainable Development Goals (SDGs). The foundation of the National Waste Management Strategy (NWMS) of 2020 is the "circular economy" (DEFF, 2020). Circular Economy initiatives promote integrated sustainability using clean energy generation (wind, solar, biofuels, wave, tidal), sustainable transport (electrical vehicles, technologically advanced transportation infrastructure), green buildings (building with eco-friendly material or recycled material), green manufacturing (sustainable consumers and producers), green tourism practices, sustainable waste management (reduce, reuse recycle) altogether contributing to green job creation (The Green Jobs Initiative, 2012). It unlocks the door to protect societies and ecosystems and successfully adapt to the global climate change crisis, preventing developing environmental threats and non-renewable resources (water and energy) depletion (United Nations Industrial Development Organisation, 2012). This is achieved by applying a mixture of environmental instruments, which consists out of the following approaches; the Agreements-based (voluntary instrument to use in the quest to sustainability), Civil-based (social inclusion on

equal access to clean energy, decrease in poverty, increased job creation, and income opportunities, gender equality) as well as Fiscal-based (eco-tax introduction; shifting the focus towards resources and pollution) (The Green Jobs Initiative, 2012).

Overall the Circular Economy advocates moving away from the linear economy approach to a circular economy approach (Ellen MacArthur Foundation, 2015). The Ellen MacArthur Foundation has identified six actions that governments or organisations can use during their transition from a linear economy towards a circular economy: Regenerate, Share, Optimise, Loop, Virtualise, and Exchange, which forms the Resolve Framework (Ellen MacArthur Foundation, 2015).

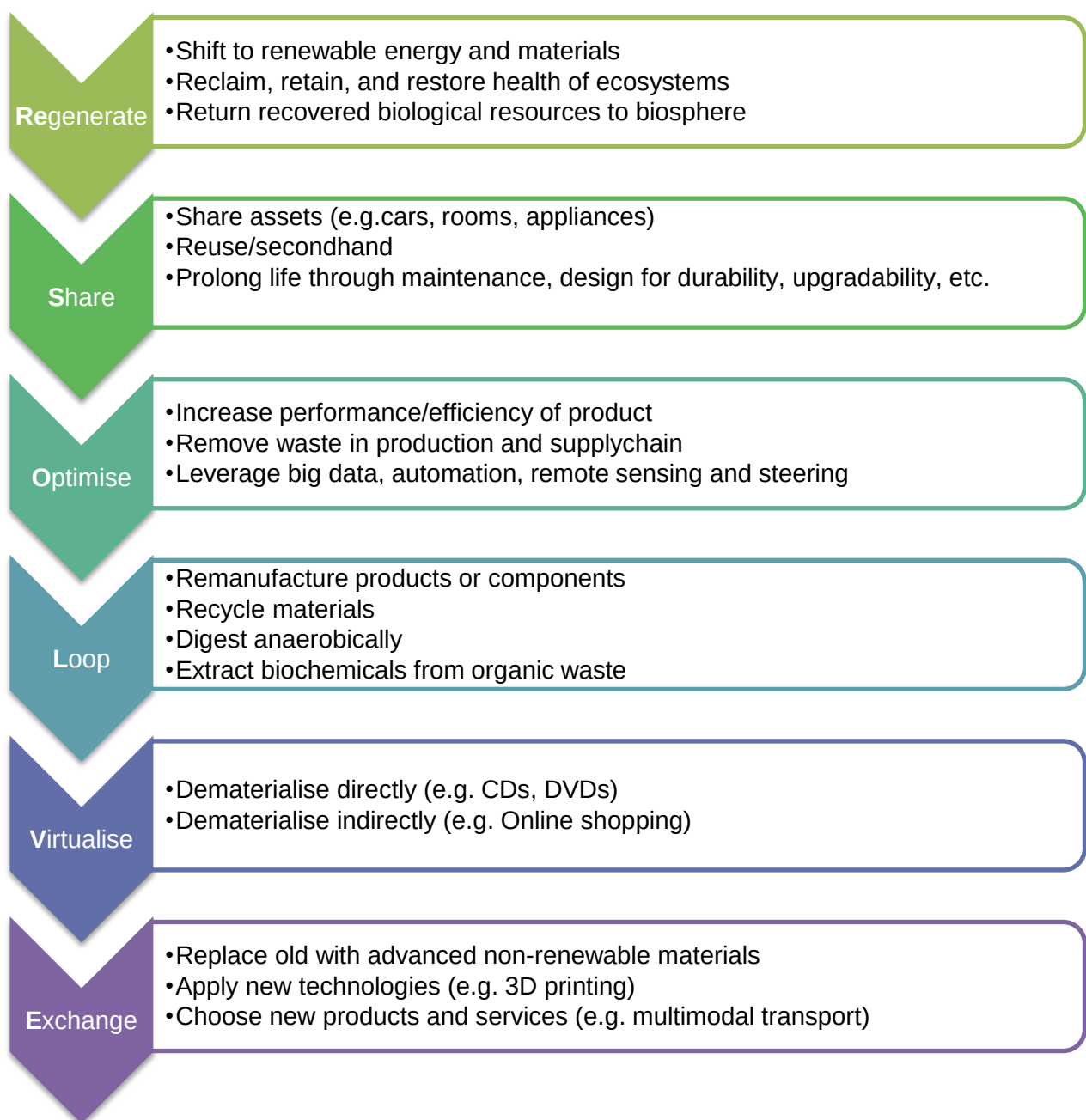


Figure 2-1: The Resolve Framework (adapted from: Ellen MacArthur Foundation, 2015:9)

In the next section, the link between protected areas and waste management will be discussed.

2.5 Protected areas and waste management

Protected areas play a significant role in achieving ecological sustainability, climate change adaptation, maintaining ecological infrastructure networks, and preserving the ecosystems that provide essential ecosystem services to communities (DEA, 2016). Unfortunately, this natural infrastructure of protected areas is free of charge for the most part (DEA, 2016). Hence it is often disregarded, although significant for supporting human livelihoods and well-being (DEA, 2016). South Africa's protected areas are widely distributed and managed by a mixture of bodies which includes South African National Parks (SANParks), provincial parks boards and private organisations (DEA, 2016). SANParks, however, is one of the leading conservation organisations in South Africa (Paterson, 2009), followed by others such as Ezemvelo KwaZulu-Natal Wildlife, which manage approximately 120 protected areas in KwaZulu-Natal, including the Maloti-Drakensberg Park World Heritage Site (KZNWild, 2021). Protected areas typically have high environmental importance due to various natural resources of incalculable value (Przydatek, 2019). Therefore, it is essential to pay special attention to the issue of waste management in these areas (Dunjić *et al.*, 2017).

2.5.1 The protected area system in SA

Protected areas in South Africa are a respected instrument for safeguarding the nation's natural and cultural inheritance (Paterson, 2009). Protected areas are proclaimed areas of land or sea that are protected by law and managed mainly for biodiversity conservation (DEA, 2016). They are geographical spaces recognised, dedicated, and managed, through legislation or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values (Dudley, 2008). According to the National Environmental Management Protected Areas Act (NEM: PAA) (57 of 2003), PAs in South Africa are classified, managed, and protected in terms of the following categories;

- Special nature reserves, national parks, nature reserves, and protected environments;
- World heritage sites;
- Marine protected areas;
- Specially protected forest areas, forest nature reserves, and forest wilderness areas;
- and

- Mountain catchment areas (Strydom & King, 2018).

Currently, all protected land in South Africa accounts for 11,280,684 ha (or 112,807 km²), which 9.25 % of the total area of SA (StatsSA, 2020). Seen in context, if protected land in South Africa was a province, it would be larger than the North West, KwaZulu-Natal or Mpumalanga (StatsSA, 2020).

2.5.2 Importance of waste management in PAs (issues from literature)

The leading activities within protected areas include tourist influx, development of amusement activities, and a rise in visitors (Balmford *et al.*, 2009). Activities related to protected areas may impact sensitive surroundings. Although tourists and their associated travelling and recreational activities form an essential part of the modern individual's life, these activities are also a source of waste generation (Dunjić *et al.*, 2017; Przydatek, 2019; Steg & Vlek, 2009). For example, as part of a littering assessment study in Madrid, Spain, on average, 11.65 m²/ha of litter were recorded in zones with high visitation levels to natural and protected areas (Rodríguez-Rodríguez, 2012). Over 75% of all waste was paper, cardboard, and plastic while 88% of litter coverage was large pieces over 25 cm² in size (Rodríguez-Rodríguez, 2012). According to the United Nations Environment Program (UNEP), an estimated 4.8 million tonnes of solid waste is produced by tourists (Dunjić *et al.*, 2017). In the areas where tourist proliferation are found, two point sources of waste generation are identified (Przydatek, 2019). The first point of waste generation is linked to the location of the accommodation and catering facilities (e.g. holiday centres, hostels, museum facilities, management offices, viewpoints, tourist and recreational facilities) (Przydatek, 2019). The second point of waste generation is linked to communication routes (including tourist routes), pedestrians, water, and motorsports, in the areas around recreation centres, on the seacoast, on the outskirts of other natural and artificial water reservoirs, and along watercourses (Łuniewski, 2015). These factors adversely affect the environment and degrade vegetation (Przydatek, 2019).

For example, the rapid growth of visitor numbers to the Kruger National Park, probably one of South Africa's most popular tourist destinations, has led to a massive rethink of the Park's waste management (Shelley, 2014). For instance, 1.45 million visitors visited the Kruger National Park during the peak summer period in 2013 (Shelley, 2014). If effectively implemented, environmentally sound waste management can add to the conservation of sensitive areas (such as PAs) by merely avoiding and reducing negative impacts (Przydatek, 2019). Therefore, South Africa regulates developments in protected areas by requiring EIAs to reduce the potential waste-related impacts. Furthermore, environmental awareness of visitors and staff members can benefit waste management associated with developments in protected areas. The following

section will reflect on the manner in which EIA can contribute to the implementation of waste management measures in protected areas, especially in the case of new developments.

2.6 The role of EIA in waste management

According to the NEMA 107 of 1998, developments in protected areas require authorisation from the Department of Forestry, Fisheries and the Environment as the competent Authority (South Africa, 1998) since the proposed developments' trigger the activities and thresholds listed in GNR 983 and GNR 985 of the Environmental Impact Assessment Regulations, 2014. In South Africa, infrastructure development in protected areas has been subject to mandatory EIA for approximately two decades (Sandham *et al.*, 2020). Principle 17 of the 1992 Rio-declaration on Environment and Sustainable Development states that EIA should be the tool of choice for achieving sustainable development (Devuyst, 2000; Roos *et al.*, 2020). Environmental Impact Assessment (EIA) informs decision-makers and associated stakeholders of the ecological, social, and economic consequences (opportunities and constraints) of implementing a proposed development to determine the best practical course of action (Meyer & Steenkamp, 2020).

Currently, in South Africa, two EIA processes can be followed, namely the Scoping and EIA process or the Basic Assessment process (Meyer & Steenkamp, 2020). The Basic Assessment process is conducted for small-scale, straightforward developments with shorter timeframes proposed in low sensitivity environments (ENVASS, 2017). The activities are low risk, associated impacts are generally manageable, and solutions are easily implemented (ENVASS, 2017). The full Scoping and Environmental Impact Reporting process is conducted for large-scale, complex, and often more controversial developments with longer timeframes which are often proposed in sensitive environments (ENVASS, 2017). The associated activities are high risk relating to pollution, waste, and degradation (ENVASS, 2017). In addition, these impacts are also difficult to predict and manage (Meyer & Steenkamp, 2020).

2.6.1 How EIA can contribute to waste management (specifically in PAs)

The EIA process informs decision-makers and associated stakeholders of the ecological, social, and economic consequences (opportunities and constraints) of implementing a proposed development to determine the best practical course of action (Meyer & Steenkamp, 2020). As part of this process EIA has the potential to inform decision-makers on the possible consequences related to waste specifically. Most EIA report templates include a waste management component that should be completed. The following questions are typically included in the waste management section of the EIA report: a) will any aspect of the activity, produce waste that will require a waste permit in terms of the NEM: WA 59 of 2008, b) specify

the estimated waste volumes that will be produced during the construction and operational phases and c) how and where (specify the registered landfill site) will the waste be disposed of?

This information, if adequately answered, will provide the competent authority and relevant stakeholders with information to inform their decision in terms of waste management to approve or reject proposed developments in protected areas. Ultimately, an EIA report of good quality can significantly support the potential of the EIA to contribute to informed decision-making for developments in protected areas to ensure more sustainable outcomes (Sandham *et al.*, 2020).

2.6.2 Findings from EIA quality reviews

Although the waste-related component within EIA reports can theoretically contribute to the Competent Authority's decision, the extent and confidence to which the required waste information is completed can be questioned. Therefore, various studies have been conducted to evaluate the quality of EIAs (Alberts *et al.*, 2021; Huysamen, 2019; Linde, 2006; Sandham *et al.*, 2008; Sandham *et al.*, 2020; Sandham & Pretorius, 2008) as well as specific components, such as EIA follow-up (Alberts *et al.*, 2021; Alers, 2016; Huysamen, 2019; Linde, 2006; Sandham *et al.*, 2008; Sandham *et al.*, 2020; Sandham & Pretorius, 2008) and the quality of EIA within specific contexts such as hazardous waste management (Thorpe, 2014), renewable energy projects (Boshoff, 2013), explosive industry projects (Van der Vyver, 2008), solar photovoltaic projects (Scheepers, 2019), mining activities (Hoffmann, 2007; Sandham *et al.*, 2008) and filling stations (Kruger, 2020).

Herewith are a few waste-related findings from the EIA reports mentioned in the paragraph above. Poor performance regarding waste issues were found, which is a matter of concern since waste is an essential part of any development due to the associated impacts that can develop over time (Sandham & Pretorius, 2008). Additionally, waste generation, estimation and disposal were found as a weakness (Scheepers, 2019). In contrast, a somewhat interesting finding was discovered in a quality review of EIA reports in the mining industry. The satisfactory performance of issues relating to waste management is slightly surprising since the waste section often requires improvement (Sandham *et al.*, 2008). However, it is most likely due to the excessive waste volumes in the mining industry and the strict requirements for rehabilitation, including the financial provision of the rehabilitation trust (Sandham *et al.*, 2008).

There has only been a limited number of research studies conducted on EIA quality and effectiveness in protected areas (Sandham *et al.*, 2020; Alberts *et al.*, 2021). The research by Sandham *et al.* (2020) indicated that dealing with waste management within the PAs was a particular weakness; especially calculating significance and determining associated mitigation

measures. A case study on selected EIA reports was conducted by Wylie *et al.* (2018) by evaluating the quality of EIA reports for proposed tourism-related infrastructure developments in the protected areas of South Africa. It was established that there is a need to provide better estimates on the waste quantities anticipated for proposed projects. If this issue concerning waste quantities is left unattended, the receiving environments are susceptible to degradation, thus resulting in ecological functions being compromised (Whyllie *et al.*, 2018). The issue of waste quantity estimation was also confirmed by Sandham (2020), who concluded that the methods for obtaining volumes of waste generation need improvement. Apart from this research very little has been conducted focussing primarily on the waste management measures within EIA reports in protected areas in South Africa.

2.7 Conclusion

Due to the reality of South Africa's waste challenges, an integrated waste management approach has been adopted to improve waste management in South Africa (Seadon, 2006). The successful implementation of such an IWM approach can contribute towards the global Sustainable Development Goals (SDGs), especially those concerning waste management. Typically, waste disposal at uncontrolled landfill sites still dominates in developing countries such as South Africa (Godfrey & Oelofse, 2017). As a result, landfilling hazardous and general waste is the dominant solution in South Africa, with approximately 90% of waste generated in South Africa disposed of at the landfill (Godfrey & Oelofse, 2017).

SA is a developing country with a goal to balance the socio-economic challenges of a community that is unequal while attempting to conserve environmental resources (DEFF, 2020). The 1996 Constitution of SA gave the right to an environment that is not harmful to your health or wellbeing. In 1998 the National Environmental Management Act (NEMA) No. 107 was adopted as South Africa's principal environmental framework legislation (Oosthuizen *et al.*, 2018). Due to the criticality of waste management in South Africa, specific legislation that deals directly with waste management was established (Zhakata *et al.*, 2016). The NEMA No. 107 of 1998 gave effect to the NEM: WA No. 59 of 2008 as a Specific Environmental Management Act focused on managing waste (Oosthuizen *et al.*, 2018). The Government Notice Regulations, Norms and Standards, and the National Waste Management Strategy are used to support South Africa's waste legislation and assist in achieving the objectives of the Act.

If effectively implemented, environmentally sound waste management can contribute to the management of sensitive areas by merely avoiding and reducing negative impacts (Przydatek, 2019). Therefore, South Africa regulates developments in protected areas to reduce the potential waste-related impacts. In South Africa, infrastructure development in protected areas

has been subject to mandatory EIA for approximately two decades (Sandham *et al.*, 2020). However, limited research focuses on the waste management component in the EIA reports of protected areas in South Africa and the little that has been done indicates that waste management measure are largely neglected.

CHAPTER 3 - METHODOLOGY

3.1 Introduction

This chapter presents the methodological design that was applied to achieve the aim of the study. Given the nature of the aim, which was to review the quality of waste management measures in EIA reports for developments in protected areas within South Africa, a qualitative research approach relying on a case study design was used, with documentation review as the method for data capturing and analysis. Documentation reviews on scoping reports, assessment reports, and specialist studies across different sectors and contexts are widely used to evaluate the quality (measured against waste-related legislation and best practices) of EIAs in South Africa (Sandham *et al.*, 2020).

First, the research design is discussed, followed by data collection, documentation review, the description of the review protocol, data analysis and finally, the ethical considerations.

The researched literature is linked to the aim of the research study to review the quality of waste management measures within EIA reports for developments in protected areas in South Africa. Literature was accessed through academic search engines such as Google Scholar and the North-West University's (NWU) library website. Documents from the websites of government departments and other relevant organisations were also considered. The following keywords and phrases related to the study were used to find the relevant literature, such as "waste", "waste management", "protected areas and waste management", "EIAs conducted in South African protected areas", and "waste and tourism" in different combinations. The keywords and phrases mentioned above yielded various literature sources.

3.2 Research design

The research study employed a case study approach, which is preferred when researching EIA quality (Alberts *et al.*, 2021; Retief, 2007; Robson, 2002; Yin, 2003). The case study approach enables the researcher to capture information on a more explanatory basis with 'how', 'what' and 'why' questions (Crowe *et al.*, 2011). The EIA case studies that were selected will be discussed next.

3.3 Data collection

The then Department of Environmental Affairs EIA database was consulted, from which six EIA case studies were selected. According to Eisenhardt (2002), there is no ideal number of case studies to be utilised, and a number between four and ten cases is generally sufficient (Alberts

et al., 2021; Eisenhardt, 2002). Eisenhardt (2002) argues that with fewer than four (4) cases, it becomes complicated to compile a theory and understanding, while with more than ten (10) cases, the information is likely to be challenging to deal with due to its complexity and volume and the data become saturated with larger samples.

The six cases were chosen based on the following criteria:

- The EIA study areas must be in a formally protected area in South Africa;
- The EIA reports should represent more than one province in South Africa;
- The proposed development must be tourism-based;
- Different types of developments must be selected;
- The EIA report must be relatively recent (2016 - 2017); and
- The cases must involve various role players (i.e. different environmental assessment practitioners, competent authorities, and specialists).

The six selected EIA reports for developments of PAs in South Africa are listed below in tabular form (case study number, a brief case study description mentioning the name of the PAs), in no particular order, and are dealt with anonymously in the discussions:

Table 3-1: Summary of selected case studies within South African protected areas

Case Study Number	Case Study Description
1	Proposed education centre and self-catering dormitories and associated infrastructures and structures at Mphaphuli Nature Reserve, Limpopo Province.
2	Proposed upgrade of the Kraalbaai day visitor's facilities, West Coast National Park, Western Cape Province.
3	Proposed construction of staff accommodation and associated infrastructure in the Barberton Nature Reserve, Mpumalanga Province.
4	Proposed extension of the existing Kirkman's Camp in the Sabi Sand Game Reserve, Mpumalanga Province.
5	Proposed Dawid Kruiper Rest Camp and picnic sites at the Veertiende and Bedinkt waterholes in the Kalahari Gemsbok National Park, Northern Cape Province.
6	Proposed Shangoni gate development in the Kruger National Park, Limpopo Province

Figure 3-1 indicates the geographical location of the selected cases, with cases representing five of the nine provinces in South Africa.

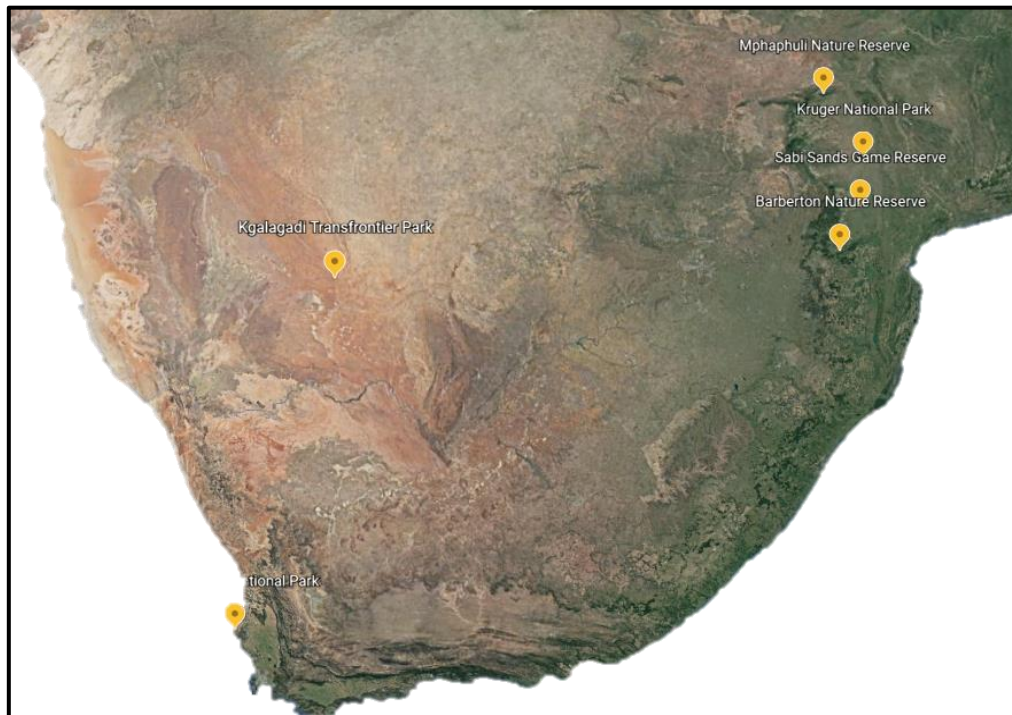


Figure 3-1: Location of the PAs of the selected EIA case studies

3.4 Documentation review

As discussed, EIA documents were sourced from the then Department of Environmental Affairs EIA database. The documentation review of the research study included the following resources: Environmental Impact Assessment (EIA) Reports, Environmental Management Programme Reports (EMPRs) and Records of Decision (RODs). The documentation is essentially the data in a qualitative review, and documentation review was therefore used as it is the most suitable method to review such documentation. The mentioned documents associated with each of the six selected EIA case studies were reviewed with a specific focus on the waste management component. A review protocol was developed to this end and is discussed next.

3.5 Description of review protocol

The Lee and Colley review package is typically used internationally and in South Africa to review EIA documentation (Mounir, 2015; Sandham *et al.*, 2010) as it is well established and widely known (Sandham & Pretorius, 2008). Although the original Lee and Colley review package was not applied in this study, its principles were used to inform the development of a review protocol tailored towards the review of waste management measures in EIA. The

principles of the original Lee and Colley package are discussed first, followed by a description of the adapted review protocol that was applied in this study.

3.5.1 The original Lee and Colley review package

The Lee and Colley review package (Lee & Colley, 1992; Lee *et al.*, 1999) has often been utilised to assess the quality of EIA reports both internationally and in South Africa (Sandham *et al.*, 2020; Whyllie *et al.*, 2018). It was primarily intended for use by planning authorities, environmental authorities and agencies, consultancies, researchers, and non-governmental organisations involved in the environmental assessment process (Lee & Colley, 1992; Lee *et al.*, 1999). The Lee and Colley review package consists of review criteria which are organised in a hierarchical structure which includes the overall quality assessment of the EIA report (Level 4), assessment of review areas (Level 3), assessment of review categories (Level 2) and assessment of sub-categories (Level 1) (see Figure 3-2) (Lee & Colley, 1992; Lee *et al.*, 1999). Level 1 is informed by so-called key performance indicators (KPIs) which are grouped under key performance areas (KPAs). Each of the KPIs is assessed using a criteria indicating the extent to which an EIA is conforming to the indicator. The same hierarchical principles, concepts of KPAs and KPIs, as well as the same approach to evaluation scores, were applied in the development of the review protocol used in this research.

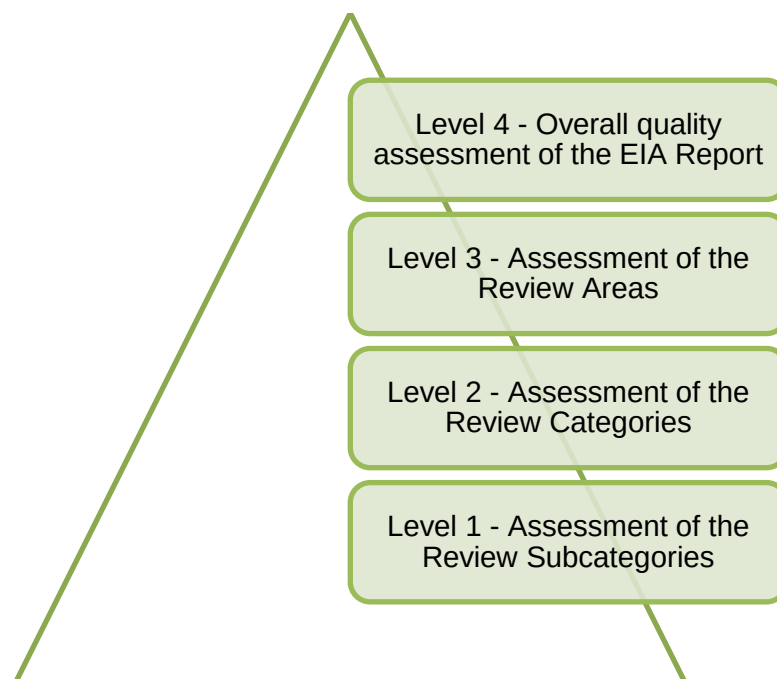


Figure 3-2: The original assessment pyramid for EIA reports (Lee & Colley, 1992; Lee *et al.*, 1999)

3.5.2 The adapted Lee and Colley review package

The adapted Lee and Colley review package is based on the original Lee and Colley review package's logic, approach, and basic principles. However, the hierarchical structure of the original Lee and Colley review package was slightly altered to suit the context of the review and the explicit focus on waste management measures. One level (review area) was subsequently excluded as the distinction was not made between various areas of interest, as would be the case in an overall EIA review. The overall quality assessment of the EIA report (Level 3 - the top of the hierarchy), assessment of key performance areas (KPAs) (Level 2), and assessment of key performance indicators (KPIs) (Level 1) consequently make up the levels of the review protocol applied in the research (see Figure 3-2). The development of KPAs and KPIs was informed by relevant waste management-related legislation and policy such as NEMA No.107 of 1998, NEM: WA No. 59 of 2008, GN R. 634 as well as the NWMS. A total of four KPAs was developed, which are informed by 17 KPIs (Table 3-2). The review protocol was designed in such a way as to indicate the extent to which the waste management components within the sampled EIA reports adhered to the relevant legal and other requirements.

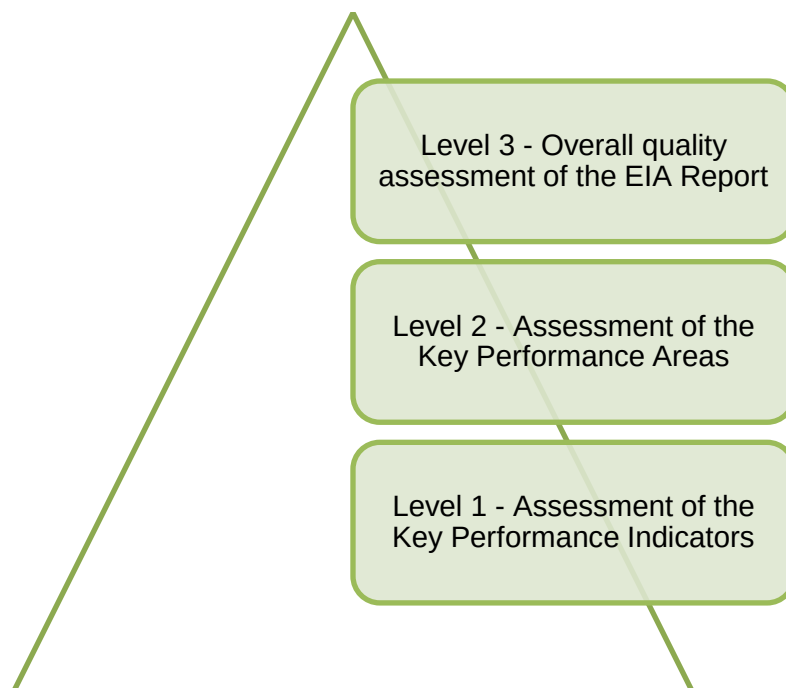


Figure 3-3: The adapted assessment pyramid for EIA reports

Corresponding legal and other requirements	Requirement or principle	KPAs and KPIs	Waste related information
KPA 1: Consideration of waste-related information			
*NEM:WA 59 of 2008 (Chapter 6) and the National Waste Information Regulations (GNR. 625 of 2012)	The Minister must establish a national waste information system for the recording, collection, management and analysis of data and information that must include (a) data on the quantity and type or classification of waste generated, stored, transported, treated, transformed, reduced, re-used, recycled, recovered and disposed of	KPI 1.1	Were estimations of expected waste volumes provided? (any methods identified considered to obtain the quantity of wastes)?
KPA 2: Consideration of implementation measures for the waste management hierarchy (avoidance, re-use, recycling, recovery and separation at source)			
* The Constitution of 1998 Section 24	Implementation of waste management measures to minimise, re-use, recycle and recover waste, including the separation of waste at the point of generation for the classification of waste.	KPI 2.1	Were measures considered to support waste avoidance and reduction?
* NEMA Section 28		KPI 2.2	Were measures considered to support waste re-use?
* NEM:WA 59 of 2008 Part 2 (Section 7)		KPI 2.3	Were measures considered to support waste recycling?
* NEM:WA 59 of 2008 Part 2 (Section 16)		KPI 2.4	Were measures considered to support waste recovery?
* NEM:WA 59 of 2008 Part 3 (Section 17)	The Minister must establish a national waste information system for the recording, collection, management and analysis of data and information that must include (a) data on the quantity and type or classification of waste generated, stored, transported, treated, transformed, reduced, re-used, recycled, recovered and disposed of.	KPI 2.5	Were measures considered (as last resort) to support waste treatment as well as the disposal route?
* The waste classification and management regulations (WCMR)		KPI 2.6	Were measures considered to separate waste types?
GN R. 634, regulates waste classification and management		KPI 2.7	Were the expected waste types (construction waste, domestic waste, hazardous waste, others) identified?
* Goal Nr.1 of the 2011 NWMS			
KPA 3: Consideration of pollution prevention measures			
* NEM:WA 59 of 2008 Part 2 (Section 16)	Ensure measure are implemented to correctly manage waste to prevent endangering the health and/or the environment from noise, odour or visual impacts	KPI 3.1	Were waste management measures considered where activities might cause impacts to health and/or the environment or cause a nuisance through noise, odour or visual impacts?
* NEM:WA 59 of 2008 Part 2 (Section 16)	Ensure measures are implement to prevent any person from contravening the NEM:WA 59 of 2008	KPI 3.2	Were measures considered to prevent any employee or any person from contravening the NEM: WA No. 59 of 2008?
* NEM:WA 59 of 2008 Part 2 (Section 16)	Ensure measures are implement to prevent waste from being used for any unauthorised purpose	KPI 3.3	Were waste measures considered to prevent any waste from being used for any unauthorised purpose?
* NEM:WA 59 of 2008 Part 2 (Section 16)	Ensure measures are implemented to manage any potential contamination	KPI 3.4	Were remediation measures considered to prevent potential waste pollution that occurred, arises or may arise? Measures may include: investigations, assessment and evaluation of the impact of the waste in question on the environment?
* NEMA Section 28 * Goal No. 4 of the 2011 NWMS	Ensure that people are aware of the impact of waste on their health, well-being and the environment	KPI 3.5	Were any awareness training considered to inform and educate employees regarding the environmental risks of their work and how their tasks must be performed to avoid causing significant pollution or degradation of the environment?
* NEM: WA 59 of 2008 Part 2 (Section 16)	Ensure measures are implemented to cease, modify or control any act or process causing pollution, environmental degradation or harm to health	KPI 3.6	Were any management measures considered to cease, modify and/or control any act, activity or process causing the pollution, environmental degradation or harm to health?
* NEM: WA 59 of 2008 3A Part 6 (Section 27)	Ensure (a) that sufficient containers or places are provided to contain litter that is discarded by the public; and (b) that the litter is disposed of before it becomes a nuisance, a ground for a complaint or causes a negative impact on the environment	KPI 3.7	Were any measures considered to prevent littering?
KPA 4: Consideration of beneficial use/circular economy initiatives			
* The Polokwane Declaration	Ensure initiatives are implemented to achieve the target of zero waste to landfills of 70% waste to landfills by 2022	KPI 4.1	Were there any proposed initiatives considered to achieve the zero waste to landfill targets of the Polokwane Declaration by 2022?
* The Circular Economy	Ensure reducing the environmental impact of economic activity by means of reuse and recycling processed materials	KPI 4.2	Were there any proposed initiatives considered as a waste sector contribution to the green or circular economy/beneficial use?

Table 3-2: The adapted Lee and Colley review package

3.6 Data analysis

The relevant documentation associated with each of the six cases was reviewed by applying the review protocol and evaluating each KPI based on predefined evaluation scores. The evaluation scores (Table 3-3) ranged from A to F and reflected the extent to which a KPI was addressed through the EIA. An A indicating 'well performed, no important tasks left out', which would be the most desirable rating, while F indicated 'very unsatisfactory, important tasks poorly done', which would represent the most undesirable rating. Once all cases were reviewed, the consolidated results were summarised in a meta-matrix table and discussed, first on a case by case-based and then per KPA and across cases (See Table 4-1). To assist in visualising the results, a colour code was developed and presented in Table 3-4 below.

Table 3-3: Evaluation scores for the adapted Lee and Colley review package

Evaluation Scores	Score Description
A	Well performed, no important tasks left out
B	Satisfactory, only minor omissions
C	Just satisfactory despite only minor mistakes
D	Just unsatisfactory because of only minor mistakes
E	Not satisfactory, significant mistakes
F	Very unsatisfactory, important tasks poorly done or not at all

Table 3-4: Colour groupings for evaluation scores

Evaluation Scores	Score Description	Colour Code
A - B	Satisfactory performance – overall well performance	
C - D	Average performance – overall average performance	
E - F	Unsatisfactory performance – overall weak performance	

3.7 Ethical consideration

The research proposal was submitted to the North-West University, Faculty of Natural and Agricultural Sciences Ethics Committee (FNASEC) for approval. As the research did not involve any human participants, animals or had any environmental impacts, it was classified as 'no risk' and ethics approval was granted. An ethics number (NWU-00460-21-A9) was provided by the Faculty of Natural and Agricultural Sciences Ethics Committee (FNASEC).

3.8 Limitations of the research

As discussed in Chapter 1 this research is limited to environmental assessments conducted for tourism-related developments within South African National parks. The findings should, therefore, be considered within this context and is not generalisable to other contexts.

The Lee and Colley review method, from which the review protocol used in this research was adapted, recommends the use of at least two independent reviewers when reviewing documentation. However, as this research is the product of a Master's study the candidate was the primary reviewer. To address this concern, the outcomes from the review process were reviewed by both the supervisor and co-supervisor and discussed with the primary reviewer. Where ratings seemed unclear, clarity was sought, and interpretation discussed.

3.9 Conclusion

This chapter discussed the methodological design that was utilised to address the aim of the research. Six cases were selected for review against the selection criteria. The cases represent EIA studies conducted for development projects in various Protected Areas across South Africa.

The review protocol was adapted from the original Lee and Colley review package and was informed by relevant waste management legislation and guidelines. The results obtained through the application of the review protocol will now be presented and discussed.

CHAPTER 4 - RESULTS AND DISCUSSION

4.1 Introduction

For this research study, the six selected EIA case studies were reviewed for proposed developments in protected areas within South Africa. The studies were reviewed by means of an adapted Lee and Colley review package specifically designed to evaluate the waste management component in the EIA reports. Results of the cases are analysed and discussed, first case-by-case to identify interesting and significant findings and then cross-case to identify trends observed across all cases. A summary of the findings is presented in a meta-matrix as Table 4-1 below and are subsequently be discussed in detail.

Table 4-1: Meta-matrix indication performance scores across KPIs

KPA 1 Waste related information	KPA 2 Implementation measures of the waste management hierarchy					KPA 3 Pollution prevention measures									KPA 4 Circular economy/beneficial use initiatives		
	KPI 1.1	KPI 2.1	KPI 2.2	KPI 2.3	KPI 2.4	KPI 2.5	KPI 2.6	KPI 2.7	KPI 3.1	KPI 3.2	KPI 3.3	KPI 3.4	KPI 3.5	KPI 3.6	KPI 3.7	KPI 4.1	KPI 4.2
KPI criteria	Were estimations of expected waste volumes provided? (any methods identified of obtaining quantity of waste?)	Were measures considered to support waste avoidance and reduction?	Were measures considered to support waste re-use?	Were measures considered to support waste recycling?	Were measures considered to support waste recovery?	Were measures considered (as last resort) to support waste treatment as well as the disposal route?	Were the expected waste types (construction waste, domestic waste, hazardous waste, others) provided?	Were waste separation measures considered?	Were waste management measures considered where activities might cause impacts to health and/or the environment or cause a nuisance through noise, odour or visual impacts?	Were any measures considered to prevent any employees or any person from contravening the NEM: WA No. 59 of 2008?	Were measures considered to prevent waste from being used for any unauthorised purpose?	Were remediation measures considered to manage potential waste pollution that occurred, arises or may arise? Measures may include: investigations, assessment and evaluation of the impact of the waste in question on the environment?	Were any awareness training considered to inform and educate employees regarding the environmental risks of their work?	Were any management measures considered to cease, modify and/or control any act, activity or process causing the pollution, environmental degradation or harm to health?	Were any measures considered to prevent littering?	Were there any proposed initiatives considered to achieve the zero waste to landfill targets of the Polokwane Declaration by 2022?	Were there any proposed initiatives considered as contribution of the waste sector to the circular economy?
Case Study 1	F	F	F	C	F	F	A	A	C	F	F	B	F	F	A	F	F
Case Study 2	C	F	F	C	F	F	B	C	B	F	B	F	B	F	A	F	F
Case Study 3	A	F	F	C	F	F	F	D	C	F	C	F	C	F	A	F	F
Case Study 4	F	E	E	E	F	F	E	E	F	F	F	F	F	F	F	F	F
Case Study 5	C	F	F	F	F	F	B	B	B	F	F	F	B	F	A	F	F
Case Study 6	F	F	A	F	F	F	F	D	F	F	F	F	F	F	F	F	F

4.2 Case-by-case analysis and discussion

The information presented in this section provides an overview of the results obtained from reviewing each of the EIA case studies. The performance of KPIs is, therefore, discussed per case. Those that performed exceptionally well indicate an area of strength, and those that scored very low indicate an area of weakness and are highlighted in the following discussion. Priority is given to interesting and significant findings and possible reasons discussed with support from the literature.

4.2.1 Results related to Case study # 1

The EIA process was followed for the following developments:

- Modern education centre;
- Ablution block;
- Five self-catering dormitories (including walkways, parking and braai facilities);
- Water and electricity infrastructure (including septic tank); and
- Upgrading of existing fence as well as constructing a new fence.

Overall, Case Study # 1 performed relatively poorly, as 11/17 KPIs performed unsatisfactorily, 2/17 KPIs performed average, and only 4/17 KPIs performed satisfactorily. The following interesting findings were recorded while evaluating Case Study # 1 and will now be discussed.

According to Chapter 6 of the NEM: WA No. 59 of 2008, waste information such as the quantity and type or classification of waste generated, stored, transported, treated, transformed, reduced, reused, recycled, recovered, and disposed of should be entered into the South African Waste Information System (SAWIS). The review found that no waste quantity estimation was done in accordance with Chapter 6 of the NEM: WA No. 59 of 2008, as the EAP argued that it was too difficult to calculate, and no attempt was therefore made **KPI 1.1 = F**. The NEM: WA No. 59 of 2008 adopted the internationally accepted Waste Management Hierarchy. Therefore, waste prevention interventions are the most preferred option and should be the first to be applied to any waste stream, and disposal should be considered only as a last resort (Roos, 2020a). However, waste management measures to avoid, reduce, recover and re-use waste were not considered at all **KPI 2.1, 2.2, 2.4=F**. The EIA report stipulated that recyclable waste should be transferred to a recycling facility, but although recycling is promoted, no implementation measures were provided in any of the reviewed documents **KPI 2.3=C**. The EIA report stated that waste generated during the construction phase would be disposed of in an environmentally sound manner **KPI 2.5=F** but in accordance with the waste management hierarchy, waste disposal is regarded as the least favourable choice (DEA, 2011). Waste

separation was, however, encouraged, and the relevant separation categories were provided, such as glass, paper, metals, plastics, organic waste, and hazardous waste **KPI 2.7=A**. No additional waste management measures were provided regarding where the waste must be transported to. An important finding was that the waste management hierarchy were barely considered and that zero waste to landfill or circular economy initiatives were also not regarded in waste management measures **KPI 4.1=F & KPI 4.2=F**. However, this is not surprising since the initiatives for zero waste to landfill and the circular economy are directly based on the implementation of the waste management hierarchy (avoiding, reducing, reusing, recycling waste, treatment and disposal). PAs typically have high environmental importance due to various natural resources of incalculable value (Przydatek, 2019). If effectively implemented, environmentally sound waste management can add to the conservation of sensitive areas (such as PAs) by merely minimising negative impacts (Przydatek, 2019). It was, therefore, encouraging that the EIA specifically referred to the deployment of litter collection bins to prevent unwanted litter and wind-blown waste into the surrounding environment **KPI 3.7=A**. The EIA further considered activities that may result in waste **KPI 3.1=C** and proposed some additional measures to ensure the management of possible pollution **KPI 3.4=B**.

4.2.2 Results related to Case Study # 2

The EIA process was followed for the development of the following infrastructure:

- Two buildings (management complex & ablution facilities);
- Three parking areas;
- Two new boardwalks; and
- Sewerage system.

Overall, Case Study # 2 also performed relatively poorly, as 9/17 KPIs performed unsatisfactorily, 3/17 KPIs performed average, and only 5/17 KPIs performed satisfactorily. The following interesting findings were recorded while evaluating Case Study # 2 and will now be discussed.

Although Chapter 6 of the NEM: WA No. 59 of 2008 states that waste information on all types of waste should be entered into the South African Waste Information System (SAWIS), the EIA process considered only construction waste quantities is calculated **KPI 1.1=C**. Therefore, the projected waste quantities of the operational phase were not calculated as required by Chapter 6 of the NEM: WA No. 59 of 2008 which would impact waste management planning with regard to the project. The EIA report states that all waste should be disposed of at a registered landfill site **KPI 2.5=F**, although disposal to land is regarded as the least preferred option. In addition, it

stipulates that waste should be separated **KPI 2.7=C** to be recycled **KPI 2.3=C**, which suggests that the implementation of the waste management hierarchy were considered, but that some aspects such as avoidance and re-use were not considered **KPI 2.1=F & KPI 2.2=F**. Although the separation of waste was considered, only two categories: hazardous and non-hazardous waste, were specified **KPI 2.6=B**. Under NEM: WA, Section 16, the burning and burying of waste were cited as prohibited activities in the EIA report **KPI 3.1=B & KPI 3.3=B**. According to Section 16, waste should be managed in a manner that does not endanger the health and/or environment or cause a nuisance through noise, odour or visual impacts as a control measure for pollution prevention (South Africa, 2008). Additionally, a statement was made that environmental awareness training will be conducted to educate and empower employees regarding the waste management hierarchy **KPI 3.5=B**. This action should prove beneficial to staff and subsequently also tourists regarding environmentally sound waste management (Du Plessis, 2010). According to the EIA report workers from the immediate environment will be encouraged to take their waste home with them at the end of each day. However, this waste management measure is not sustainable as the problem will only be transferred to another local area where the waste is even more likely to be managed incorrectly, which will damage the local rural communities where municipal waste services are not available. Finally, no zero waste to landfill or circular economy initiatives were suggested because the waste management hierarchy was initially not implemented for the proposed development **KPI 4.1=F & KPI 4.2=F**.

4.2.3 Results related to Case Study # 3

The EIA process was followed for the construction of the following developments:

- Ten-bed staff accommodation unit;
- Office block;
- Entrance gate with guardhouse; and
- Parking area and paved road surface linking the entrance gate.

Overall, Case Study # 3 performed very poorly, as 10/17 KPIs performed unsatisfactorily, 5/17 KPIs performed average, and only 2/17 KPIs performed satisfactorily. The following interesting findings were recorded while evaluating Case Study # 3 and will now be discussed. Waste expected to be generated during the construction and operational phases was estimated **KPI 1.1=A**. With this vital information, waste management planning can be better executed during the development planning phase. As a result, the KPI was scored as satisfactory. The EIA report states that waste will be disposed of at a registered landfill site **KPI 2.5=F**, however, this is regarded as the least preferred option. It was further stated that waste separation and recycling opportunities would be investigated **KPI 2.3 and KPI 2.7**, which left uncertainty, as no

further information was provided as to how and when. According to NEMA No. 107 of 1998, individuals should be aware of the impact of waste on their wellbeing, health, and the environment. The EIA subsequently proposed environmental training to educate visitors and staff members on waste management and the associated waste management hierarchy **KPI 3.5=C**. The more educated and empowered individuals become, the more responsible their actions concerning waste management. In accordance with Section 27 of the NEM: WA No. 59 of 2008, litter prevention is prioritised by employing scavenger proof bins **KPI 3.7=A**. In addition, no burning or burying of waste will be allowed to prevent any unwanted noise, air quality and odour impacts **KPI 3.1=C**.

4.2.4 Results related to Case Study # 4

The EIA process will be followed for the construction of the following developments:

- Lounge, dining, and bar area overlooking the river;
- A deck extending from the front of the building;
- Nine individual luxury rooms, with bedroom, lounge, bathroom as well as a deck with pool and outside showers;
- Spa/Massage Room;
- Wooden footbridge;
- Parking facilities;
- Staff accommodation;
- Laundry and housekeeping store;
- Sewerage system;
- Water and electricity; and
- Electric fence.

Overall, Case Study # 4 performed relatively poorly, as 17/17 KPIs performed unsatisfactorily. According to Chapter 6 of the NEM: WA No. 59 of 2008, waste information such as the quantity and type or classification of waste generated, stored, transported, treated, transformed, reduced, reused, recycled, recovered and disposed of should be entered into the South African Waste Information System (SAWIS). No waste volumes were estimated, neither construction nor operational **KPI 1.1=F**, as required by NEM: WA No. 59 of 2008, Chapter 6. Therefore, effective waste management planning could not have been conducted and waste data could not have been entered into the South African Waste Information System. The EIA report states that a proactive attitude towards waste management is adopted, however, it is an empty statement without any implementation guidelines. The minimisation, recycling, and separation of solid waste were mentioned. However, no implementation methods were offered or discussed **KPI**

2.1=E, KPI 2.3=E & KPI 2.7=E. The EAP focused on waste disposal by utilising rubbish bins as a waste management solution **KPI 2.5=E**, even though it was the least preferred option when the focus was on implementing the waste management hierarchy. Goal No. 4 of the National Waste Management Strategy (NWMS) requires training to be provided to stakeholders, staff or visitors. Even though environmental awareness training and awareness is a legal requirement, it was not considered to educate employees or visitors regarding correct waste management practices or prevent littering in protected areas **KPI 3.5=F**. Zero waste to landfill and green economy initiatives were not touched on **KPI 4.1 & KPI 4.2** either, which again indicates that the waste management hierarchy is mentioned but not necessarily seriously considered for implementation.

4.2.5 Results related to Case Study # 5:

The EIA process was followed for the construction of the following developments:

- A 28-bed tourism accommodation facility; and
- Picnic sites consisting of ablutions and ten picnic tables per site.

Overall, Case Study # 5 performed relatively poorly, as 11/17 KPIs performed unsatisfactorily, 1/17 KPIs performed average, and only 5/17 KPIs performed satisfactorily. The waste estimation for the construction phase was not calculated, although estimated waste quantities were calculated for the operational phase **KPI 1.1=C**. As a result, waste management planning could be conducted for only the operational phase of the proposed development. The EIA stated that generated waste was to be collected and separated into the following categories, e.g. glass, paper, metals, plastics, organic waste, and hazardous waste **KPI 2.7=B**. SANParks promoted the development of their sorting and recycling policy **KPI 2.3=F**, but no additional information was given in the EIA report. The disposal of all waste generated was then acknowledged as the contractor's responsibility **KPI 2.5=F**, indicating that the waste management hierarchy was not implemented. According to Section 27 of the NEM: WA No. 59 of 2008, the landowner should prevent littering. Therefore, the EIA report further stated that littering was to be prevented by providing scavenger proof bins at strategic points **KPI 3.7=A**. However, this waste management measure only ensures that waste is contained and that waste is not wind-blown across the environment but does not deal with its disposal. Lastly, no circular economy initiatives were considered to minimise the need to extract raw materials from the environment, and to minimise the need to dispose of waste were not considered **KPI 4.1** (DEFF, 2020).

4.2.6 Results related to Case Study # 6:

The EIA process was followed for the construction of the following developments:

- Visitor's entrance gate into the park;
- Reception facility;
- New surfaced road;
- Three high-level bridges;
- Picnic site;
- Camping site; and
- Tented rest camp.

Overall, Case Study # 6 performed very poorly, as 15/17 KPIs performed unsatisfactorily, 1/17 KPIs performed average, and only one 1/17 KPIs performed satisfactorily. First, the waste quantities were not estimated at all **KPI 1.1=F**, resulting in a total waste information gap, which again confirmed previous findings of weak performance regarding the descriptions and quantities of the types of waste (Sandham *et al.*, 2008). Therefore, waste management planning could not have been conducted effectively in any way. As mentioned earlier, waste prevention interventions are the most preferred option. They should be the first to be applied to any waste stream, while disposal should be considered a last resort (Roos, 2020a). Unfortunately, waste disposal is still the dominant waste management solution in South Africa (Godfrey & Oelofse, 2017). Only solid construction waste was considered to be used for filling, rehabilitation, and stormwater infrastructure in some instances **KPI 2.2=A**, prevention measures were largely absent **KPI 2.1,2.3,2.4,2.6=F** **KPI 2.7=D**.

In contrast with Section 16 (responsible waste management) and 17 (waste management hierarchy) of the NEM: WA No. 59 of 2008, waste disposal was suggested, although disposal should be the least favourable option **KPI 2.5=F**. No pollution prevention measures were considered **KPA 3=F** and no mention was made of the circular economy **KPA 4=F**. If materials were reused and recycled according to the 2020 National Waste Management Strategy, then the circular economy could have been given effect.

4.3 Cross-case analysis and discussion

The information presented in this section provides cross-case analysis of the results obtained from reviewing all six EIA case studies. This is done to identify common trends pertaining to the quality of the waste management measures within the sample of EIA reports and reflects both strengths and weaknesses. The discussion is presented in terms of the four KPAs. Therefore, the KPAs that performed exceptionally well indicated an area of strength, and those that scored

very low an area of weakness. Observed trends are discussed and possible reasons are offered. The scores assigned to each KPI for each of the six EIA reports included in the review sample are summarised in Table 4-1.

4.3.1 KPA 1: Waste-related information

The first KPA focuses on calculating waste management quantities as this information is crucial for planning and managing waste in protected areas. Chapter 6 of the NEM: WA No. 59 of 2008 states that waste information such as the quantity and type or classification of waste generated, stored, transported, treated, transformed, reduced, reused, recycled, recovered and disposed of should be entered into the South African Waste Information System (SAWIS).

Three of the EIA case studies performed overall satisfactory, as waste-related information was generally estimated (**KPI 1.1 A=1, C=2, F=3**). In these evaluated EIA reports, waste quantities were either calculated for the construction or the operational phase, or both. The remaining three EIA case studies' performance was unsatisfactory as waste quantities were calculated for only some of the project phases and, in some cases, not at all. One particular environmental assessment practitioner (EAP) argued that the calculation would be too difficult and subsequently made no attempt. The findings for KPA 1 partially support those of Whyllie *et al.* (2018) who called for improved estimates of the anticipated waste quantities for proposed projects. Furthermore, it was found that if waste quantities are left unattended, the receiving environments are susceptible to degradation, thus resulting in dysfunctional environments (Whyllie *et al.*, 2018). The trending outcomes of KPA 1 further also support the findings from Sandham *et al.*, (2020). This study found that the methods and descriptions to obtain waste types and volumes for treatment and disposal (including routes) needs to be improved (Huysamen, 2019; Sandham *et al.*, 2020). These results suggest that EIAs for protected areas need to significantly strengthen the consideration of waste-related aspects to better align with international trends of emphasising and promoting best practice waste management in protected areas (Dunjić *et al.*, 2017; Hockings *et al.*, 2000; Sandham *et al.*, 2020). Failing in this area could result in neglecting waste-related pollution impacts, which should be a critical thought for any development in a protected area (Sandham *et al.*, 2020). Additionally, there is a need for minimising waste since distances to landfills are relatively far away, and on-site landfills may potentially affect protected species in PAs. Lastly, performance cannot be measured if quantitative data are not available.

4.3.2 KPA 2: Implementation measures of the waste management hierarchy

The second key performance area (KPA) focuses on considering the waste management hierarchy as part of the waste management measures for the proposed development. The National Environmental Management Waste Act (NEM: WA) No. 59 of 2008 adopted and incorporated the internationally accepted Waste Management Hierarchy. Implementing the waste management hierarchy is crucial to prevent significant impacts on protected areas (Przydatek, 2019). Therefore, waste prevention interventions are the most preferred option and should be the first to be applied to any waste stream, and disposal should be considered only as a last resort (Roos, 2020a).

Waste avoidance and reduction (**KPI 2.1 E=1, F=5**) and recovery (**KPI 2.4 F=6**) measures were not considered in the sample of EIA reports resulting in these KPIs performing unsatisfactory. In addition to these, only one of the case studies considered waste management measures for waste reuse (**KPI 2.2 A=1, E=1, F=4**) and waste recycling (**KPI 2.3 C=3, E=1, F=2**) was considered in only three case studies. However, the proposed implementation measures pertaining to recycling were not specified. Instead, simple statements were made, such as “waste shall be recycled”. The recyclable waste types were further not identified, making waste management planning even more challenging. In the sample of case studies, disposal to landfills was the most favoured waste management option for the disposal of waste (**KPI 2.5 F=6**). However, it may have been regarded as the more straightforward solution as it still dominates South Africa, even though it is the least preferred disposal option when considering the waste management hierarchy. According to the 2011 National Waste Information Baseline (NWIB), 108 million tons of waste were generated where 10% of the waste stream was recycled, and 90% was landfilled (Green Cape, 2019). To add to the problem, South African Municipalities face challenges regarding waste service delivery and the diversion of waste to landfills (Earth, 2020). The lack of proper consideration of alternatives to disposal in projects such as these only contributes to the problem and will reinforce the practice of landfilling as the dominant solution in South Africa (Godfrey & Oelofse, 2017). More must, therefore be done to drive the planning and implementation of the waste management hierarchy, especially through EIA and even more so within sensitive areas such as PAs.

4.3.3 KPA 3: Pollution prevention measures

Section 16 (1) (d) of the National Environmental Management Waste Act (NEM: WA) No. 59 of 2008, focuses on the general duty in respect of waste management. It states that the waste license holder must take reasonable measures to ensure that human health and the environment are not endangered through odour or visual impacts resulting from poorly

managed waste. In four of the case studies, waste management measures were considered to safeguard the health of humans and the environment from waste-related odours or visual impacts, which resulted in an overall average to satisfactory performance. However, it should be noted that two of the cases did not consider these waste management measures (**KPI 3.1 B=2, C=2, F=2**). In addition to Section 16 (1) (d), Section 16 (1) (f) of the National Environmental Management Waste Act (NEM: WA) No. 59 of 2008 requires the holder of waste to prevent waste from being used for any unauthorised purpose. No specific waste management measures were considered to prevent individuals from contravening the NEM: WA 59 of 2008 in this regard. In two cases, it was highlighted that waste should not be utilised for any unauthorised purpose, such as burning and burying. (**KPI 3.3 B=1, C=1, F=4**). Therefore, KPI 3.3 performed overall unsatisfactory. Even though correct waste management is vital for global sustainable development (Lenkiewicz, 2016), only three case studies considered environmental training to empower visitors and employees and coach individuals on the expected waste management (**KPI 3.5 B=2, C=1, F=3**). Section 16 (3) (b) of the National Environmental Management Waste Act (NEM: WA) No. 59 of 2008 further requires the holder of waste to consider remediation measures for potential environmental pollution. Even though this is a legal requirement, no efforts to cease, modify or control any act or process from waste-causing pollution were considered in any case studies (**KPI 3.6 F=6**) and KPI 3.6, therefore, showed overall unsatisfactory performance. However, waste management measures that prevent littering were fairly well-considered by proposing scavenger-proof bins at strategic points (**KPI 3.7 A=4, F=2**). As part of a littering assessment study in Spain, on average, 11.65 m²/ha of litter were recorded in zones with high visitation levels to natural and protected areas (Rodríguez-Rodríguez, 2012). Therefore, this waste management measure is very relevant in protected areas. In general, the consideration of pollution prevention measures showed poor performance. Although some aspects were considered as discussed above, it is evident that the EIA struggled to effectively deal with the concept of pollution prevention measures in a holistic manner. In light of the sensitivity of the areas for which these EIAs were conducted, this is especially concerning and a shortcoming that should be carefully considered.

4.3.4 KPA 4: Circular economy initiatives

The National Waste Management Strategy (NWMS) is a legislative requirement of the National Environmental Management: Waste Act No. 59 of 2008 (DEA, 2011). However, the foundation of the National Waste Management Strategy of 2020 is known as the "circular economy" (DEFF, 2020).

As discussed above, the second key performance area (KPA 2) deals with implementing the waste management hierarchy while the fourth key performance area (KPA 4) deals with the

associated circular economy initiatives. The two key performance areas (KPAs) are subsequently linked to each other. Although the South African government supports a zero waste policy which should result in cleaner and healthier communities supported by adequately managed and financially steady waste services (DEFF, 2020), no zero waste to landfill initiatives (**KPI 4.1 F=6**) or circular economy initiatives (**KPI 4.2 F=6**) were considered in any of the EIAs. While the phrase “zero waste” may not be entirely achievable, it is possible through the implementation of the waste management hierarchy to reach the set targets of the Polokwane Declaration (DEFF, 2020). Zero waste can be achieved by means of implementing waste management measures that consider reusing, recycling, recovery of waste as the preferred management options, instead of disposing of waste to landfills (DEFF, 2020). By implementing the waste management hierarchy, contributions could have been made to promote the circular economy initiatives. The KPA, therefore, does not reflect the vision of the government and others (Godfrey & Oelofse, 2017) that the circular economy is the future.

4.4 Conclusion

The following significant findings were noted during the discussions of the results in Chapter 4. The quantity, type and classification of waste generated, stored, transported, treated, transformed, reduced, reused, recycled, recovered and disposed of was partially considered in KPA 1. However, in half of the case studies, no waste quantity estimation was conducted as it was either deemed too difficult or just wholly left out for no specified reason. Therefore, this finding partially aligns with the outcomes of the Whyllie *et al.* (2018) research that there is a need to provide improved estimates on the anticipated waste quantities for proposed developments. Furthermore, if waste quantities are left unattended, the receiving environments are susceptible to degradation, possibly resulting in dysfunctional environments (Whyllie *et al.*, 2018). The trending outcomes of KPA 1 agree with the findings from Huysamen (2019) and Sandham *et al.* (2020), that the methods and descriptions to obtain waste types and volumes for treatment and disposal (including routes) are in need of improvement (Huysamen, 2019; Sandham *et al.*, 2020). Failing in this area could result in neglecting waste-related pollution impacts, which should be a critical thought for any development in a protected area (Sandham *et al.*, 2020).

The NEM: WA No. 59 of 2008 adopted the internationally accepted Waste Management Hierarchy. Therefore, waste prevention interventions are the most preferred option and should be the first to be applied to any waste stream, and disposal should be a last resort (Roos, 2020a). The second key performance area (KPA 2), which focused on the waste management hierarchy, was scored relatively low, as the preferred method of waste management was identified as waste disposal. However, disposal unfortunately still dominates in South Africa, as

approximately 90% of waste generated in South Africa are landfilled (Godfrey & Oelofse, 2017). Although PAs require specific consideration, it seemed as if waste management sections were merely cut-pasted from other previous EIAs. Adding to the problem is the challenges faced concerning municipal waste service delivery and the diversion of waste to landfills (Earth, 2020). Furthermore, alternative waste management options usually are more expensive than landfilling (Earth, 2020).

In terms of key performance area three (KPA 3), waste pollution prevention measures were, except for litter prevention methods, very poorly considered. The EIA reports considered litter-proof bins, which indicates that waste will be contained as per Section 27 on the National Environmental Management: Waste Act No. 59 of 2008. By considering litter-proof bins, a similar situation as the one where waste resulted in a visual impact that affected aquatic and terrestrial environments in the Kruger, can be avoided (Mabibibi *et al.*, 2021).

No zero waste to landfill or circular economy initiatives were mentioned in any of the EIAs (KPA 4). If the waste management hierarchy had been even partially implemented, the waste management measures would have given at least some effect to zero waste to landfill initiatives and/or the green economy initiatives. However, that was not the case. As a result, KPA 4 is not aligned with Godfrey and Oelofse (2017), which suggest that the circular economy is the future. This is critical for PAs since on-site landfills are often necessary due to distances from formal landfills. In addition, on-site landfills have implications for scavenger attraction and groundwater pollution, affecting protected species.

According to the evaluation scores, the EIA reports varied significantly through all the case studies, because the information provided by the Environmental Assessment Practitioners (EAPs) also differed significantly, which is most likely due to a lack of guidance from the Competent Authority in terms of specific waste management requirements. The results aligned with the finding of Wylie *et al.* (2018), which states that waste management measures were found to be borderline. Therefore, the continuous improvement regarding waste management measures in protected areas and their consideration in EIA processes will be further discussed in the following chapter.

CHAPTER 5 - CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This study aimed to review the quality of waste management measures within EIA reports for developments in protected areas within South Africa.

Improperly managed waste poses a threat to public health and can result in environmental degradation and pollution on a global scale, which has further damaging social-economic effects (Bosman *et al.*, 2018; Wilson & Rogero, 2015). Africa faces various complex waste management problems (UNEP, 2019). In addition, poor waste management practices are one of the biggest contributors to pollution and land degradation (UNEP, 2019). Waste is typically disposed of without consideration of environmental and human health impacts (UNEP, 2019). This is critical for PAs since on-site landfills are often necessary due to distances from formal landfills. In addition, on-site landfills have implications for scavenger attraction and groundwater pollution, affecting protected species.

South Africa faces several environmental challenges such as an increase in developments to counter a struggling economy by accommodating a growing population's developmental requirements (Alberts, 2010). However, these challenges are not only limited to urban areas but also affects rural, agricultural, and sensitive environmental areas such as protected areas. The impacts of waste within sensitive areas such as PAs must, therefore, be considered. The EIA process has been identified as one of the mechanisms through which waste management measures can be considered and implemented in PAs, in particular for new developments. The extent to which EIAs are considering waste management measures has, however, not been extensively researched, which is what this research aimed to do. The limited research generally found waste management measures to be relatively poorly reflected in EIA processes (Wylie *et al.*, 2018). The following section reflects on the key conclusions emanating from this study.

5.2 Conclusions

Overall the six case studies performed unsatisfactorily as most Key Performance Indicators (KPIs) scored relatively poor.

As an overview, the quantity, type and classification of waste generated, stored, transported, treated, transformed, reduced, reused, recycled, recovered and disposed of was only partially considered in KPA 1. However, in half of the case studies, no waste quantity estimation were conducted as it was either deemed too difficult or just wholly left out for no specified reason. As a result, waste management planning could not have been performed effectively and waste

quantities and types could not have been captured in the South African Waste Information System. The EIAs generally failed to adequately consider the implementation of the waste management hierarchy as most of the EIAs did not reflect on the extent to which different components of the hierarchy could and should be implemented. As a result, both KPA3 (pollution prevention measures) and KPA3 (circular economy activities) were largely neglected. In the context of protected areas these findings are especially concerning as these areas are highly sensitive to any anthropogenic impacts. If waste management measures are not properly considered in EIA processes for developments in PAs, it will likely result in impacts that could have been avoided but which will likely impact both the surrounding environment as well as the visitor experiences in these areas.

Suppose the waste component within the EIA report was correctly completed with all the necessary information to achieve the objectives of the NEM: WA No.59 of 2008. In that case, EIAs could genuinely be regarded as an assessment tool that can play a role in preventing and minimizing waste and assisting with the transition from a linear economy to a circular economy (UNEP, 2018). However, the waste component of the six EIA reports varied significantly, which gives the impression that this information is not adequately considered by EIA decision makers, as all EIAs were approved regardless of this shortcoming. For example, some reports provided detailed estimates of envisaged waste quantities and types, while others only indicated that their waste would be taken to a landfill site. This suggests that the waste component in EIA reports is not deemed a determining factor in the approval process and is something that should be addressed by the regulator. If the expectation that waste measures should be properly considered and reflected in EIA reports is not communicated to officials and consultants, EIAs will continue to fall short in this regard. Currently, the standard basic assessment (BA) report template in terms of the Environmental Impact Assessment Regulations of 2014, promulgated in terms of the NEMA No.107 of 1998, does not require extensive waste information, which could be regarded as a gap from the competent authority that was responsible for providing the necessary checklists. The standard report template is designed as a tick box principle. Therefore, the Environmental Assessment Practitioners only provided the minimum information required by the Competent Authority.

Therefore, it is concluded that the waste management component within the sample of EIA case studies did not provide efficient information for the Competent Authority to make a well-informed decision.

5.3 Recommendations and areas of future research

It is recommended that the Competent Authority (CA) improve existing EIA report templates to reflect waste management measures more directly and in line with the requirements of the National Environmental Management Waste Act (NEM: WA) No.59 of 2008 and its associated regulations. Additionally, the Environmental Assessment Practitioners (EAPs) should ensure that the information that they include in terms of waste management should be in line with the requirements of the National Environmental Management Waste Act (NEM: WA) No.59 of 2008 and its associated regulations.

Finally, it is recommended to research the actual implementation of the waste management measures of EIA reports in protected areas (PAs) within South Africa. Even if the EIA reports contain perfect waste management measures, there is no assurance that the considered measures are implemented. The EIA process is an assessment process and is not responsible for implementing the considered waste management measures.

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