AN EVALUATION OF SOLID WASTE MANAGEMENT PRACTICES AT CARNIVAL CITY, BRAKPAN

By

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I declare that the above dissertation is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.
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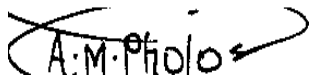

31 January 2019

SIGNATURE DATE

Dedication

This research is dedicated to my family. And to my late daughter Oreneile, she is dearly missed and her memory continues to inspire me. May her soul rest in peace.

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Abstract

Waste management is a global concern and landfill sites are facing a crisis of handling capacity. This is worsened by the fact that many consider landfilling as an environmentally responsible and cost-effective solution to waste disposal. Carnival City generates vast quantities of solid waste on a daily basis and most of it ends at the landfill, which it acknowledges that it's a wastage of recoverable resources, hence its commitment of "zero-waste-to-landfills by 2022". This study evaluated solid waste management practices at Carnival City Casino in Brakpan. Informed by an interpretive paradigm, qualitative methods including interviews, observations, photographs and document reviews were used to collect data.

Based on abductive reasoning, the waste management hierarchy and the ISO 14001 standard were used as frameworks for recontextualising and presenting the collected data. The waste hierarchy sets out the preferred order of waste management practices, from the most favoured to the least preferred option. The effectiveness of current waste management practices is limited as Carnival City heavily depends on landfilling and implement waste minimisation, reuse, recycling and recovery on a small scale. Absence of a waste separation at source policy limits recycling activities significantly. The researcher noted the presence of some areas of conformity to South African legislation pertaining to waste management, international standards and Carnival City's standard operating procedures, and some areas of good practice.

The study showed that there is room for improving concerning Carnival City's current waste management practices. It recommends that waste management training and awareness be undertaken on a continuous basis to improve current practices and ensure that more waste is diverted from landfill sites. Investment into waste to energy technologies should be considered to help Carnival City to meet Sun International's commitment of "zero-waste-to-landfills by 2022". Recycling must be maximised and its environmental and financial benefits be highlighted.

The research recommends developing of a separation at source policy and its enforcement by the Environmental Committee as the absence of the documented procedures results in deviations from environmental objectives. Offenders who do not follow procedures should be duly punished. It also recommends that a disciplinary action and a fine be introduced for kitchens that will deviate from the policy.

Key terms

Waste management practices, Carnival City, Waste hierarchy, Waste separation at source, Reuse, Recycling, Waste disposal, Zero waste, Landfilling, Effectiveness,

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List of Acronyms

CAQDAS	Computer Aided Qualitative Data Analysis Software
CSI	Corporate Social Investment
CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DWAF	Department of Water Affairs and Forestry
EMS	Environmental Management System
HWEEE	Hazardous Waste Electrical and Electronic Equipment
IWMSA	Institute of Waste Management of Southern Africa
ISO	International Organisation for Standardisation
LED	Light Emitting Diodes
LPG	Liquefied Petroleum Gas
NEMA	National Environmental Management Act
NEMWA	National Environmental Management: Waste Act
NWMS	National Waste Management Strategy
NOWCS	National Organic Waste Composting Strategy
OHSAS	Occupational Health and Safety Assessment Series
PET	Polyethylene Terephthalate
PPE	Personal Protective Equipment
QSR	Qualitative Software Research
RDF	Refuse-Derived Fuel
SAWIC	South African Waste Information Centre
SMMEs	Small, Medium and Micro Enterprises
SRI	Socially Responsible Investment
UNEP	United Nations Environment Programme
USEPA	United States Environment Protection Agency

Chapter 1: Introduction

1.1 Background

The New Zealand Waste Minimisation Act (Act No. 89 of 2008, s.5, p.8) defines waste as

> "(a) … anything disposed of or discarded; and (b) includes a type of waste that is defined by its composition or source (for example, organic waste, electronic waste, or construction and demolition waste); and (c) to avoid doubt, includes any component or element of diverted material, if the component or element is disposed of or discarded"

Waste is any unwanted, rejected, abandoned, discarded or disposed of material, substance or object 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 (National Environmental Management: Waste Amendment Act, (NEMWA) Act 26 of 2014, s.1).

Solid waste means any garbage or refuse, sludge from a wastewater treatment plant or air pollution control facility and other discarded material resulting from industrial, commercial, mining and agricultural operations, and from community activities (USEPA, 2016). Solid waste is unwanted and useless abandoned garbage arising from human or animal activities and are discarded or intended to discard (Otchere, Anan & Bio, 2015). Solid waste is categorised into general (non-hazardous) and hazardous waste depending on the risk it poses (SAWIC, 2015). General waste is non-hazardous and does not pose immediate environmental or health hazards (NEMWA, Act 59 of 2008, s.1). NEMWA (Act 59 of 2008, s.1) describes hazardous waste as any waste containing organic or inorganic elements and has the potential to have a detrimental environmental and health impact.

Categorisation of solid waste into different types depends on the sources and characterisation can be based on physical properties (India Water Portal, 2017). Organic waste, combustibles, non-combustibles, ashes/dust and residues, bulky waste, dead animals, construction waste and hazardous waste are some of the different categories of solid waste (Zhou, Meng, Long, Li, & Zhang, (2014). Organic waste is biodegradable and it includes food waste and garden and lawn clippings. Food waste is any waste that is raw, edible or cooked, and is generated during preparation and consumption of meals (Oelofse *et al*., 2016). Combustibles include paper and wood, while tins, and cans and bottles are non-combustibles. Refrigerators, stoves, furniture, tyres, trees, branches and other large appliances are types of bulky waste. Hazardous waste include oil, fluorescent lighting, battery acid and medical waste (DEA, 2013). Hazardous waste is flammable, corrosive, reactive and toxic to humans and the environment (USEPA, 2016).

Different types of waste are generated throughout the life cycle of a casino. The construction, operational, demolition and the refurbishment stages are four different stages that the majority of business operations go through. Literature review indicates that larger quantities of waste are generated in the operational stage as compared to all other stages even though waste is generated in all the four stages (Machete, 2015). More space is allocated to banqueting halls, eating outlets, public and guest areas, health clubs and the gardens during the design and construction phase of a hotel or casino. The small remaining areas are left for waste sorting, and disposal by the back-of-house staff (Lalonde, 2013).

Casino industries are resource-intensive operations and generate many waste streams from the multi-function facilities (Chazin *et al*., 2012). Operating a casino generates huge quantities of waste. Although waste composition and waste management practices are similar for most organisations, investigations have not been done on waste management practices at Carnival City Casino. Casinos are destinations that attract a wide variety of people and should be perfectly poised to serve as exemplary establishments of what sustainable and environmental consciousness means (Chazin *et al*., 2012). A holistic and integrated effort must be made to reduce generated waste quantities and avert potential environmental impacts (Badgie *et al.,* 2012).

1.1.1 Waste management challenges

Waste management is a challenge that many countries face. Waste continues to be an environmental burden and remains a potential threat to human beings irrespective of the presence or absence of controls in place or not (Davidson, 2011). Waste management service delivery is a function assigned to the local government in South Africa (Gumbi, 2015). South African municipalities are mandated by the country's constitution to provide waste management as a basic service to their citizens (Constitution of South Africa, 1996, s.152). The waste management function of the municipalities entails collecting, transporting and disposing solid waste generated by different users. Various disease outbreaks, environmental pollution, and degradation can occur if this function is not carried out (Maluleke, 2014).

Sustainability and improvement of waste management services remain significant challenges for many countries around the world (Lalonde, 2013). Many cities struggle to meet the waste management services' demands due to lack of resources. The implementation of waste management services in South Africa is affected by lack of proper planning (Gumbi, 2015). Environmental pollution and unpleasant living conditions occur as a result of poor planning and inadequate waste services (DEA, 2011; Zhakata, Gundani, Chauke & Odeku, 2016). Inadequate management and service delivery result in increased practices of littering, dumping and burning of household solid waste (Naidoo, 2009).

The waste management system remains inadequate and expensive even though governments allocate and spend substantial amounts of resources to offer this service (Badgie, Samah, Manaf & Muda, 2012). The 2015 Waste Management Summit acknowledged that waste management service delivery and infrastructure require urgent attention (DEA, 2015).

Generated municipal waste increases as a result of rural to urban migration for a better life and employment opportunities. The increased population exerts pressure on the cities' service delivery level (Kubanza, 2010). The urgent need to develop and implement waste management strategies that would divert negative the environmental impacts resulting from waste is evident when driving past any of South Africa's informal settlements, open fields, and streams. Residents of informal settlements residents are of the idea that waste management is the government's responsibility. These residents perceive dumping waste along the roads as a call to attract the municipalities' attention to the fact that removal services are needed (Moiloa, 2007). Heaps of uncontrolled garbage, illegal dumping sites, and drains blocked with rubbish and health hazards to residential areas emanating from the disposal sites are aspects of waste management problems in South African cities (Kubanza, 2010).

Rag pickers minimise the amount of waste destined for transportation and landfill sites but their role in the recycling industry is not highly recognised in waste management streams (Joshi & Ahmed, 2016). The roles of these rag pickers in the waste industry have not been researched and measured. Informal waste picking reduces poverty by providing work for the unskilled and bringing socio-economic benefits to countries worldwide. Recyclable waste is scavenged from the municipal skips and taken to buy-back centres to help generate income for unemployed people. Money collected from the buy-back centres has an essential role in waste management as it encourages people to participate in recycling activities. Informal waste pickers assist local manufacturing industries with a constant supply of secondary raw materials (Mamphitha, 2011).

Waste collection, transportation, and disposal are the functions of the municipality, but are also extended to the waste contractors appointed by the private sector and the municipalities due to an increase in waste volumes and lack of capacity. Municipalities face major challenges with regard to capacity, planning, administration, segregation at source, waste collection and illegal dumping (IWMSA, 2014). The receptacles that are used for waste collection services are wheelie bins, waste skips, compactors, trucks, and dumpers (Mandevere, 2015). Mechanical breakdown of the compactors and trucks, industrial strikes and service delivery protests are some of the reasons why municipalities struggle to render waste collection services. Waste collection efficiency is determined by manpower availability and transport capacity (Keisham & Paul, 2015). The collection systems that are currently used need to be revised as they are not conducive to waste separation at source. Separation at source will provide higher quality recyclables and a cleaner working environment (CSIR, 2011).

Recycling is an essential alternative for managing solid waste as landfilling space is limited (Ozbay, 2015). The recycling process includes searching and retrieving waste materials that can be used for making new products (Joshi & Ahmed, 2016). The quantity of virgin raw materials required to meet consumer demands is minimised by recycling through the recovery of organics and materials recovery from the waste stream and transforming them into new products. Recycling promotes conservation of natural resources, creates jobs and strengthens the economy (USEPA, 2016b).

Landfilling is the process where waste that has received little or no pre-treatment is managed and disposed of on land, and buried and covered with soil layers (SAWIC, 2015). It is the most dominant waste management practice used in many developing countries (UNEP, 2016). South African municipalities pick up waste from point of generation and dump it at the landfills. Waste disposal releases carbon dioxide and methane gases into the atmosphere. The methane gas generated from large amounts of waste ending up in landfills is twenty to twenty-five times more potent than the powerful greenhouse gas carbon dioxide (Lalonde, 2013). Waste disposal is implemented as the last resort where sound waste management practices are applied. Major challenges for disposing waste at the landfill sites are the costs and limited availability of land (Joshi & Ahmed, 2016).

The majority of the landfills in African countries are open dumps without leachate or gas recovery systems. Most of the landfills are not properly lined at the bottom to prevent groundwater pollution (UNEP, 2016). South Africa is operating 247 unlicensed municipal landfill sites. Many municipal waste disposal sites in South Africa do not operate according to their environmental permit conditions (DEA, 2015). The Department of Environmental Affairs (DEA) launched a national compliance and enforcement operation in 2014 for provinces to license the illegal dumping sites yet these unlawful sites are still in operation (News24, 2017). The use of unlicensed landfill sites by municipalities must be addressed to increase the number of the few existing compliant landfills (DEA, 2015).

1.1.2 Waste management legislation

The driving forces for ensuring that responsible waste management practices are implemented are legislation and enforcement (Davidson, 2011). Legislation without enforcement does not yield compliance. The pieces of South African legislation governing waste handling and management are the South African Constitution (1996), National Environmental Management Act (Act No. 107 of 1998), National Environmental Management: Waste Act (Act no. 59 of 2008), National Water Act (Act no. 36 of 1998), Air Quality Act (Act No. 39 of 2004), National Health Act (Act No. 61 of 2003), Occupational Health and Safety Act (Act No. 85 of 1993), Hazardous Substances Act (Act 15 of 1973), Plastic Bag Regulation R543 and municipal by-laws. Littering and illegal waste dumping are supposedly controlled by these pieces of legislation, yet all prohibited actions are evident countrywide (SAWIC, 2015).

The South African Constitution provides a foundation for South African environmental legislation (DEA, 2011). A clean and healthy environment is a basic need and a constitutional requirement for all South Africans. Section 24 of the South African Constitution's Bill of Rights stipulates the citizens' rights to an environment which is not harmful to their health or well-being (Constitution of South Africa, 1996). The right to environmental protection aims to promote economic and social development through the use of natural resources, prevention of pollution and ecological degradation and securing ecological sustainable development (Rautenbach, 2014).

The duty of care, the polluter pays and the cradle-to-grave principles from the National Environmental Management Act (Act No. 107 of 1998, s.2) promote proper waste management and ensure that environmental pollution and degradation is avoided, minimised and remedied by taking reasonable measures (NEMA Act No. 107, 1998, s.2). The impact that poor waste management practices can have on the state's water resources is regulated and addressed by the National Water Act (Act no. 36 of 1998, s.19). The intention of the National Environmental Management: Waste Act (NEMWA), Act no. 59 of 2008, s.19) is to ensure provision of licenses for listed waste management activities a as well as a comprehensive basis for regulatory control of waste management practices. The coming into effect of this Act (DEA, 2015) brought about the waste management hierarchy and a significant policy shift for South African waste management.

The National Waste Management Strategy (NWMS) is a legislative requirement aimed at accomplishing the waste act objectives (NEMWA Act no. 59, 2008, s.6). This strategy sets out plans, targets, and measures for addressing innumerable challenges arising from waste management. The priority areas include creating jobs and SMMEs to drive the recycling economy, implementing a varied regulatory system, promoting public awareness and supporting waste service delivery (DEA, 2011). The establishment of a pricing strategy for waste management charges and the institutional mechanisms in the form of the Waste Management Bureau are provided for by the National Environmental Management Waste Amendment Act (Act 26 of 2014, s.1), to fast-track the implementation of the recycling economy in South Africa.

The Municipal Structures Act No. 117 (1998, s.84) places responsibility on municipalities to make provision for strategic developments and sites for waste disposal. The Municipal Systems Act No. 32 (2000) designates waste management service delivery to the local government and binds municipalities to deliver waste collection services. Efficient and cost-effective service delivery needed for public health and the municipalities (DEA, 2011) must provide environmental protection. The effectiveness of environmental legislation depends upon its authorisation and permitting or licensing of persons to carry out certain waste management activities (NEMWA, Act no. 59, 2008, s.43).

Inconsistency of the local government practices and procedures with the implementation of South Africa's national municipal solid waste legislation, policies and strategies compromised equity, efficiency, effectiveness, and sustainability of municipal solid waste disposal (Naidoo, 2009, p.ii).

Waste management is largely regulated by legislation and policies worldwide, but has been a decadal challenge due to rapid urbanisation and industrialisation, resource limitations, and the ever-increasing population (Pokhrel & Viraraghavan, 2005). The implementation of legislation is not easy but it enforces companies to uphold environmental rights by carrying out sustainable waste management practices. Changes are noticed in pollution prevention, minimising ecological degradation and improving efficiency in waste management (Moiloa, 2007). Capacities, practices, and policies on managing solid waste are inadequate in many countries despite the magnitude of the problem (Kudoma, 2013).

Municipalities encounter numerous challenges in enforcing waste management policies. The efficient implementation of waste management strategies remains a challenge for most South African companies despite the establishment of several good waste management policies and legislation (Mnisi, 2008, as cited in Tshimbana, 2014, p.4). Lack of suitable waste expertise and practices have made the enforcement and monitoring of the South African waste legislation difficult even though it is in line with global trends (Mannie, 2017). Waste management standards are deteriorating in most provinces despite acknowledgement of waste legislation (Mandevere, 2015).

1.1.3 The waste management hierarchy

The waste management hierarchy is an internationally accepted guide for prioritisation of waste management practices (Zero Waste South Australia, 2016, p.1). In the context of South Africa the waste management hierarchy is outlined by the National Waste Management Strategy and dictates that waste prevention and minimisation should be given first preference before reuse, recycling, recovery and disposal (Figure 1.1), (DEA, 2011, p.18, Intech Open, 2011). The general principle of the waste hierarchy is to implement waste disposal as the last resort. Waste segregation reduction, reuse and recycling should be emphasised and considered first in managing solid waste and negative environmental impacts before landfill site disposal (Badgie *et al*., 2012; Joshi & Ahmed, 2016).

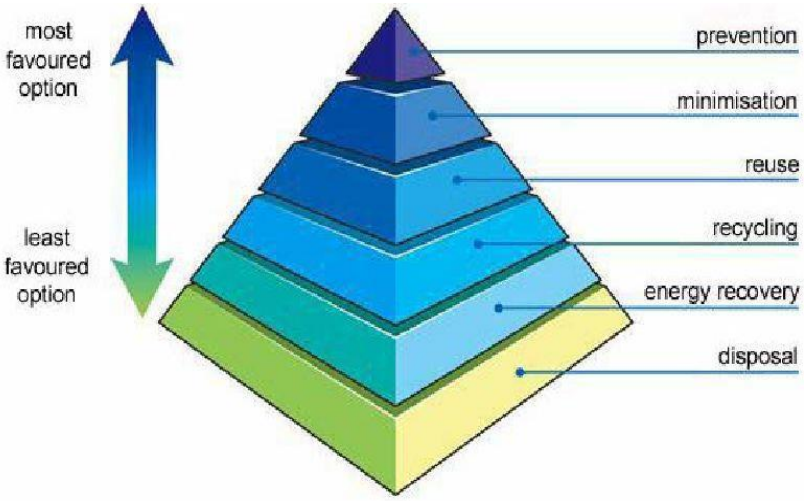

Figure 1.1 Waste Management Hierarchy

(Intech Open, 2011)

Waste prevention and minimization are given first and second priority in the waste management hierarchy in implementation of waste management practices. Waste prevention and minimisation involve decreasing waste prior to its generation (Badgie *et al*., 2012). Waste prevention and minimisation are aimed at encouraging manufacturing industries to manufacture or produce their products in a manner that minimises waste generation. Cleaner production and cleaner technologies promote waste prevention and minimisation by decreasing the waste quantities entering the waste stream (DEA, 2011). Waste prevention and minimisation must be encouraged across all levels, including at household level (CSIR, 2011).

Reuse is the process whereby items from the waste stream are used once more for the same or different purposes without changing their form or properties (NEMWA Act no. 59, 2008, s.1). Reusable waste must be reclaimed to divert waste from the landfill and conserve resources. Recovering reusable products results in cost savings, as this is less costly compared to producing brand new products. Diverting reusable materials from the landfill sites ensures that less waste is send to landfills and increases the lifespan of the landfills (CSIR, 2011). Reuse encourages consumers to buy non-disposable items and donate products that they no longer need to charity organisations.

“Recycling is the process where waste is separated from the waste stream, processed as a product or raw material and reclaimed for further use” (NEMWA Act no. 59, 2008, s.1). Separation at source is a vital instrument for increasing the quantity of recyclables and for reducing waste sent to landfills as mixed waste (DEA, 2011). Recycling is preferable to treatment and disposal because it conserves energy, reduces waste and contributes significantly to job creation (DEAT, 2001). South Africa has started implementing the recycling process but the recycling rate is happening at a slower pace (Godfrey & Oelofse, 2017). Buy-back centres are used to encourage active public participation in recycling by paying people cash for the recyclables they bring in (DEAT, 2001b).

Energy recovery is the process of using waste or useful components or material reclaimed from waste to generate energy. The reclamation of materials from landfill sites indicates the high value of materials being disposed of at landfills. Mechanical biological treatment, gasification, incineration, autoclaving, pyrolysis, and aerobic and anaerobic digestion are some of the methods for extracting energy from waste (UNEP, 2011). These recovery processes have been made possible by technology and have resulted in South Africa implementing waste-to-energy projects (Mathiesen, 2014). The development and introduction of waste management technologies by South African companies will ensure full implementation and high usage of the waste management hierarchy in managing all the waste produced in the country (DEA, 2011). Energy recovery projects are minimising the pressure exerted on the electricity grid (DEA, 2015). The goal of sustainable solid waste management is to use less energy in recovering valuable products from waste. Most countries are busy developing waste-to-energy technologies to divert waste from the landfills. Using waste to produce energy will address the challenges of limited space available for landfills and minimise negative environmental impacts (Badgie *et al*., 2012).

Waste disposal is the least preferred method and should be implemented as a last resort in the waste hierarchy. Waste disposal must only be considered once all other options in the waste hierarchy have been explored. Disposal of waste occurs in landfill sites that are known to be air pollution sources as they emit greenhouse gases such as methane and carbon dioxide (DEA, 2011). Significant greenhouse gas emissions occur because of the subsequent decomposition of organic waste (USEPA, 2016). Landfill sites are the most common method of waste disposal implemented worldwide as landfilling is regarded as the most cost-efficient way to dispose of waste (Badgie *et al*., 2012).

South Africa is experiencing an increased amount of waste due to the growing economy and population, which adds pressure to its waste management facilities (Mathe, 2014). South African landfills are rapidly filling up as the bulk of the waste ends up in landfills as mixed waste (CSIR, 2011). The current value of waste that could have been reused or recycled but which is lost through landfilling to the South African economy is estimated to be in excess of R17 billion per annum (CSIR, 2017)

1.1.4 Solid waste management

Solid waste management is associated with controlling the generation, storage, collection, transportation, treatment and disposal of solid waste (Gumbi, 2015). Solid waste management strategies may vary depending on the types and volumes of waste generated (Zhou *et al*., 2014). The South African Constitution (1996, s.24) emphasizes that solid waste must be managed effectively and efficiently to promote a clean environment. Legislation requires businesses to manage their waste from point of generation to disposal (NEMWA Act no. 59, 2008, s.21).

Reduction, reuse, recycling, composting and disposal are major ways of managing solid waste (Mahamba, 2015). Municipal solid waste (non-hazardous) and industrial solid waste (hazardous) are the two broad categories of solid waste based on its origin (Maluleke, 2014). This study will focus on non-hazardous and hazardous waste generated by the commercial sector, Carnival City Casino.

Carnival City Casino and Entertainment is a multi-function facility operating on a 24-hour basis with a wide selection of restaurant outlets, a cinema, bars, a hotel, and the Road Lodge. The casino industry deals with a great assortment of materials, a significant amount of waste, and attitudes of the majority of customers and visitors' behaviour from within and outside the province (Davidson, 2011). Entertainment events, restaurants, landscaping, maintenance, and office duties are activities that possibly generate huge amounts of solid waste at Carnival City Casino.

Solid waste has the potential to result in negative environmental impacts if it is not managed appropriately (Gumbi, 2015). Waste management impacts are significant and not unique in the casino industry but they are given little consideration (Chazin, Goldman, McAuliffe & Onuzo, 2012). This study was undertaken to assess solid waste management practices implemented at Carnival City Casino to establish their effectiveness, explore waste management challenges and determine the level of employee awareness of waste management at practices Carnival City Casino. The types of solid waste that will be explored are food waste, combustibles, non-combustibles, medical waste, and fluorescent tubes. The study aimed to provide information on the management of solid waste at Carnival City Casino and to complement existing knowledge to provide recommendations to correct identified shortcomings and improve current waste management practices (Kudoma, 2013).

1.2 Motivation for the study

Environmental concerns are not at the forefront when people think about casinos. It was established from the monthly reports generated by Interwaste on-site solutions that the majority of waste at Carnival City end up in landfills. Organic waste, mainly food waste, dominates the quantity of waste dumped at the Weltevreden landfill site yet its moisture content makes it more suitable for composting (Kadir, Azhari & Jamaludin, 2016).

Most African countries are reluctant to implement reduce, reuse and recycle methods even though they are deemed to have considerable environmental, social and financial benefits (Badgie *et al.,* 2012). Environmental issues compete with other economic sectors for available limited resources (Maluleke, 2014). A review of literature shows that solid waste management is not given the priority it deserves, as it has not received sufficient attention in most organisations. Solid waste can be a useful resource for providing job opportunities through recycling if awareness in waste management practices is highly emphasised.

The literature review indicated that investigations have never been done on the waste management practices implemented at Carnival City Casino. Only non-conformances that were raised during the audits were noted. Sun International's commitment of 'zero-waste-to-landfills' by the year 2022 prompted the researcher to conduct this study. The appointed waste management contractor has not evaluated its programme or done research to explore possible solutions for the success of this commitment. Thus this research was undertaken to assess the casino's solid waste management practices and establish the alternatives that could be implemented to minimise waste disposal and potential pollution. The research will benefit Carnival City in establishing its current position where the 'zero-waste-to-landfills' goal is concerned, and in terms of recommendations to adjust practices in line with that target.

1.3 Research problem

Waste generation is an integral part of human activities influenced by social dynamics and economic development (Ayuba, Manaf, Sabrina & Wan Nur Azmin, 2013). Solid waste is one of the fastest-growing waste streams, which has become an issue of concern for South African municipalities. Organisations' daily operations and improper waste disposal can despoil the natural environment and make it unattractive and less valuable (Davidson, 2011). Restaurants make food service the largest casino function after gaming with organic materials as the largest component of the waste stream (USEPA, 2016). Food waste, glass, paper, cans, and cardboard boxes are the types of solid waste that are normally generated by the restaurant outlets. The separation of waste at source stands as the most visible challenge attaining a worrisome dimension for restaurants as recyclable materials are being sent to landfill sites.

It was not clear how the complex mix of solid waste at Carnival City Casino is being managed as well as employee awareness and the challenges they face in managing the waste. Most important, Sun International, Carnival City's parent company, committed to the Polokwane Declaration on waste management and which set targets for 'zero-waste-to-landfills' by 2022. It was not clear if the waste management practices are effective enough for Carnival City to meet the 'zero-waste-to-landfills' targets.

The stated areas that needed clarity made it necessary to determine if the high volumes of waste generated at Carnival City are being managed effectively, to evaluate the level of employee awareness with regards to solid waste and to understand its management challenges. Overall, the research sought to evaluate current solid waste management practices at Carnival City Casino in Brakpan so as to recommend actions that will improve the management of solid waste. Failure to address solid waste management challenges at Carnival City Casino will put more pressure on the Casino in terms of trying to achieve Sun International's commitment of 'zero-waste-to-landfills'.

1.4 Aim and objectives

The aim of the study was to identify and establish the effectiveness of current solid waste management practices implemented at Carnival City Casino in Brakpan, explore challenges encountered, determine the level of employee awareness and recommend improvement measures for addressing the waste management standard.

Objectives include:

1. To identify solid waste management practices at Carnival City Casino.
2. To establish the effectiveness of current solid waste management practices at Carnival City Casino.
3. To explore solid waste management challenges faced by Carnival City Casino.
4. To determine the level of employee awareness on solid waste management at Carnival City.
5. To recommend improvement measures for Carnival City Casino's solid waste management standard.

1.5 Research questions

The following are the research questions that the study sought to answer:

1. What are the solid waste management practices implemented at Carnival City Casino?
2. How effective are the current solid waste management practices at Carnival City Casino?
3. What are the challenges faced by Carnival City Casino with regard to solid waste management?
4. What is the level of employee awareness on solid waste management practices at Carnival City Casino?
5. Which measures can be recommended to improve Carnival City Casino's solid waste management standard?

1.6 Significance of the study

No known studies have been carried out to evaluate solid waste management practices in casinos in the Gauteng area. This research has the potential to make a valuable contribution to improving solid waste management practices in the casino industry and to motivate commitment among the public and other private sectors. The study is useful to different stakeholders particularly employees, customers and private waste collectors in developing understanding of the advantages of adopting best practices and cost-effective environmentally friendly methods of managing solid waste. The study enabled the researcher to make recommendations that will assist Carnival City and its business associates in minimising waste going to landfills and cutting down on disposal costs.

Lessons learnt through this study and participation of stakeholders in supporting the whole concept of evaluating solid waste management practices implemented at Carnival City Casino in turn could reduce the resultant environmental impacts of current practices.

1.7 Chapter outline

Chapter 1: **Introduction** - This chapter contains the background to global waste management practices, the motivation of the study, research problem, the aim and objectives, research questions, significance of the study and format of the study.

Chapter 2: Literature review - This chapter reviews literature on solid waste management practices implemented worldwide and waste characterisation, the effectiveness of waste management practices and challenges emanating from waste management.

Chapter 3: Research methodology - Chapter 3 provides a description of the study area and data collection methods, and techniques used during the study are outlined. Data analysis, ethical considerations, limitations of the study, methodological challenges, and validity and reliability of data are also discussed.

Chapter 4: Research results - This chapter presents the findings of the study.

Chapter 5: Analysis and discussion of research results - This chapter discusses the results of the study, and links the methodological framework, and literature review to the research findings.

Chapter 5: Conclusion and recommendations – This chapter provides a summary of the study, conclusion, and recommendations made based on the research findings.

Chapter 2: Literature review

2.1 Introduction

This chapter reviews various studies on waste management practices implemented worldwide. The literature reviewed is outlined according to themes. The themes are derived from the study objectives and focus on the concepts of waste management practices implemented worldwide, waste characterisation, the effectiveness of implemented waste management practices, awareness of waste management practices and waste management challenges.

2.2 Waste management practices

Overwhelming environmental significance of the impact of poor waste management practices has attracted a lot of attention worldwide (Sabiiti & Katongole, 2012). Waste management practices that are implemented worldwide are waste minimisation, waste handling, and sorting, waste recycling, composting, incineration and landfilling. Most countries are still searching for the best practices to treat and dispose of waste.

Waste minimisation involves reduction and reuse which reduces the volume of waste generated and the usage of reusable products (Badgie *et al*., 2012). Waste minimisation makes economic sense as it reduces purchasing costs for new products and disposal fees, and helps with environmental protection and natural resources conservation. It can alleviate financial challenges of organisations (USEPA, 2016). Waste reduction and reuse conserves energy and water, minimises pollution and consumption of natural resources (Keisham & Paul, 2015). In South Africa, the Polokwane Declaration on waste management was premised on a vison to encourage all South Africans to be committed towards the effective reduction of waste (DEAT, 2001, p.1). Most organisations in South Africa have tried to implement the 3Rs of waste management: reduce, reuse and recycle, to try and deal with the ever-increasing problems of solid waste (IWMSA, 2014).

Waste sorting focuses on separating different types of waste and placing them into storage containers for collection. The source of generation is the best place to start separating waste (Nkosi, 2014). Organised waste segregation is not practised at household levels, municipal skips and other private companies in the majority of countries (Yoada, Chirawurah & Adongo, 2014). Waste is disposed of as mixed waste at landfills. Segregation of waste materials that can guarantee the rag pickers higher economic returns in the recycling market, waste separation and sorting all occur under unsafe conditions (Joshi & Ahmed, 2016). For household solid waste, hazardous waste is not separated at source as waste is collected as mixed waste. Waste bins are the same for all different types of waste generated in South African municipalities (Nkosi, 2014). This is prohibits adoption of better waste management practices and discourages recycling.

Few organisations have demarcated colour-coded bins to encourage waste separation at the source. Only private companies that employ waste contractors to manage their waste sort waste on-site and send it to transfer stations to be taken for recycling, before disposal at landfill sites. This makes private companies better managers of waste compared to municipalities. Private waste contractors are charged disposal fees, which are determined by the weighbridge at the landfills (Mahamba, 2015).

Reverse logistics is the reverse supply chain that focuses on recovering and repurposing products (Barloworld Logistics, 2016). The reverse logistics process enables businesses to reuse, renew and recycle waste materials generated in their value chain. Manufacturing companies govern the return of their products, parts, and materials from the consumers for reuse, recovering their residual value or for disposal (Kulikova, 2016). The measures aimed at reducing waste in reverse logistics start in the product design phase and incorporate the entire product life cycle, transportation, and final disposal. Reverse logistics promotes the reuse of products and materials and encourages companies to be environmentally efficient by minimising pollution. Reverse logistics result in significant savings in waste disposal as used materials and products are returned to the suppliers and are not sent to the landfill sites (Alnuwairan, 2016).

Waste recycling is a better alternative as discarded materials are reprocessed into new useful products as compared to burning or dumping of waste. The use of recycled products reduces energy use in industries and conserves raw materials. Recycling minimises the need for waste disposal (Badgie *et al.,* 2012). Recycling is an essential alternative for solid waste management due to limited landfilling space and high disposal costs (Maluleke, 2014). Waste recycling is implemented at a lower level in the majority of the countries.

Composting is the biological decomposition of waste. Food and garden waste are biodegradable and are types of organic waste used for making compost. Composting reduces waste disposal costs and diverts organic waste destined for landfills by converting it into soil fertilisers or mulch (Badgie *et al*., 2012). The compost product improves the soil condition, reduces erosion and assists in suppressing plant diseases (Keisham & Paul, 2015). Composting can help hotels and casinos to reuse food and garden waste and cut down on money spent on fertilisers.

Incineration is the controlled burning of waste at maximum temperatures (Badgie *et al*., 2012). Incineration is mostly used in hospitals to burn medical waste and the ash produced is disposed of at hazardous landfill sites. Incineration reduces waste volumes and the demand for landfill space, but waste incineration is the most expensive solid waste management practice due to the need for highly skilled personnel and careful maintenance required in incineration plants (Keisham & Paul, 2015). Incineration of waste releases toxic gases into the atmosphere. Flue gas pollution from the incineration plants is not well controlled in many countries (Ma, Zhan & Zhang, 2014).

Therefore, while incineration diverts hazardous waste from landfills, it may create other health and environmental challenges if it is not well managed. Unsupervised incineration occurs in villages and low-income urban areas (Kgosiesele & Zhaohui, 2010).

Landfilling is still the major waste disposal method implemented worldwide (Greenworks, 2017). Low costs make landfilling the most preferable method of waste disposal in most countries (Keisham & Paul, 2015). Management of solid waste in many developing countries is based on collection and landfilling (Sabiiti & Katongole, 2012). Sanitary landfilling in Kocaeli in Turkey has been used to manage integrated solid waste (Ozbay, 2015). The siting of landfills and solid waste management have been a burning issue and a topic of discussion for the media, government and non-governmental organisations for more than a decade in the Kathmandu valley of Nepal. Serious environmental and public health problems have been experienced due to illegal dumping on the riverbanks (Pokhrel & Viraraghavan, 2005). Landfills cause air, soil and groundwater pollution. Landfills are among the largest producers of greenhouse gases such as carbon dioxide and methane. Soil and groundwater pollution occur because of leachate released into the soil (Sabiiti & Katongole, 2012).

South African municipalities collect solid waste from point of generation and dump it at the landfills. Landfilling was found to be the only method of managing waste in Polokwane city (Maluleke, 2014). South Africa's reliance on landfilling as a waste management option results in disposal of a substantial amount of recyclables at the landfills yet these could have been diverted through sorting them for recycling. Landfilling continues to be the most implemented waste management practice in South Africa, even though various attempts are being made to move away from the landfill approach (Godfrey & Oelofse, 2017). It seems as if landfilling will continue to be the most implemented waste management practice in many countries for many years, despite its negative environmental impacts.

2.2.1 Waste characterisation

Waste characterisation is a method used to determine the proportion and the types of materials discarded in a waste stream for full waste treatment to be attained (National League of Cities, 2013). Waste characterisation helps in determining the amount of recyclables that can be taken out of the waste streams through recycling and the life expectancy of the landfill sites (Cronjé, du Plessis & Mearns, 2014). Waste characterisation is done with the aim of minimising waste, introducing technologies meant to address discrete segments and best management options for different waste streams, sizing of facilities, planning recycling and composting programmes, and estimating transport and separation costs (Oelofse, 2015). Conservation of natural resources, cost savings, and less environmental pollution are the benefits of waste characterisation (Mahamba, 2015).

Limited waste characterisation studies have been done in South African municipalities. The waste characterisation study conducted in the Ekurhuleni Metropolitan Municipality in 2014 to 2015 had to be repeated due to questionable sampling methods, unrepresentative sampling, inadequate compositional analysis and unreliable waste composition results (Oelofse, Muswena & Koen, 2016). There is therefore not much scholarly literature to inform practices in the country. Developers of the new waste technologies must know the exact composition of the waste streams for them to be able to carry out full waste treatments. The use of composting and anaerobic digestion systems determines the importance of biodegradable elements of the waste stream (National League of Cities, 2013).

Waste characterisation studies allow cities to map their entire waste streams and to identify gaps so that they can focus their efforts on diverting the most appropriate materials that will have the greatest impact (National League of Cities, 2013). The Environmental Affairs Department developed the South African Waste Information System to collect, record, manage and analyse waste data to address discrepancies of reliable data in the waste sector. Decisions based on incorrect data could result in significant programmes, businesses and technology investments being incorrectly put in place (Oelofse *et al.,* 2016).

2.3 Effectiveness of waste management practices

The status of waste management in South Africa indicates that municipalities are not very efficient in carrying out this function (CSIR, 2011). The effectiveness of waste management practices is affected by lack of infrastructure and non-adherence to municipal by-laws (Nkosi, 2014). Most cities only receive a fraction of proper disposal, as municipalities do not collect all the generated waste quantities. Waste contractors appointed by municipalities render waste management only in places where ratepayers pay their bills (Sabiiti & Katongole, 2012).

There is a need for municipalities to fully integrate informal settlements and illegal dumping sites into their waste management systems (Jerie & Tevera, 2014). Major causes of lack of effective solid waste management practices in the informal sector can be traced to the lack of urgency by municipalities in dealing with waste management problems (Jerie & Tevera, 2014). Illegal dumping is common in most countries worldwide. Few attempts have been made to address littering problems in South Africa's public areas (Mathe, 2014). Inadequate supply of waste bins and the location of waste skips increase the likelihood of waste being dumped in open spaces and by the roadsides (Nkosi, 2014). Landfills and illegal dumping sites are not protected in most countries as children can access them easily (Mathe, 2014).

Lack of awareness and consumer behaviour affected the effectiveness of waste management practices at the University of Malaysia in 2012 (Desa, Kadir & Yusooff, 2012). Incentives and waste awareness and education programmes have the potential to change people's behaviour (CSIR, 2011). People practise poor waste management even though they know the problems associated (Desa *et al.,* 2012). The introduction of the plastic bag levy was one of the government initiatives to change consumer behaviour and minimise waste.

The plastic bag levy is a form of tax that is aimed at reducing the number of plastic bags being disposed of, limit their utilisation and increase the reuse and value of plastic bags (DEA, 2011). Aesthetic unattractive impacts resulting from incorrect disposal of plastic bags are still visible in most areas countrywide. This shows that the plastic bag levy initiative did not bring much difference as expected by the government, despite plastic bags being sold at a cost of approximately 69 cents at retail stores. The human elements including understanding, commitment and cooperation from employees defines the success of waste management practices implemented and will help organisations to achieve their objectives. A combination of behavioural change and technological improvements can assist organisations to adopt and implement best practices for managing solid waste.

2.3.1 Waste minimisation

Waste minimisation focuses on reducing waste through reuse and recycling (Joshi & Ahmed, 2016). The 3R's, reduce, reuse and recycle are crucial for successful waste management strategies. Informal waste reclaiming was found to be the waste minimisation strategy implemented in the Ekurhuleni metropolitan municipality in Gauteng. Sensitisation of the public regarding waste management best practices is lagging due to lack of waste management awareness campaigns (Gumbi, 2015). Waste minimisation in South Africa is mostly undertaken by the private sector through participation in recycling. Waste minimisation strategies implemented in South Africa are not as effective as only 10% of the waste generated is diverted from landfills (Godfrey & Oelofse, 2017). Most organisations apply the cost-benefit analysis where they consider the cost implications of implementing waste minimisation strategies. Less expensive ways of managing solid waste are implemented without considering shortfalls in waste reduction and environmental protection.

2.3.2 Waste separation at source

The South African Domestic Waste Collection Standard (2011, s.4.1) requires waste separation at the source of generation before collection to prolong the life of the landfill sites. The separation at source programme is a constituent of the national strategy for responding to environmental issues of overfilled landfills in South Africa (Oelofse, 2018). Waste segregation at source is done to maximise recycling and divert more waste from landfills.

The current waste collection systems in South Africa are not conducive to separate collection of recyclables at the source of generation as waste is collected as mixed waste (Oelofse, 2018). Separation at source is not effective in South Africa, as it is mostly implemented by informal waste pickers who sell the waste at buy-back centres. Most recyclables are contaminated and increase the risk of diseases to waste collectors (Rautenbach, 2014). Effective consumer participation is needed to maximise the correct sorting of food waste and the recyclables even though waste separation at source is a common and economical way for separating recyclable fractions (Rousta, Bolton & Dahlen, 2016). Waste pickers also require protective clothing to minimise health risks.

2.3.3 Reverse logistics

The country with the highest pesticide consumption worldwide is Brazil. A reverse logistic program was implemented for pesticide packaging in Brazil as a result of its improper disposal. The Brazilian Waste Management Policy enforces waste reverse logistics, as the main waste management solution is to increase recycling. There is no economical solution in most reverse logistics programs as the focus is on diverting waste from the landfills. The reverse logistics program in Brazil was effective for large rural communities due to its highest global recovery rate (Veiga, 2013).

An analysis was done on reverse logistics performed by beverage manufacturing companies in Lusaka in Zambia for polyethylene terephthalate (PET) plastic bottles. Recovery of the economic value in the returned product, government legislation, and environmental concerns were the three drivers in reverse logistics in Zambia (Mwanza, Mbohwa, & Telukdarie, 2016). The increase in the volume of unrecovered plastic waste for recycling and final disposal has contributed greatly to land pollution in Zambia. Beverage companies in Zambia do not practice reverse logistics of PET plastic bottles as they consider it to be a non-value adding process and very costly from the financial point of view (Mwanza *et al.,* 2016). This is one area that governments can incentivise to attract companies to participate.

2.3.4 Waste recycling

An overview of South African municipalities predominantly considered the willingness of companies to recycle waste as recycling programmes are not yet well established (Rautenbach, 2014). Waste recycling can be a potential job creation opportunity for a country with a high level of unemployment like South Africa (Gumbi, 2015). Polokwane municipality does not have waste recycling programmes. Very little waste is recycled at a recycling facility through informal salvaging activities, as the municipality has not yet implemented formal recycling programmes. However, sixty percent of waste disposed of at the Weltevreden landfill in Polokwane municipality is recyclable. Waste recycling efforts in Polokwane were not effective as waste was collected as mixed waste in refuse bags (Ogola *et al*., 2011).

Waste recycling in Harare is executed on a small scale as it is done by unemployed people who pick up items from the dumpsite for reselling. Formal waste recycling is not implemented in Harare due to lack of resources and environmental education. This has resulted in the city issuing recycling licenses to individuals. Waste recycling strategies implemented in Harare were found not to be effective as the city is failing to provide sustainable and satisfactory waste management services (Mandevere, 2015). In both cases, a lot of recyclable material end up at landfills. There is a need to support individual recycling efforts (whether done by informal or licensed individuals) through education and awareness to increase the quantities of recycled waste.

2.3.5 Composting

Composting is not a widely employed practice in South Africa (Maluleke, 2014). The main aim of composting is to divert organic waste from landfills (DEA, 2013). Composting is a much more cost-effective way of controlling greenhouse gas emissions from waste (Couth & Trois, 2012). Composting could reduce environmental pollution and provide job opportunities (Maluleke, 2014). Earth Probiotic has introduced on-site food waste composting solutions that help to reduce organic waste send to landfills and add valuable nutrients to the soil (Earth Probiotic, 2016). On-site composting reduces waste management transport costs. Silverstar and Monte Casino operations from Tsogo Sun in Gauteng have already started implementing waste minimisation and recycling methods in their operations through the Bokashi Bran composting, but the effectiveness of these methods remains unknown and still have to be proven if they are beneficial over the long term (Redel, 2016).

2.3.6 Incineration

Waste incineration is used mostly for the treatment of non-recyclable municipal waste, industrial, medical and hazardous waste in many countries (Liu, Ren, Lin & Wang, 2015). Medical waste incinerators are the common in most types of incinerators used in South Africa (Kohler, 2013). Medical waste management practices from Polokwane municipality clinics were not effective, as medical waste was not separated from general waste in most of the clinics.

Four urban and nineteen rural clinics within the Polokwane municipality were researched. There was no sufficient collection and transportation of medical waste in the clinics and the majority of the clinics lacked medical waste storage facilities. The clinics from the urban areas were disposing of medical waste with general waste at dumping sites. The burning of medical waste along with general waste inside the clinic yard was witnessed in clinics from rural areas (Setati, 2013, as cited in Raphela, 2014, p.98). The ash was buried in a hole in the clinic yard contravening the requirements of Health Act No. 63 of 1977, which requires every generator of medical waste to dispose of such waste in a way that it does not cause health hazards to the handler or the public (Health Act, 1977).

2.3.7 Landfilling

The least preferred method in the waste hierarchy is landfilling and must be implemented as the final resort (DEA, 2011). One of the NWMS's strategic goals is to focus on diverting waste from landfills to avoid the need for establishing new landfills or expanding existing facilities (DEA, 2011). Few waste treatment options in South Africa are more expensive than landfill costs, hence waste management still relies heavily on landfilling (Naidoo, 2015). An estimated ninety percent of the waste generated in South Africa is sent to landfills. The incentive to devise alternative waste handling techniques in South Africa has been limited by low pricing for landfilling (Godfrey & Oelofse, 2017).

2.4 Level of awareness on waste management

Most municipalities in Zimbabwe were failing to cope with waste collection demands, mainly from the high-density suburbs (Mutungwe, Tsvere, Munikwa, Dondo, & Pedzisai, 2014). Most of the residents in the Chinhoyi urban community in Zimbabwe do not take waste disposal as their responsibility; hence, they were not doing much to help the situation. Waste management in Zimbabwe had reached crisis levels as waste was dumped in rivers, wetlands and everywhere in the city. The Chinhoyi residents were cognisant of the dangers of improper waste management but their level of awareness on waste management methods such as reduce, reuse and recycling was very low. There was no public awareness in Chinhoyi on regulations that govern waste management in Zimbabwe (Mutungwe *et al*., 2014).

Literature review revealed that the students in the primary and secondary schools in Secunda in Mpumalanga province were cognisant of the concerns with waste and waste management practices in their schools and the local environment. The students from grade 7 to grade 11 were asked questions to determine their knowledge and awareness on waste management practices. The students had an acute awareness of the negative impact that poor waste management would have on the country and on them as individuals. The level of awareness and knowledge that the students had was however not evident in their waste management practices as littering was observed at school and home environment (Madimabe, 2011, as cited in Van Niekerk, 2014, p.1).

The level of awareness on waste management was found to be very low in the Ekurhuleni metropolitan municipality. There was some awareness at the household level on waste management practices rendered by the municipality and local recycling implemented in the Ekurhuleni municipality. Household residents revealed that they obtained information on waste management from the radios, televisions, and newspapers. The weekly waste collection was among waste management services rendered to most households.

Waste materials were reclaimed from waste bins placed outside households on the municipality's collection days and from various landfill sites through informal recycling. Steel and paper were found to be the most recycled types of waste, which were in demand in the Ekurhuleni municipality when compared with other types of waste (Gumbi, 2015). The discussed literature shows varied levels of awareness in different contexts. Lack of awareness retards positive change, as people are normally hesitant to take part in practices they are not fully informed of. Raising awareness on waste management can result in more participation in practices like waste sorting and recycling.

2.5 Waste management challenges

The literature review reveals that waste management continues to be a challenge and a priority for many types of research (Davidson, 2011, Badgie *et al*., 2012, Mandevere, 2015). Global records indicated a significant increase in solid waste generation (Kaushal, Varghese & Chabukdhara, 2012). Solid waste challenges pose severe threats to human health, and need to be properly addressed before they cause major environmental damage (Maluleke, 2014). Waste management standards, legislation, and policies of many developing countries need to be amended as they are outdated and are of poor quality (Ayuba *et al*., 2013).

Increasing waste generation, the burden posed on the municipal budget and lack of understanding over a diversity of factors affecting various stages of waste management make solid waste management a major concern for cities in developing countries. The development of waste separation programs at the municipal level is hampered by limited best waste management practices and technological knowledge, equipment shortage for collection of sorted materials and non-existence of decision-makers interested in environmental issues. Solid waste management is a multi-dimensional issue and proper administration of funds is essential for the modernised sustainable systems (Guerrero, Maas & Hogland, 2013).

The challenges and the status of municipal solid waste management practices within Federal Capital Territory Abuja in Nigeria show that managing solid waste is a serious matter that needs to be properly addressed due to its human health and environmental sustainability implications. River pollution and climate change are a result of solid waste not being managed properly. Rapid population increase has caused difficulties for the state to render an effective and efficient solid waste management in Abuja metropolitan areas (Ayuba *et al*., 2013).

Management of solid waste is still highly underdeveloped and considered a crucial issue in Malaysia. Daunting challenges faced by Malaysia in relation to the management of solid waste are due to population increase, infrastructure, economic growth, public attitude and inadequate enforcement of waste legislation (Badgie *et al*., 2012). Waste management has gained significance in the environmental management field in most countries over the last decade as increasing human population and economic activities generate additional waste that requires storage, collection, transportation, and disposal (Rautenbach, 2014).

More focus is required for solid waste management and mitigation of negative public and environmental impacts. An effective solid waste management system is of great importance for the avoidance of environmental and health-related impacts (Badgie *et al*., 2012).

Waste management in Abeokuta, Nigeria, is completely left to the local government's discretion. Challenges are due to a rise in solid waste generation and an inadequate organised waste handling system. Burning is the most familiar method used for disposal of waste. Understanding the content of waste stream materials can facilitate better and informed waste management practices (Achi, Adeofun, Gbadebo, Ufoegbune & Oyedepo, 2012). The heaps of garbage littering the streets, dumped in drains, vacant plots and water bodies are seen very often in the major cities of Nigeria, and have the potential to spread communicable diseases (Babalola, Ishaku, Busu & Majid, 2010).

The challenges of solid waste management practices in Dumaturu in Nigeria are mainly due to an influx of people and its strategic location along the axial route to major cities in the Northeast region (Babalola *et al*., 2010). Constructed waste bunkers, wheeled plastic, and metal waste bins are waste collection bins that are placed at strategic locations, termed as points of high waste generation. Reliance of the current practice on monthly collection and waste disposal at dumping sites was found to be the reason behind inefficiencies of the existing solid waste management system in Nigeria (Babalola *et al*., 2010).

An assessment of waste management practices at Transnet National Ports Authority in Richards Bay revealed that general waste streams are not segregated due to lack of knowledge and awareness (Naidoo, 2015). Staff members at Transnet National Ports Authority are not cognisant of their waste-related issues. Constraints on facilities and human resources at Transnet National Ports Authority were recognised as barriers to sustainable waste management. Office paper was the only type of waste that was currently being recycled from the general waste streams at (Naidoo, 2015).

Lack of effective waste management systems in Nairobi in Kenya led to high possibilities of negative environmental and human health impacts (Muniafu & Otiato, 2010). A review of municipal solid waste management in Nairobi revealed that managing solid waste remains a huge environmental and public health concern. Solid waste management in Nairobi has been transformed into a major public health and environmental concern by rapid urbanisation, industrialisation, population growth and increased waste generation (Njoroge, Kimani & Ndunge, 2014). Efforts made by non-governmental organisations and communities to recycle paper, plastic, and metal remain minimal due to increasing urbanisation without adequate disposal sites (Muniafu & Otiato, 2010). The rising number of illegal dumpsites are as a result of inadequate enforcement of regulations. The only official operational dumpsite for the city, Dandora, is poorly managed and almost full (Njoroge *et al*., 2014).

An assessment of household solid waste disposal practices in Sabon Gari in Zaria revealed that most households generate huge waste quantities that are not properly disposed of. Insufficient funds and inadequate equipment for collection, transportation, and disposal, are some of the challenges experienced by the Sabon Gari government. They result in deterioration of the urban environment as the majority of the household waste ends up in ditches, empty plots of land and construction sites (Stanley, Andrew, Dania & Sani, 2012).

Management of urban waste is a challenge in Uganda and has been aggravated by the ever-increasing urban population and the immense differences in household waste composition (Sabiiti & Katongole, 2012). Waste collection practices by the public sector or the private operators include house-to-house and the central collection systems. Privatising waste collection in Kampala has proven to be inadequate for the solid waste problem as private collectors remove waste only in places where ratepayers afford services (Sabiiti & Katongole, 2012).

Literature review shows that population increase, rapid industrialisation, and urbanisation have major impacts on the amount of waste generated (Maluleke, 2014). An indication that the current waste management system will not be sustainable in the long run in most countries is evident due to solid waste generation rates, collection frequencies and transportation, waste minimisation, and reduction practices. A number of challenges inhibit waste management efforts made by municipalities (Jerie & Tevera, 2014).

Economic and population growth have resulted in increased waste volumes in most developing countries, and exert more pressure on the waste management facilities. Most of the waste generated in many countries is still disposed of at landfills depots (Kgosiesele & Zhaohui, 2010). South African waste management challenges are a result of the complexity of the generated waste streams and economic and population growth. South Africa faces numerous waste management challenges and deficiency of reclamation systems, recycling infrastructure and, insufficient funding mechanisms increase the complexity of these challenges (Tancott, 2013).

The main challenges are:

1. Increased waste volumes due to a growing population and economy, adding pressure on existing inadequate waste management facilities.
2. Urbanisation and industrialisation increase the complexity of waste streams and combining hazardous waste with general waste adds to this complexity.
3. Available waste data is unreliable and contradictory and its submission is not obligatory, resulting in restricted knowledge and understanding of the main waste flows and national waste balance.

4. Increasing pressure on outdated waste management infrastructure and non-existence of recycling infrastructure to separate waste at source and to divert waste streams to material recovery and buy-back centres.
5. Fewer available waste management treatment options which are more expensive than the landfill costs (Tancott, 2013).

Lessons learnt from the current literature review reveal that the majority of the countries still rely on landfilling as the main method of managing solid waste as most definitions refer to waste as unwanted material. Most countries are still struggling to implement best practices for managing solid waste due to financial constraints, lack of resources and awareness. This indicates that solid waste management practices implemented in most countries are not conducive to a healthy and sustainable environment, even though waste management has been a burning issue and a topic of discussion for over a decade. Mixing of waste remains a challenge as most of the countries do not have formal waste recycling systems.

Effective management of waste remains a challenge for most South African municipalities despite several waste management policies having been established. Waste management is a listed state-regulated activity in South Africa but enforcement and compliance seem to be a huge challenge. Sound evidence from existing literature shows that different approaches and new technologies for minimising waste and conversion of waste materials to useful resources are implemented on a lower scale. The literature review indicates that the adoption of best practices in managing solid waste remains a major concern, as it has not been successful in ensuring that waste is seen as a resource that can offer economic opportunities.

2.6 Gaps in the literature review

Reviewed literature shows that none of the past studies focused on waste management in casinos (Chazin *et al*., 2012). Environmental impacts have not been studied as closely but there is significant literature on various social casino impacts such as their effects on crime rates, local population density, and employment rates. The absence of literature on waste management at casinos shows a gap in research.

The review of the literature did not reveal any past researches that were conducted on waste management practices at Carnival City Casino. As a result, waste management practices at Carnival City Casino were not fully understood. The effectiveness of the practices, the challenges faced in managing waste and the level of employee awareness of management practices were not known. This one area had to be explored in view of the commitment by Carnival City Casino to achieve Sun International's commitment of 'zero-waste-to-landfills' by 2022. The study of this nature will assist in understanding how the casino industry manages its waste. Lack of prior research on waste management at casinos was a reflection of the need or opportunity for research to be undertaken.

The researcher used past researches that focused on private companies and municipal waste management practices to establish a framework to work with and lay a foundation for the research problem.

2.7 Conclusion

The literature review revealed that similar waste management practices are used for different organisations in different countries. Most countries use the waste hierarchy to manage waste and address the diversity of waste challenges. Waste minimisation, incineration, composting, open dumping and landfilling are common waste management practices implemented worldwide. Waste minimisation focuses on reducing waste sent to landfills through reuse and recycling.

Literature reveals that solid waste management is a major global challenge for many countries. There are costs involved in waste management whether it is reused, recycled, incinerated or landfilled. Lack of environmental awareness and ignorance are challenges that restrict people from realising that good housekeeping and environmental protection are everyone's obligation, and not only and obligation for municipalities. Solid waste management is a challenge that South African municipalities are facing. Effective waste management is more than just collecting waste and dumping it at the landfills as practised by most municipalities countrywide.

Chapter 3: Research methodology

3.1 Introduction

This section covers the research methodology for the study. The research methodology is the master plan for conducting the research. Description of the study area, research design, sampling strategy, various data collection methods, data analysis, pilot study, ethical considerations, validity and limitations of the study are all explained in this chapter.

3.2 Study area

The study was carried out at Carnival City Casino and Entertainment, which is located on the outskirts of Johannesburg East, in Brakpan in the Ekurhuleni Metropolitan Municipality, in the Gauteng Province (Figure 3.1). Carnival City is one of Sun International's operational units in Gauteng. Gauteng is the most densely populated province and the smallest of the nine South African provinces, with a land area of 16 548 km^2 (Statistics South Africa, 2011). The population density for Gauteng province is 12 272 263 (Brand South Africa, 2017). Carnival City has a geographic area of about 150 hectares. The geographic coordinates of the area are 26° 15´ 35.9´´ South, 28° 18´ 49.6´´ East (Sun International, 2015b).

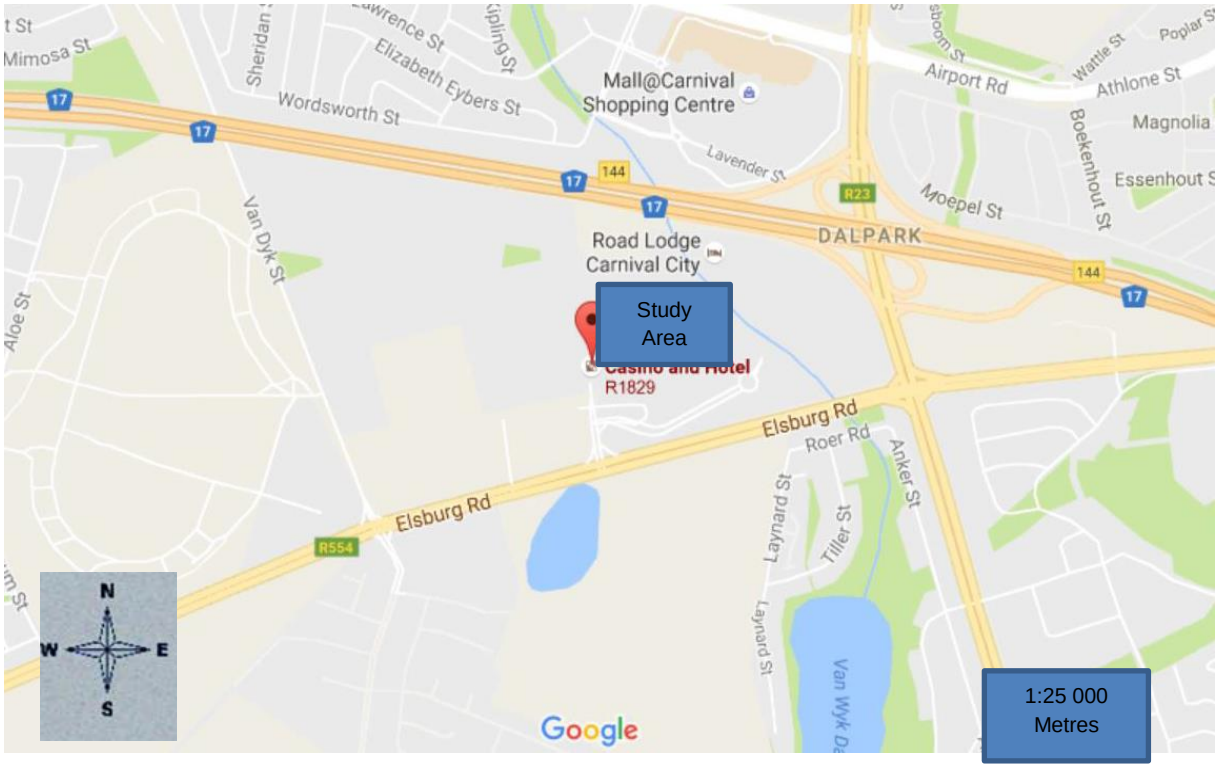

Figure 3.1 Map of the study area

(Google Maps)

Carnival City has a wide variety of restaurants, bars, a gaming floor, a cinema, a hotel, the lodge, games arcade at Magic Company, conference facilities, a clinic and supporting activities responsible for office duties, all generating vast quantities of waste on a daily basis. The core business of Carnival City casino is gaming, and there is a Carnival Club hotel and the Road Lodge responsible for providing accommodation. Carnival City is renowned for hosting a variety of live performances and star-studded events in the Big Top Arena, Festival Lawns and Mardi Gras Theatre (Figure 3.2). The tourists who visit the graves of the political icons, Oliver Tambo and Chris Hani in the Ekurhuleni Metropolitan Municipality come to Carnival City for entertainment and accommodation. Some of the guests stay permanently at the Carnival Club hotel. Various entertainment and leisure activities at Carnival City generate a great amount of waste even though they are important sources of revenue and employment, and contribute to the country's economy (Sun International, 2015b).

All the restaurant kitchens are outsourced to the concessionaires, except for one that is fully owned by Sun International; and the hotel and staff canteen kitchens are internally managed by Carnival City. Eight of the restaurants visited during the study are renting out Carnival City's property and the researcher obtained permission from the Operations Department to gain access. Carnival City Headcount for March 2017 showed that the Casino employed 2 695 employees, of which 965 were under Sun International and 1 730 formed part of the concessionaires and service providers. Fifteen of the staff complement were responsible for the management of waste within the complex (Sun International, 2015b).

The environmental management system at Carnival City is based on the ISO 14001:2015 standard requirements even though it is not certified (Sun International, 2015b). ISO 14001 is an internationally agreed standard setting out the environmental management system requirements, which include the need for continual improvement (ISO 14001, 2015). The standard focuses on more efficient resource usage, waste minimisation, and getting a competitive advantage and the trust of stakeholders to improve businesses' environmental performances (ISO 14001, 2015).

Carnival City's approach to waste management is defined by Sun International's sustainability strategy. Sun International is Carnival City's motherboard and its commitment to 'zero-waste-to-landfills' lays the foundation for addressing waste challenges at Carnival City Casino (Sun International, 2015). The commitment is based on the urgent need for waste reduction, reuse, and recycling for environmental protection, and on introducing a waste management system that promotes effective waste reduction (Maluleke, 2014). The research sites from which data was collected are restaurant kitchens, parking lots, grease trap areas, festival lawns, Big Top Arena and the waste sorting area (Figure 3.2).

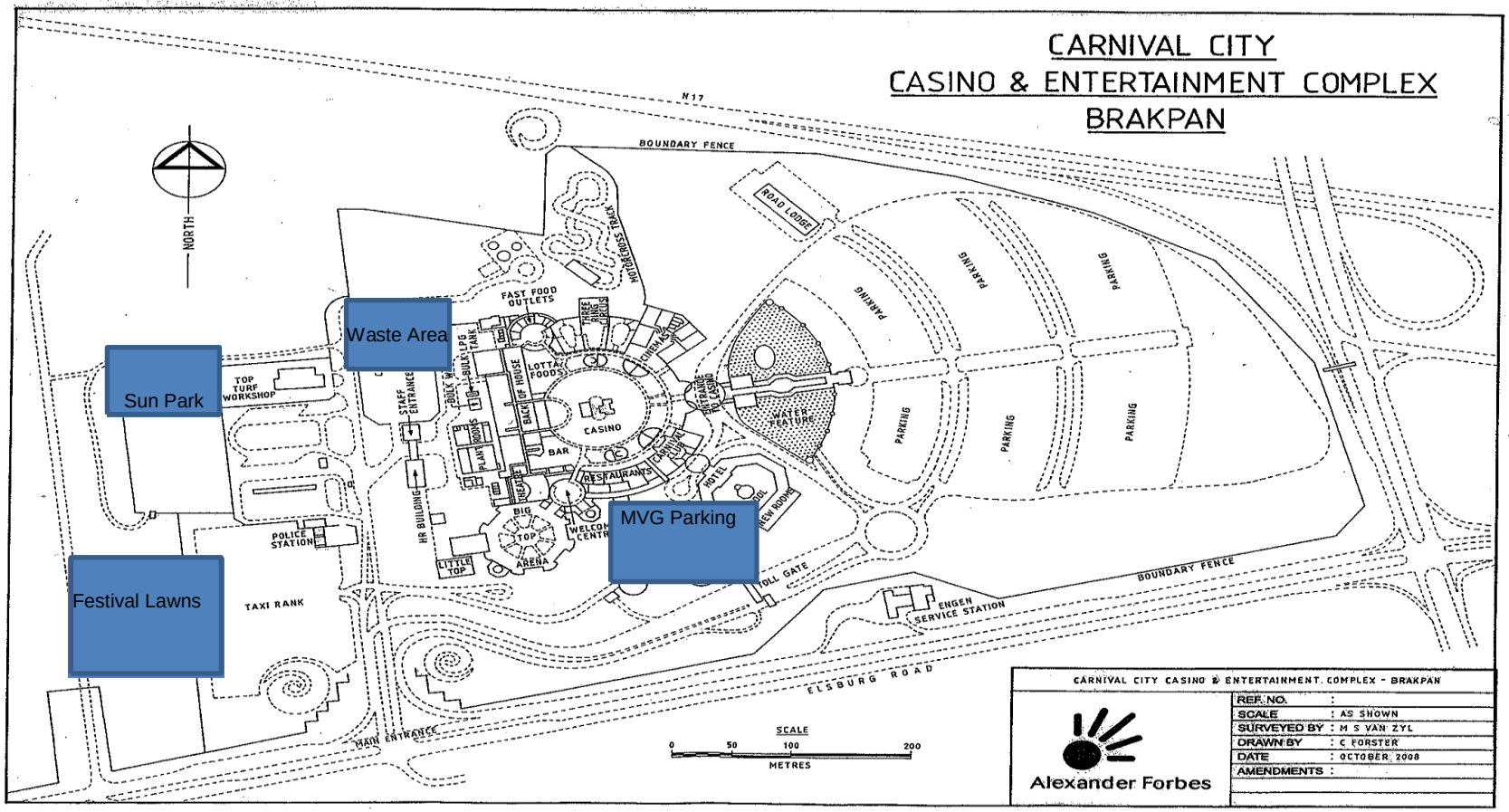

Figure 3.2 Location of data collection sites

(Carnival City Intranet)

3.3 Research design

Leedy and Ormrod (2014) define a research design as a general master plan or strategy for finding a solution to the research problem. The overall structure for the methods and techniques, and an overview of the data collection and analyses that were employed are provided in the research design (Leedy & Ormrod, 2014). The study adopted a qualitative research design. Underlying reasons, opinions, and the meanings attributed to a social or human problem by individuals or groups are explored and understood using a qualitative research approach (Marshall & Rossman, 2011).

Qualitative research allows the researcher to conduct field data collection where participants experience the issues under study, and multiple sources of data are used and triangulated to help facilitate deeper understanding (Saunders, Lewis & Thornhill, 2012).Thus this study used interviews, observations, photographs, field notes and document reviews to collect data. Qualitative research renders the researcher the capability to gain new insights and develop new ideas about a particular phenomenon, discover the existing problems and provide the means to judge the effectiveness of particular policies, practices, and innovations (Leedy & Ormrod, 2014).

Creswell (2014, p.234) conveys natural settings, researcher as the key instrument, multiple sources of data, participants' meanings, and inductive and deductive data analysis as basic characteristics of qualitative research. The study evaluated waste management practices at Carnival City's natural setting, as they were no laboratory experiments undertaken. The researcher was a key instrument in collecting data and interpreting research participants' meanings. The researcher compiled the interview guides and observation checklists and probed the research participants for more information during the study.

Creswell (2014, p.241) lists the advantages of using a qualitative research methodology as follows:

- The researcher has first-hand experience with the participants during observations.
- It enables recording of information and unusual aspects noticed by the researcher as they occur during observations.
- Interviews give the researcher control over the line of questioning.
- Secondary data saves the researcher time and the expense of transcribing as it is written evidence.

The advantages of a qualitative research methodology allowed the researcher to have control over the line of questioning and to be an active participant in the study by asking questions during the interviews. The researcher remained objective during interviews.

Observations allowed the researcher to take field notes during the site visits and to record information as it occurred. Secondary data saved time for the researcher as it was acquired from existing literature and secondary data sources. Types of qualitative research strategies are ethnography, case studies, interviews, focus groups, grounded theory, narrative enquiry, and action research. In a case study, examination of a particular phenomenon within its real-life context is conducted using multiple sources of evidence (Saunders *et al.,* 2012). A case study strategy is suitable for research studies where how, what and why questions are posed, and where the researcher has little control over events. The two types of case studies are single and multiple case studies (Yin, 2014).

An interview is the type of qualitative research strategy used in this study. Interviews assisted the researcher to obtain information from research participants' experiences on Carnival City's waste management practices. The researcher worked directly with the participants during interviews and had the opportunity to ask follow-up questions. The use of an interview guide ensured that similar questions were asked to collect data from each of the research participants.

3.4 Research philosophy

A research philosophy is a belief about the ways in which data about a phenomenon should be collected, analysed, and used. Positivism, pragmatism, realism, and interpretivism are the types of research philosophies. The positivism philosophy adopts working in the tradition of the natural scientist and is associated with large samples (Saunders *et al*., 2015, p.135). Positivist applies experiments and tests to prove or disprove hypotheses (Greener & Martelli, 2015). The pragmatism philosophy is associated with mixed or multiple method designs. The realism philosophy deals with chosen methods that fit the subject matter (Saunders *et al*., 2015).

The interpretivism philosophy is associated with small samples, investigations and emphasizes qualitative analysis. "The interpretivism philosophy focuses on understanding the differences between humans as social actors because they create meanings" and it helps to create better interpretation and understanding of society (Saunders *et al*., 2015, p.140). The research philosophy employed in this study was interpretive, naturalistic and phenomenological as the researcher was working with small samples. The ontological position of the interpretive paradigm is relativism, which means that reality is subjective; while epistemology is that of subjectivism and this is based on the argument that meaning is constructed through interaction of humans and the environment (Scotland, 2012). Guidance of this research philosophy enabled investigations that allowed the researcher to participate in the study and to develop a more accurate understanding of the behaviour of Carnival City's employees towards waste management (Saunders *et al*., 2015).

3.5 Research approach

Inductive and abductive research approaches were the forms of reasoning that were used in this study. Reasoning is the process of using existing knowledge and assumptions to make predictions, construct explanations or draw conclusions (Saunders *et al*., 2012).

3.5.1 Inductive reasoning

Inductive reasoning focuses on building theory from the research through investigation using various research methods. Untested conclusions are generated using known premises (Saunders *et al*., 2012). The researcher from the data gathered in the field (Creswell, 2014) generates meanings. Inductive reasoning draws conclusions or inferences based on facts or observed evidence (Saunders *et al*., 2012, as cited in Machete, 2015, p.93). Inductive reasoning is also known as generalisation as the researcher generalises the research outcomes from the sample to the general population from which the sample was drawn (Mouton, 2013). Inductive reasoning was applied during qualitative content analysis to come up with themes.

3.5.2 Abductive reasoning

Abductive reasoning is also known as recontextualisation. It facilitates determining a set of possible premises that are considered adequate or nearly sufficient to explain the conclusion. Testable conclusions are generated from known premises. Abductive reasoning starts with an observation or set of observations, then it seeks to find the easiest and most straightforward explanation. Data is collected to explore a phenomenon, identify themes and explain patterns to generate a new or modify an existing theory that is tested through an additional data collection (Saunders *et al*., 2012). In this research, waste management practices at Carnival City Casino were recontextualised within practices ordered according to the waste management hierarchy.

3.6 Research methodology

The focus of the research was to identify solid waste management practices implemented at Carnival City Casino, establish their effectiveness and explore waste management challenges faced by Carnival City. Observations, photographs, field notes, interviews and document reviews are multiple sources of data that were used for data collection. The required data, data collection methods and methods of analysis for each of the specified objectives are mentioned in Table 3.2.

3.7 Pilot study

A pilot study was conducted prior to the actual research. A pilot study is a small-scale study undertaken to pre-test a particular research instrument, to minimise the data collection challenges that the researcher might encounter with the research participants (Saunders *et al*., 2012). The interview process was pre-tested with two participants, one general worker, and one supervisor to check the ease with which they responded to the questions in the interview guide.

The camera and the tape recorder were pretested before the fieldwork was undertaken, to test the feasibility and ensure that there were no electrical faults. The results of the pre-tests showed that interview questions were addressing the study objectives, and no adjustments were needed to the interview guide. The two participants were later excluded from the actual study as the pilot test data was integrated in the main study.

3.8 Data collection methods

The research used primary and secondary data sources to collect data on waste management practices at Carnival City Casino. Site visits were conducted to collect primary data using interviews, observations, and photographs. Tools that were used in the study are observation checklists, interview guides, a tape recorder, a plan indicating data collection sites (Figure 3.2), a camera, and a notebook. Eleven kitchen areas were visited during the study. The safety officer accompanied the researcher to the kitchens of the nine restaurant areas, Carnival Club hotel and Carnival City staff canteen that the researcher visited in order to observe waste implemented management practices. The researcher also visited the Weltevreden landfill site and Interwaste on-site solutions recycling hub in the company of the Interwaste area manager to see what happens to the waste once it leaves Carnival City Casino's premises.

3.8.1 Primary data collection

3.8.1.1 Observations

An observation is a systematic, purposeful and selective way of watching and listening to an interaction or phenomenon as it occurs (Kumar, 2014). The researcher recorded field notes on the behaviour of individuals and activities at the research site (Kumar, 2011). An inductive approach starts with an observation, and not with a pre-established truth or assumption (Leedy & Ormrod, 2014). Observations were used to collect data to identify waste management practices implemented at Carnival City Casino.

Data was collected from the temporary waste storage areas, parking lots, restaurant kitchens, grease trap areas, festival lawns, Big Top Arena and waste sorting area at Carnival City (Figure 3.2), and the Interwaste recycling hub in Germiston. The researcher visited the study area eight times and used the observation checklist (Appendix 6) to take note of the behavior of participants concerning waste management practices. Data was collected without disturbing and interfering in the processes. The space on the observation checklist was too small to note down all the observations. A notebook was used in conjunction with the observation checklist to take notes. A camera was used for taking photographs during observations. Notes and photos taken during the observations were used to compile an observation report of the waste processes.

Restaurant kitchens were visited to observe how employees handle the wet and dry waste. Parking lots, temporary waste storage areas, and grease trap areas were observed to see how waste was managed (Figure 3.2). Festival lawns and Big Top arena were visited to establish the effectiveness of the current waste management practices and capacity in handling waste during busy events. The researcher followed the pick-up trucks of the appointed waste contractor from the waste sorting area to the Interwaste recycling hub in Germiston to observe what happens to waste from Carnival City once it is removed from the site. Permission to visit Interwaste recycling hub was obtained from Interwaste on-site solutions' management.

3.8.1.2 Interviews

An interview is a face-to-face or telephonic verbal interchange in which an interviewer attempts to draw out ideas, information, beliefs or views from another individual (Kumar, 2011). The type of interview used in this research was the semi-structured interviews with open-ended questions. The researcher conducted face-to-face interviews with Carnival City Casino's general workers and managers to collect information on the level of employee awareness on waste management and issues that could not be observed in the field and to ask questions related to Carnival City's waste management practices. Permission was granted to the researcher to use a tape recorder during the interviews. The interviews with waste sorters were conducted in the office in the waste area. Detailed information on Carnival City's waste management practices and the challenges they face, were acquired through interviewing employees in the waste sorting area, as they are the workers who are dealing with different types of waste on a daily basis.

Sampling technique

Sampling is a specific principle used for selecting population members to be included in research. The selection strategy that was used is a non-probability sampling technique, as the probability of every employee from the study area being selected was not known or guaranteed. Convenience, quota, snowball, self-selection and purposive sampling are five types of non-probability sampling techniques (Saunders *et al*., 2012). The researcher was working with small samples, and purposive sampling was used for selecting visited areas at Carnival City. Purposive sampling method helped the researcher to select informative field areas and participants who would give the best responses to the research questions (Matthews & Ross, 2010).

The researcher used personal judgment to select participants who were considered population representatives (Saunders *et al*., 2012). The focus was on employees from Interwaste on-site solutions as they have vast experience, knowledge, skills, and exposure to waste generated at Carnival City. The CSIR study on good practices of waste management in South Africa notes that good practices arise from people who work with the challenges daily, and find successful, innovative and sustainable solutions through simple approaches (CSIR, 2011).

Selection criteria: research population

A population is a full of set of cases or elements from which a sample is drawn to statistically represent a population (Saunders *et al*., 2012:260). The population consisted of Carnival City Casino's employees which had a workforce of 2 695 as per April 2017 headcount report for Carnival City. Fifteen employees from the workforce deal with waste. A sample was drawn from Carnival City employees, as it was not possible to get the information from the entire population.

All research participants were Carnival City's employees and were above South Africa's legal age for employment, 18 years. An inductive approach was used for sample observation and drawing conclusions on the research population (Saunders *et al*., 2012). A sample size of 26 employees was settled for as the researcher chose informative research participants who would best answer the research questions. Managers from operations, health and safety, and maintenance departments were selected as research participants as all concessionaires and contractors report to them. Ten employees from the waste sorting area, three employees per shift and the site manager were interviewed. Five general workers from the restaurants, one Harvest & Grill manager, two managers from the maintenance workshop, one Carnival Club hotel manager, a duty operations manager, a health and safety manager and three staff canteen commis chefs were also interviewed. Two employees from the Interwaste recycling hub were also interviewed during the time of the study (Table 3.1). Data saturation occurred within the first seven interviews to justify the sufficiency of the sample size.

Table 3.1 Interviewed people

People interviewed	Numbers	Information collected
Waste sorting area employees (Interwaste Contractor)	10	Waste management practices and their effectiveness, and challenges encountered
Restaurants' general workers	5	Waste management practices and their effectiveness, level of employee awareness on waste management
Managers (Duty Operations Managers, Health & Safety Manager, Maintenance Manager, Waste Area Site Manager, Restaurant Managers)	6	Waste management practices and their effectiveness, level of employee awareness on waste management and challenges encountered
Canteen chefs	3	Waste management practices and their effectiveness, and level of employee awareness on waste management
Interwaste recycling hub employees	2	Waste management practices and their effectiveness

Interviewing technique

Open-ended questions from the interview schedules (Appendices 4 and 5) encouraged full, meaningful answers from Carnival City employees and enabled the researcher to respond to research objectives. The research objectives that interviews were meant to respond to are identifying waste management practices implemented at Carnival City Casino, establishing their effectiveness and exploring waste management challenges faced.

Information sought from interviews was on types of waste that interviewees deal with on a daily basis, the type of waste generated in larger volumes at Carnival City, the effectiveness and challenges of current waste management practices, and the areas for improvement. The research conducted all interviews and each took approximately 20 minutes to complete. The researcher conducted 10 interviews with Interwaste employees at the waste area and found that data saturation occurred within the first seven interviews. Data saturation is the point at which no new themes or information are observed in the data (Saunders *et al*., 2012).

3.8.1.3 Photographs

A camera was used to take photographs of the waste area and waste related incidents to support notes collected during observations. Photographs were taken at Carnival City and Interwaste recycling hub and the refuse-derived fuel (RDF) plant. No photographs of the research participants were taken. The researcher ensured that an encrypted file was used to keep all downloaded photographs, and deleted them from the camera for safety assurance.

3.8.2 Secondary data sources

Existing literature from secondary data sources such as the internet, government publications, newspaper articles, past journals, and waste volume and audit reports (Table 3.2) was used to collect and extract information on waste management practices at Carnival City. Waste volume reports are compiled by Interwaste on-site solutions on a monthly basis. The types, and amount of waste generated in the study area were established using the monthly waste volume reports compiled by Interwaste on-site solutions.

Table 3.2 Research Methodology Matrix

Objectives	Required data	Data collection methods	Analysis methods
1. To identify waste management practices at Carnival City Casino	Types of waste generated and quantities waste management practices	Observation, Interviews, Photographs Waste volume reports	Content analysis Inductive reasoning
2. To establish the effectiveness of waste management practices at Carnival City Casino	Information on management practices and the views of the respondents	Observation, Interviews, Photographs Waste volume, and audit reports	Content analysis Abductive reasoning Waste hierarchy as an analytical framework Comparative analysis of practices on the ground versus ISO 14001 standard
3. To explore the challenges faced by Carnival City Casino with regards to waste management	Information on challenges faced in managing waste	Interviews Waste volume, and audit reports	Content analysis
4. To determine level of employee awareness on waste management at Carnival City.	Information on employee awareness	Interviews	Content analysis
5. To recommend measures that will improve waste management standard at Carnival City	Further analysis of information collected to meet other objectives	Research findings, Reports	Content analysis

3.9 Data analysis

Order, structure, and meaning are brought to the mass of collected data, during the data analysis process (De Vos, Strydom, Fouche & Delport, 2011). The study used content analysis to analyse collected data and to draw conclusions. Content analysis is a flexible technique for building or supporting an argument in qualitative data analysis. Content analysis helped the researcher to evaluate waste management practices at Carnival City and to establish if the practices were effective or not. A detailed and systematic examination of the contents of a particular body of material is done in content analysis with the intent of recognising themes, patterns or biases (Leedy & Ormrod, 2014). A comparison of keywords or content is done in content analysis, and meanings from the collected data is summarised (Saunders *et al*., 2012). The content analysis method is aligned to the two forms of reasoning explained in section 3.4., inductive and abductive reasoning.

The collected data was analysed using the NVivo software and manual coding and categorisation to ensure trustworthiness. NVivo is a computer-aided qualitative data analysis software (CAQDAS) which was utilised as a tool in analysing qualitative data, and speeding up the process of coding and retrieving text according to themes. The NVivo software assisted the researcher with the interviews' transcripts analysis and the structuring of data in terms of themes, patterns, and interrelationships in a manner that fulfilled the attainment of the study objectives (Saunders *et al*., 2012). Collected data was transcribed, coded and categorised.

Data from the interviews aided the researcher in understanding the meanings that employees give to waste management and determine their level of understanding on waste management at Carnival City. Conducted interviews gave the researcher an idea of how employees feel and think about Carnival City's waste management, what limitations they encounter, and how they deal with their experiences and challenges. The researcher interpreted the thoughts, feelings and actions of employees to explore the challenges that they face concerning waste management.

Detailed exploration of data gathered through interviews was done for common themes and categorisation into units of meanings to help the researcher to explore challenges faced by Carnival City concerning waste management (Leedy & Ormrod, 2013). Each interview was saved as a separate file and anonymous codes were used for identification. Data from the tape recordings were transcribed verbatim and the field notes were read repeatedly to identify common themes and patterns. The researcher repeatedly read the field notes and listened to the tape recordings to get familiar with the data and identify meanings. The categorisation of identified meanings was done to search for data recurrences and patterns. The researcher searched for recurring patterns to determine the essence of relevant information, and defined interrelationships among the categories and patterns (Saunders *et al*., 2012).

The coded data was used to draw conclusions, interpret of patterns identified in the data and attach meanings to the patterns and interrelationships (Creswell, 2014). Analysis of data gathered from the interviews, observations, photographs, and secondary sources was done using comparative analysis to compare the findings and demonstrate the effectiveness of current waste management practices against the ISO 14001:2015 standard requirements. A comparative analysis compares the practices on the ground to a standard. Data and facts were converged from the site and supported with viable constructs from the literature review (Saunders *et al*., 2012). The waste management hierarchy was also used as a framework to analyse data and demonstrate the effectiveness of current waste management practices at Carnival City.

Overall, data gathered from interviews, observations, photographs, and secondary data sources assisted the researcher to draw conclusions on whether current waste management practices are effective or not and make recommendations that will improve Carnival City's waste management standard.

3.9.1 Thematic analysis of qualitative data

The collected data was analysed using Nvivo software and manual coding. Coding is the process of sorting and analysing the collected data. Data collected from the interviews were transcribed, coded and categorised using a thematic analysis. Thematic analysis records patterns or themes within the data through identification, analysis, organisation, descriptions, and reporting of themes found within the data (QSR International, 2017). A thematic analysis was used to analyse data collected through interviews through the processes of data familiarisation, data coding, and the development of themes (QSR International, 2017).

3.9.2 Nvivo Software

Nvivo is a qualitative data analysis software tool (QSR International, 2017). Nvivo 12 software was used for analyses of data collected from the interviews. The document format was used to place data collected from the interviews and importing it into the software (Figure 3.3). Data storage, coding, and retrieval were facilitated through the Nvivo software. Themes egressing from the interview data were identified using the cluster analysis and the tree map (QSR International, 2017).

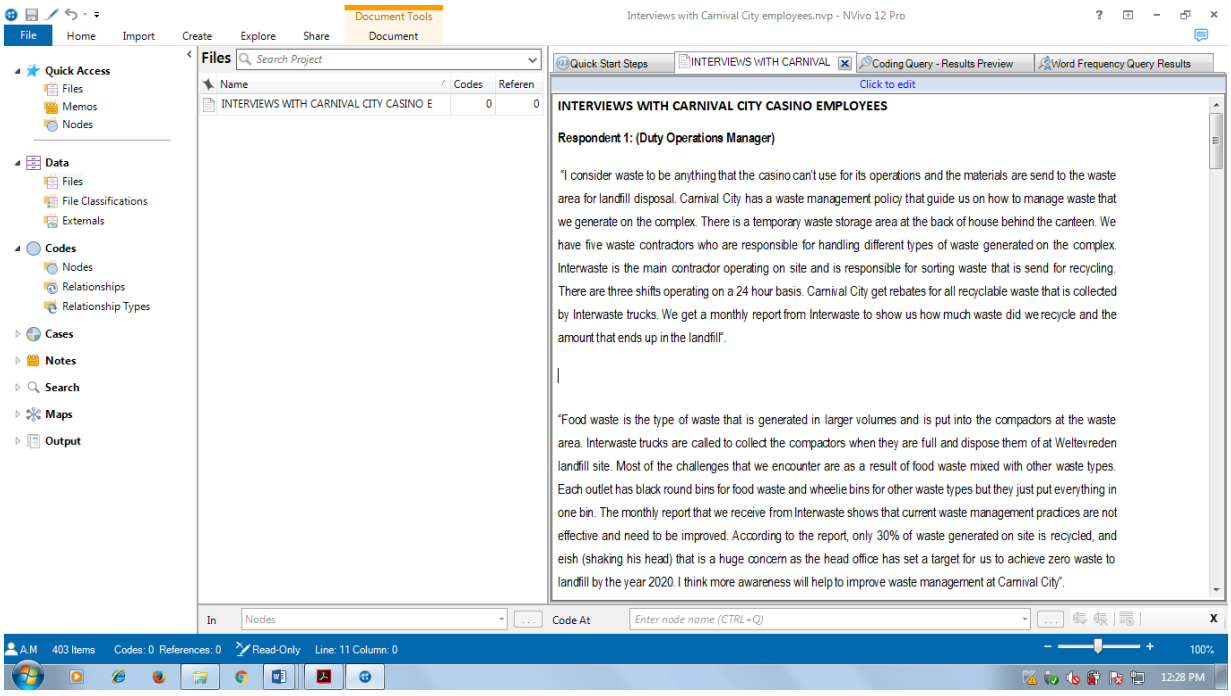

Figure 3.3 Data collected from the interviews

Manual coding was used for organising and analysing the collected data. Figure 3.4 illustrates the manual coding on a hardcopy of interview transcripts. Practices, challenges, and effectiveness were among words that were derived from the research objectives and assigned to coding categories. These words were labels that were classifying information items (Saunders *et al*., 2012).

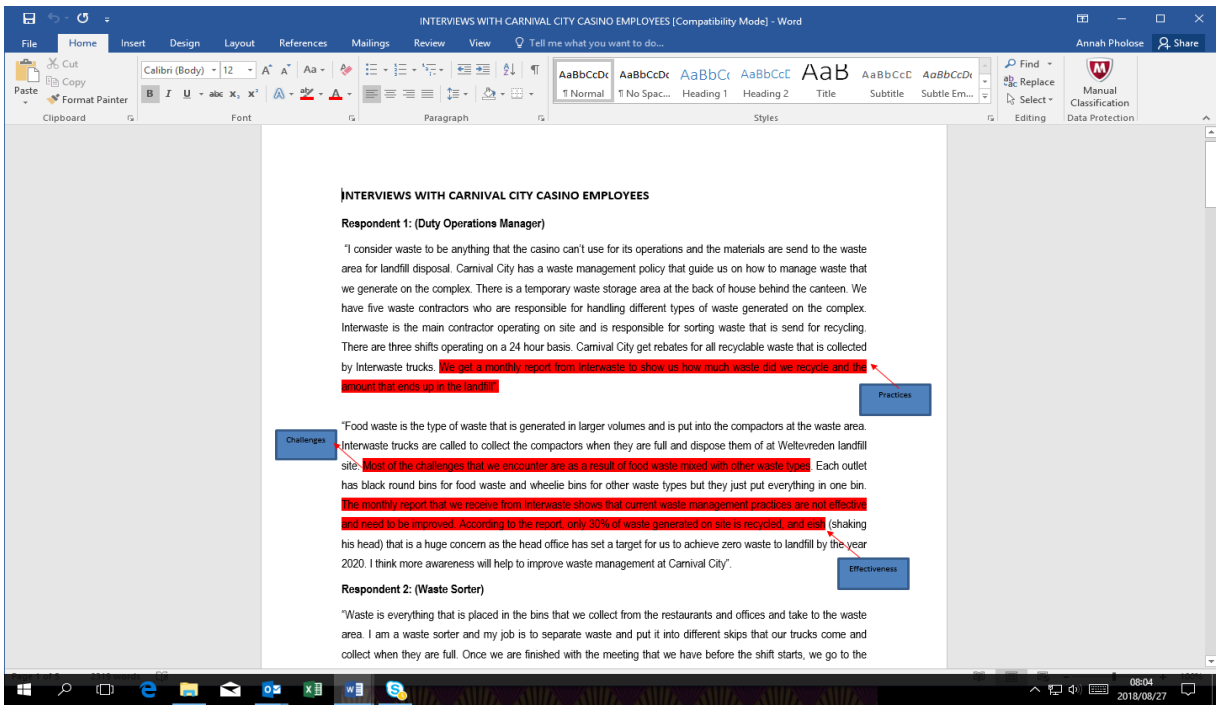

Figure 3.4 Manual coding of data collected from the interviews

Cluster analysis is an exploratory method or technique where sources or nodes sharing the same words or attribute values are grouped together to visualise patterns in a project. Sources or nodes that appear close together in the cluster analysis diagram are more similar than those that are far apart. Horizontal dendrogram, vertical dendrogram, 2D cluster map, 3D cluster map, and circle graph are types of cluster analysis diagrams (QSR International, 2017).

A tree map is a drawing or a diagram that shows hierarchical data as a set of nested rectangles of varying sizes. It is a hierarchical chart type that helps the researcher to see patterns in the coding or in viewing the attribute values of cases and sources. Size shows the number of nodes coded or the amount of coding references. Rectangles are arranged in size from top left to bottom right. Larger areas display at the top-left chart and smaller areas toward the bottom right (QSR International, 2017).

3.10 Ethical considerations

Ethical issues were considered throughout the duration of the study. Ethical clearance was obtained from UNISA's research ethics committee before the researcher undertook the study (Appendix 8).

3.10.1 Permission

The College of Environmental Sciences from UNISA wrote a letter on behalf of the student to request Carnival City to give the researcher permission to conduct research (Appendix 1). Carnival City management granted written permission to the researcher to conduct the study at their organisation (Appendix 2).

Permission obtained from Carnival City allowed the researcher to conduct the study at all the restaurants in the casino as all the concessionaires report to Carnival City's Operations department. All the concessionaires at Carnival City work according to Carnival City's standard operating procedures. Permission was also obtained from Interwaste on-site solutions for the researcher to visit their recycling hub and RDF plant in Germiston (Appendix 9).

3.10.2 Informed consent

A consent form (Appendix 3), notifying the research participants about the aim and possible benefits of the study, the use of data, their rights to privacy and confidentiality and to withdraw from the study was handed out to the research participants. The research participants signed the consent forms to give their consent in writing. The consent forms gave the participants assurance that the information they provided was to be used for academic purposes only.

The researcher provided her identification, the name of the institution and contact details to the participants to ensure trustworthiness. Carnival City management was informed of the days on which the waste sorters were followed to see how they collect and sort out waste. Notification that photographic material was required was made during permission request. The researcher notified the research participants that only photographs of the waste area and waste related incidents will be taken.

Respect and protection of the research participants' dignity, interests and privacy were exercised. The researcher ensured that confidentiality was maintained as no names and identity numbers of the participants were mentioned throughout data collection, analysis, and presentation of the research findings. Research participants were not compensated for taking part in the study. The research participants were informed of voluntary participation and their right to withdraw from the study at any time by the researcher.

3.10.3 Ensuring no harm to participants

All safety precautions were followed. The researcher wore personal protective equipment, (PPE) such as safety boots, goggles, noise clippers, and a dust mask while collecting data at Carnival City waste area and Interwaste on-site solutions' recycling hub. Research participants working at the waste area and Interwaste recycling hub wear PPE on a full-time basis for safety purposes. Wearing safety boots is a requirement for all restaurant kitchens as the floor might be wet and slippery. All participants in the restaurant kitchens wore hairnets for hygiene purposes. Some of the areas at Interwaste recycling hub in Germiston were noisy and needed noise clippers. The research adhered to safety signs and was aware of moving vehicles during research activities.

3.11 Validity and reliability

Validity is the extent to which data collection methods accurately measure what they were intended to measure (Saunders *et al*., 2012). Data triangulation was used for ensuring the trustworthiness of the research findings. Triangulation is the process where different data collection techniques are applied and used within one study (Saunders *et al*., 2012). Observations, photographs, interviews, and review of secondary data were used.

Reliability is the research instrument's ability to produce consistent measurements when used repeatedly (Kumar, 2011:173). Similar questions were posed to the research participants to ensure the reliability of the interview guide. Two research participants were used to undertake a pilot study before the actual research was done and the results showed that that no adjustments were needed in the interview guide. Data saturation was achieved after interviewing seven participants from the waste sorting area as no new information was emerging. Research participants from the waste sorting area were knowledgeable about managing waste and deal with the waste challenges on a daily basis.

3.12 Limitations of the study

Research findings could not be generalised as the study followed a case study design based on non-probability sampling. The researcher depended heavily on the waste volumes received from Interwaste, as there was no weighing and recording of waste taking place at Carnival City's waste area. Reliance on secondary data is a limitation as the data provided might not be accurate and those inaccuracies are carried into the research.

3.13 Methodological challenges encountered during fieldwork

Data collection through interviews was the most challenging phase in the study as it depended on other people. Some of the employees from the waste area were hesitant to participate as interviewees as they did not want the tape recorder to be used. They believed that people who knew them would be able to recognise their voices even if their names could be kept anonymous. Those employees were scared that the researcher would expose them to their superiors. The researcher promised them that the recordings would be used for study purposes only and will not be published without their consent. Employees agreed to participate in the study after days of persuasion, with the assistance of the union representative and signed the consent forms to give their consent in writing.

3.14 Methodological aspects that worked well during fieldwork

No challenges were experienced in accessing the study area, as Carnival City's safety officer accompanied the researcher during the data collection process. The safety officer acted as a guide as he did not interfere with the interview process and only guided the researcher to all the selected field areas.

As a guide, the researcher did not allow the safety officer to be present during the interview sessions to ensure that the interviewed people were at ease when giving their responses. None of the interviewed research participants refused to answer questions asked or withdrew from the study during the data collection process.

3.15 Conclusion

This chapter addressed the research methodology applied in the study. The qualitative methods used to collect data included interviews, observations, photographs, field notes and document reviews. Waste management practices were observed and participants were interviewed to collect data at Carnival City and draw conclusions. The chapter laid out the method and technique used for data collection and analyses. The researcher interpreted the data to draw up conclusions and compile the final research report. Ethical considerations, limitations of the study and the research rigour such as validity and reliability were also discussed.

Chapter 4: Research results

4.1 Introduction

The aim of the study was to evaluate solid waste management practices at Carnival City. Data collection was through observations, interviews and secondary data sources. The research findings aimed to address the research objectives mentioned in Chapter 1 are presented in this chapter. The results are presented in different formats such as text, photographs, tables, and graphs. Part of the results of this research were used to write a paper that was presented at the Waste Conference (WasteCon) at Emperors Palace in October 2018. The paper was published as a conference proceeding (See appendix 11).

4.2 Summary of results

This research sought to investigate the following:

- Waste management practices at Carnival City Casino
- Effectiveness of implemented waste management practices
- Waste management challenges
- Waste management training and awareness

The themes that egressed from the sub-headings based on the study objectives include: materials handling and management, waste prevention, waste generation, use of waste bins and waste compactors, waste collection, waste minimisation, reuse, waste separation at source, waste sorting, recycling, weighing of waste skips, Interwaste recycling hub, energy recovery, waste disposal or landfilling, efficiency of waste practices, lack of hygiene, lack of support from top management, awareness of waste management practices, and awareness and use of personal protective equipment (PPE). Table 4.1 presents themes related to sub-headings based on the study objectives and identified issues. Waste classification, total general waste, food waste management, medical waste, cost efficiencies, waste reduction, reverse logistics, fluorescent tubes recycling, cardboard packaging recycling, scrap metal recycling, fat skip area, containment leakage, no proper waste separation at source, employees' attitude and perception towards waste management, training and development, waste management policy and health and safety are identified issues from the themes.

Table 4.1 Identified themes per sub-heading

Objectives Sub-headings	Themes	Identified Issues
Sub-heading 1: Waste management process	• Materials handling and management • Waste prevention • Waste generation • Use of waste bins and waste compactors • Waste collection • Waste minimisation • Reuse • Waste separation at source • Waste sorting • Waste recycling • Weighing of waste skips • Interwaste recycling hub • Energy recovery • Waste disposal/ Landfilling	• Waste classification • Total general waste • Food waste management • Medical waste • Waste reduction • Reverse logistics • Types of recyclable waste • Paper recycling • Cans recycling, • Cardboard packaging recycling • Plastic recycling • Glass recycling • Fluorescent tubes recycling • Scrap metal recycling
Sub-heading 2: Effectiveness of implemented waste management practices	• Efficiency of waste practices'	
Sub-heading 3: Waste management challenges	• Lack of hygiene • Lack of support from top management	• Containment leakage • No proper waste separation at source • Poor maintenance of the fat skip bund area • Employees' attitude and perception towards waste management • Cost efficiencies
Sub-heading 4: Waste management training and awareness	• Awareness of waste management practices • Awareness and use of PPE	• Training and development • Waste management policy • Health and safety

Cluster analysis and the tree map were used for identifying themes egressing from the interview data (QSR International, 2017). No themes were determined as the software reported that the items in the query scope were inadequate to execute the cluster analysis (Figure 4.1).

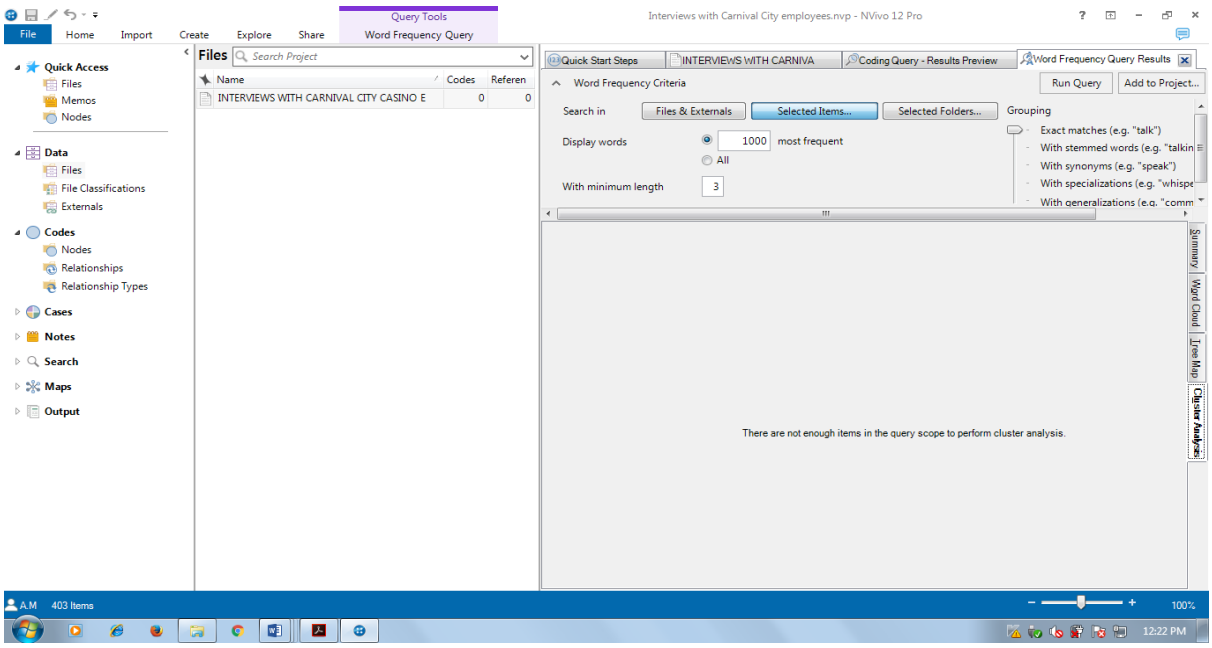

Figure 4.1 Cluster analysis

In a tree map, the results of the words with less coding references in the data were visualised in smaller rectangles. Words with most coding references were in larger rectangles e.g. waste (Figure 4.2).

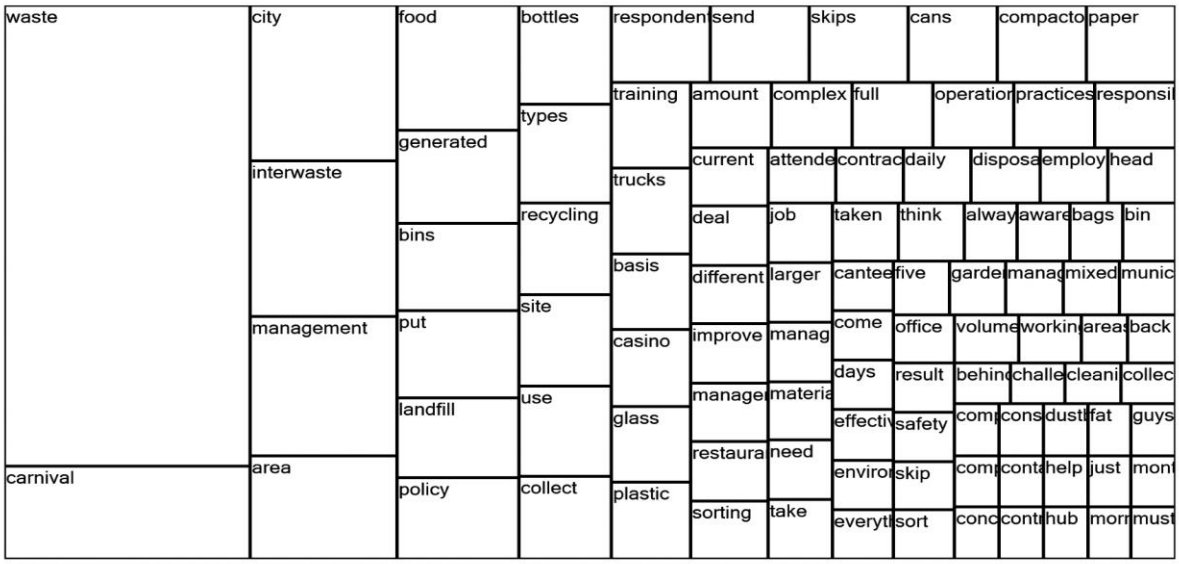

Figure 4.2 Tree map

4.3 Waste management practices at Carnival City Casino

4.3.1 Waste prevention

The first priority is given to waste avoidance or prevention in the waste management hierarchy. Electronic communication and online bookings were waste prevention practices implemented at Carnival City to avoid the use of paper.

4.3.2 Waste generation

Carnival City's operations generate wet and dry waste on a daily basis. Wet waste is organic waste generated by the eating establishments at Carnival City and is heavy in weight due to dampness. Wet waste includes food waste from the restaurants, staff canteen, hotel and the Road Lodge kitchens and fat from the grease traps. Cans, glass, plastic bottles and containers, cardboard boxes, magazines, paper, wooden pallets, scrap metal, garden refuse, paint containers, batteries, waste fluorescent tubes, and light-emitting diodes (LED) down-lighters are the types of dry waste generated at Carnival City. Carnival City Casino generates more than 900 000 kilograms of general waste on an annual basis as reflected on Carnival City's waste statistics for the year 2016 (Interwaste on-site solutions, 2016).

Five waste contractors and Ekurhuleni municipality are appointed to handle and manage waste generated on Carnival City's property. Interwaste on-site solutions is the main contractor responsible for waste sorting on the complex and operates on a 24-hour basis just like the casino operations. Interwaste received ISO 14001 accreditation in 2002 and has valid permits to operate a landfill site and a transfer station (Interwaste Holdings Limited, 2015). Interwaste has employees based at Carnival City who are responsible for collecting waste bins from the office blocks, temporary waste storage areas, hotel, Big Top arena, Sun Park, festival lawns, Mardi Gras Theatre, and the restaurants to the waste sorting area. Festival Lawns, Big Top area, Sun Park and Mardi Gras Theatre generate waste only if there are events that are held in those areas. Extra waste skips are placed at Sun Park and Festival Lawns.

4.3.2.1 Waste classification

Solid waste generated at Carnival City is classified as general and hazardous waste (Table 4 .2).

Table 4.2 Carnival City Waste Classification

General Waste	Hazardous Waste
1. Recyclable waste: Glass, plastic, cans, paper, cardboard boxes, wood, scrap metal, magazines,	1. Recyclable waste: fluorescent tubes
2. Organic waste: Food waste and garden waste	2. Organic waste: Used cooking oil and fat from the grease traps.
3. Non-recyclable waste: Paper towels, plastic,	3. Medical waste: Blood-soaked bandages, swabs, contaminated gloves, expired medicine, needles, and syringes

4.3.2.2 Total general waste

Figure 4.3 shows total general waste generated at Carnival city divided into recyclable and non-recyclable waste managed by Interwaste on-site solutions. The figure shows general waste generated from January to December 2016 as compiled by Interwaste in monthly waste volume reports. Total non-recyclable waste from January to December 2016 was 647 490 kg and total waste recycled was 256 809 kg for the same period. Total general waste for January to December 2016 was 904 299 kg. The monthly waste volume reports show that more than 70% of Carnival City's general waste is landfilled on a monthly basis (Interwaste on-site solutions, 2016).

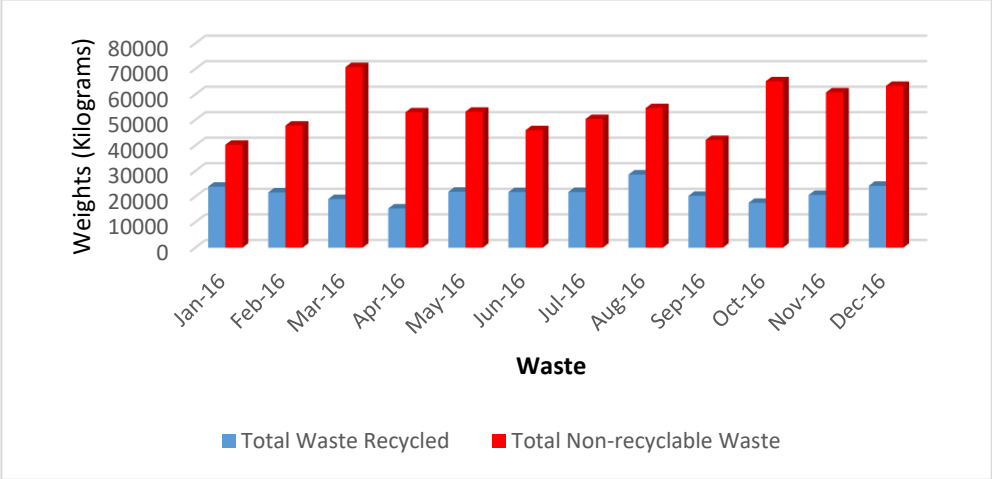

Figure 4.3: Total general waste (January - December 2016)

4.3.2.3 Food waste management

The study revealed that employees saw food waste as the type of waste that was generated in larger quantities. This was substantiated by the words spoken verbatim by the interviewees.

Respondent 1: (Duty Operations Manager)

"The type of waste that is generated in larger volumes is food waste and is put into the compactors at the waste area. Interwaste trucks are called to collect the compactors when they are full and dispose them of at the Weltevreden landfill site. Most of the challenges that we encounter are as a result of food waste mixed with other waste types. Each outlet has black round bins for food waste and wheelie bins for other waste types but they just put everything in one bin. I think more awareness will help to improve waste management at Carnival City".

Respondent 7: (Landscaping Supervisor)

"I think food waste is generated in larger volumes as it is put into the compactors at the waste area and I always see dirty water dripping from the compactors onto the concrete. The liquid dripping from the compactors is damaging the concrete at the waste area".

4.3.2.4 Medical waste

The documentary review revealed that Medicare 24, which is the contractor responsible for operating a clinic at Carnival City, manages medical waste. The clinic caters for both employees and guests and operates on a 24-hour basis and reports to the Operations department. Blood-soaked bandages, contaminated gloves, swabs, pharmaceutical waste, needles and syringes are the types of medical waste generated at Carnival City Clinic. Pharmaceutical waste includes expired medicines and vaccines, and their packaging materials. Pharmaceutical waste is reduced through checking of expiry dates and supplying and using older batches first to reduce expired material that is thrown away. Designated colour-coded bins are provided to ensure the separation of clinical waste from general waste. The waste bins are puncture-resistant, leak-proof and rigid (Sun International, 2015b).

Medical waste management poses major health problems in developing countries as it is still disposed of with general waste. Medical waste is hazardous and infectious, and poses health and environmental risks if not properly managed. The public, municipal and healthcare workers are exposed to infections and injuries due to poor management of medical waste (Kudoma, 2013). Medical waste is removed by SharpMed waste contractor from Carnival City clinic for incineration at the Wasteman Incinerator Plant.

Ash from the incinerator is given a hazard rating by the Wasteman Incinerator operator before disposal at a hazardous waste landfill site. The class of the landfill at which waste is disposed of is determined by the hazard rating (DWAF, 1998). The Holfontein landfill site is used to dispose of the incinerator ash. Carnival City clinic and the Health and Safety Manager retain safe disposal certificates for every medical waste collection and disposal.

4.3.3 Waste minimisation

Waste minimisation focuses on practices that organisations implement to lessen the quantity of waste generated. Waste minimisation must start at purchasing points (Radwan, Jones & Minoli, 2012). Waste reduction and reverse logistics are practices that were identified under the waste minimisation theme.

4.3.3.1 Waste reduction

Usage of porcelain plates and cups, and stainless steel forks, spoons, and knives in the staff canteen, conference rooms, restaurants and hotel kitchens instead of disposable plastics was one of the waste reduction practices observed at Carnival City. The crockery and cutlery are not allowed to leave the canteen and employees are allowed to bring their own lunch boxes to collect food. This reduces the amount of waste generated from using polystyrene food containers.

Electric air-hand dryers in the restrooms reduce the use of paper towels. Paper towels are still used in the staff designated restrooms, the canteen and the restaurants. Glass jugs and glass water bottles used in the conference rooms reduce the amount of plastic water bottles disposed as plastic waste and eliminate disposal costs. However, plastic bottled water is still sold on the casino floor and the bars. Paper usage is reduced as electronic mails are used for interdepartmental communications. Back-of-house screens are used for employees without access to emails to eliminate the need for printing and posting communications on the notice boards. Short message service (SMS) is used to communicate with most valued guests (MVGs). Rechargeable batteries minimise waste generated from using disposable batteries.

4.3.3.2 Reverse logistics

Reverse logistics focuses on waste generated at Carnival City and returned to suppliers. Wooden pallets, paints, solvent containers, and used cooking oil are types of waste that are returned to the suppliers.

4.3.4 Use of waste bins and waste compactors

Black round plastic bins were provided for wet waste and 240 wheelie bins for dry waste in the food outlets kitchens. Black round plastic bins were intended for food waste separation but there were huge inconsistencies in their use as the majority of bins observed had mixed waste.

The restaurants have a temporary storage area where empty wheelie bins are kept and exchanged for full waste bins. Interwaste employees use wheelie bins to move waste to the waste-sorting area. Employees from the fast food outlets take waste bins from the fast food court to the waste area. Red wheelie bins were kept separate in the waste sorting area and were only used for events in the Big Top arena.

None of the wheelie bins in the visited areas were labelled. Empty bins are cleaned with water and industrial GP biodegradable degreaser and sanitiser. Segregation of waste was observed in the offices as paper-recycling boxes were provided. Office cleaners or waste sorters empty paper-recycling boxes when they are full. Food waste is put into the enclosed containers and waste compactors and is temporarily stored at the waste area. Interwaste rents the waste compactors from Bulkmatech South Africa and carries the responsibility for maintaining the equipment. The waste skip for grease from the fat traps is managed by the Maintenance department and Ekurhuleni Metropolitan Municipality, and not the appointed waste contractor on site.

4.3.5 Waste separation at source

At the time of the study, only one of the eleven kitchen areas visited, Ocean Basket separates food waste from dry waste at the source. The most progressive kitchen observed ensured that food, glass, cardboard boxes, plastics, cans and paper were separated. Waste that is not separated at the source impact negatively on recycling as mixed waste is often contaminated. Recyclables that have been contaminated with wet waste at Carnival City were left with general waste for landfill disposal.

Documentary review showed that there is a strong possibility that recyclables were disposed of with general waste during October, November and December 2016. Carnival City monthly waste volume reports indicated that general waste disposal was quite high (Interwaste, 2016). Cardboard boxes at Carnival City were easier to sort as they were separated at the point where they enter the waste stream. Cardboard boxes were not placed in the bins provided in the kitchens. Each food outlet is required to take the cardboard boxes straight to the cage at the waste area (Figure 4.4) directly after they become empty. Cardboard is baled and placed in a skip for efficient transportation to Interwaste recycling hub.

Figure 4.4 Cardboard boxes' cage at the waste area

4.3.6 Waste collection

The collection process was different for all outlets visited during the study. Staff canteen employees take the waste bins to the waste area for sorting. Interwaste employees exchange full waste bins from the fast food court and the canteen for empty ones at the waste sorting area. Leftover magazines are collected by Interwaste employees from the Marketing department storeroom. Bidvest Prestige Cleaners empty office bins. The Landscaping Contractor, Servest, is responsible for emptying the steel bins in the parking areas. Waste from the bins in the parking areas is put into sacks by Servest employees and taken to the waste area for sorting. Ekurhuleni municipality is responsible for managing and disposing fat from the grease traps. Carnival City has five grease trap stations for capturing fat from the kitchens.

Bongani Cleaning Services maintain the grease traps. The bucket system is used to pump out fat manually and to remove it from the grease traps. The fat is then emptied into plastic bags, which are fastened close with cable ties. Plastic bags are temporarily stored in a waste skip at the waste area until the skip is full for collection. The Ekurhuleni Metropolitan Municipality truck collects the waste skip for disposal at Weltevreden municipal landfill site (Sun International, 2015b).

Recyclables are recovered and various waste streams are placed into designated containers. Dry waste from the casino complex operations is sorted into different categories and put into recycling bags and waste skips by Interwaste employees. Recyclable waste is sorted into different waste skips, which are removed, from site by Interwaste on-site solutions when they are full. Cans, bottles, glass, cardboard boxes, paper, plastic and magazines are taken to the Interwaste recycling hub in Germiston by Interwaste truck drivers and distributed for recycling. Food waste and non-recyclables are put into the waste compactors at Carnival City's waste area and collected twice a week by Interwaste trucks for disposal at Weltevreden landfill site in Ekurhuleni municipality.

Carnival City's electricians and handymen are responsible for managing all the lights at the complex. They collect used fluorescent tubes and lights from all areas on the complex and take them to a Maintenance workshop. Used fluorescent tubes are crushed with a crusher unit by the Maintenance department employees and temporarily stored in closed 210 litre-drums in a bunded area before they are send to Reclite Company for recycling. The Temple Waste Contractor is responsible for the removal of used fluorescent tubes and LED lights. A transfer manifest and safe recycling certificate are provided with every collection.

4.3.7 Waste sorting

Interwaste employees who are divided into three shifts, Shift A, Shift B and Shift C, conduct waste sorting at Carnival City. The three shifts are rostered to work day and night shifts. Interwaste on-site solutions' staff based at Carnival City receive induction and ongoing refresher training. They undergo medical fitness evaluations on an annual basis.

The process and handling of waste at Carnival City is not well executed by Carnival City staff members and Interwaste employees. Observations revealed that recyclable waste is ending up at the landfill site because there is no separation of wet and dry waste at the source in most of the kitchens. Based on interviews with the waste sorters, all the waste sorters at Carnival City appeared to be engaged and knowledgeable with managing waste. Observations showed lack of commitment to waste sorting at hand, as some of the recyclable waste was put in waste compactors for landfill disposal. The researcher observed that there was inconsistency on all three shifts responsible for waste sorting, as commitment seemed to be lacking during some of the shifts, especially at night and during busy events. Methods implemented by some of the shifts were questionable as mixed refuse bags were put directly into the compactor without doing proper waste sorting. This resulted in some of the recyclables being disposed with general waste.

4.3.8 Reuse

Empty oxygen gas cylinders from the clinic are returned to the supplier for refill and reuse. Bidvest Prestige cleaners use washable rags instead of paper towels to clean the casino complex. Rechargeable batteries used for two-way radios have a long lifespan and save money as they are reused. The maintenance department repairs broken furniture from restaurants and offices for reuse and in order to minimise frequent replacements.

4.3.9 Waste recycling

Types of recyclable waste, paper recycling, cans recycling, cardboard packaging recycling, plastic recycling, glass recycling, fluorescent tubes recycling and scrap metal recycling are aspects that fall under the recycling theme. Waste is sorted into different recyclable materials on a daily basis and placed into different skips by Interwaste employees.

Paper, cans, glass and plastic are four of the five priority waste streams that Carnival City sends for recycling. Tyres are the fifth of the five priority waste streams but these are not send for recycling by Carnival City. Waste tyres are generated during motor racing events and are managed by the event organisers. Documentary review showed that Carnival City gets rebates for all the recyclables retrieved on a monthly basis.

4.3.9.1 Types of recyclable waste

Paper, cans, cardboard boxes or packaging, plastic, glass, fluorescent tubes and scrap metal are types of waste that is recycled by Carnival City's operations. Waste that was recycled at Carnival City for the period of January to December 2016 is shown in Figure 4.5.

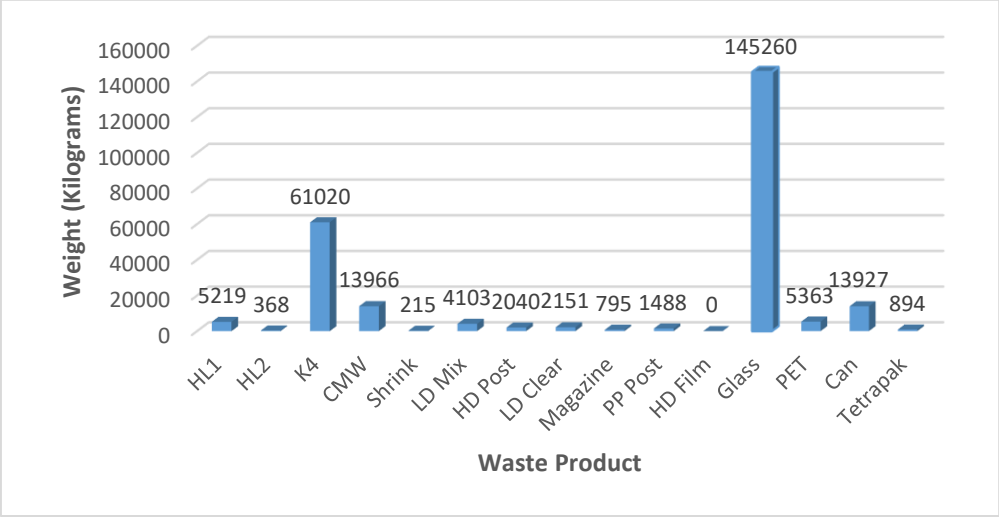

Figure 4.5 Recyclable waste (January-December 2016)

Key

HL1	White office paper	HD Post	High-density plastic post-consumer
HL2	Coloured paper	LD Clear	Low-density clear plastic
K4	Cardboard boxes	PPT Post	Polypropylene post-consumer
CMW	Common mixed paper	HD Film	High-density plastic
Shrink	Shrink wrap	PET	Polyethylene terephthalate (cold drink and mineral water bottles)
LD Mix	Low-density mixed plastic	Tetrapak	Milk, juice and wine cartons

All cardboard, paper, plastic, cans, and glass materials generated at Carnival City are sorted accordingly and placed into different waste skips and recycling bags. Waste skips and recyclable bags are temporarily stored at the waste area and taken to Interwaste recycling hub in Germiston when the skips are full.

Paper recycling

Paper generated at Carnival City includes white office paper (HL1); coloured paper (HL2), common mixed paper (CMW) and magazines. White office paper (HL1) recycled in 2016 totaled 5219 kg (Interwaste on-site solutions, 2016). Boxes for recycling paper are placed in offices by Interwaste employees. Finance and Surveillance departments shred their document for confidentiality purposes before they discard the paper into the recycling boxes. Recycling boxes for paper are emptied by Bidvest Prestige cleaners and taken to the waste area. Recycling paper minimises the need for raw materials and conserves trees. Less energy is used in making recycled paper as compared to virgin paper (Greenworks, 2017). Documentary review showed that no rebates were paid for common mixed waste paper (CMW) for January to December 2016, even though it was the third highest waste product recycled at 13 966 kg.

Cans recycling

Cans at Carnival City include beverage and food cans. Beverage cans include steel and aluminium cans. Aluminium cans increase recycling volumes, as they are recyclable without loss of strength or quality. The Brazilian market leads global can recycling with a recovery rate of 97,9%. Recovery rate for used beverage cans is at 72% in South Africa (Bulbulia, 2017). The Brazilian market leads global can recycling with a recovery rate of 97,9%. Cans followed common mixed waste paper on Carnival City's recyclable scale at 13 927 kg (Interwaste on-site solutions, 2016).

Cardboard packaging recycling

Interwaste management revealed that cardboard (Figure 4.6) is the most recycled product at their hub as it is easier to sort. Thirty tonnes of cardboard are loaded at the hub on a daily basis. Cardboard boxes (K4) were the second highest waste product found to be recycled at Carnival City amounting to 61 020 kg in 2016 period (Interwaste on-site solutions, 2016). Cardboard is sorted into cardboard boxes (K4) and tetrapak (milk, juice and wine cartons) in preparation for recycling.

Figure 4.6 Cardboard at Interwaste recycling hub

Plastic recycling

Plastic includes shrink-wrap, low-density mixed plastic (LD mix), high-density plastic (HD post), low-density clear plastic (LD clear), cold drink and mineral water bottles (PET), and polypropylene post-consumer (PP post). Polyethylene terephthalate (PET) containers include bottles for water, soft drinks, milk, juice and energy drinks. PET recycling was at 5363 kg. Plastics are put into bales at Carnival City (Figure 4.7) before the Interwaste trucks remove them from site. Plastic bales simplify handling, storage and transportation (McKenzie, 2012). No high-density plastic (HD Film) was recycled for January to December 2016 (Interwaste on-site solutions, 2016).

Figure 4.7 Plastic bales

Glass recycling

The beer, wine, and spirit manufacturers spearhead the returnable glass bottle system in South Africa. The glass bottles are sent back to the manufacturers for sterilisation, inspection and refill (Vivier, 2018). Glass generated at Carnival City consists of glass bottles and jars (Interwaste on-site solutions, 2016). The results presented in Figure 4.5 show that glass was the highest waste product type that was recycled in 2016 at a quantity of 145 260 kg. Interviews revealed that glass is easier to sort.

Recycling of fluorescent tubes

Carnival City's internal safety, health and environmental standards compiled using the Hazardous Waste Electrical and Electronic Equipment Regulations (2016) are used to manage waste fluorescent tubes. The Hazardous Waste Electrical and Electronic Equipment (HWEEE) Regulations, (2016) prohibit mercury containing lamps and all hazardous lighting from dumping at the landfills. Mercury, lead and arsenic are toxic substances that are removed when recycling fluorescent tubes and lights (Van Heerden, 2016).

Resource recovery and diverting all hazardous lighting waste from landfills contribute towards the 'zero-waste-to-landfills' commitment (Van Heerden, 2016). The interview with Maintenance management revealed that the Temple Waste contractor recycles used fluorescent tubes and light bulbs. Documentary review showed that safe recycling certification is provided to the Maintenance department with every collection of used fluorescent tubes at Carnival City. Recycling fluorescent tubes ensures that Carnival City diverts hazardous waste from the landfill site, and contributes to Sun International's 'zero-waste-to-landfills' commitment.

Scrap metal recycling

Scrap metal includes ferrous and non-ferrous metals. Ferrous metals contain iron and non-ferrous metal have aluminium and copper and do not have iron (Alton Materials, 2013). Scrap metal has higher value than all other recyclable materials. Recycling scrap metal cut down on disposal costs and minimises environmental impacts (DEA, 2016). Scrap metal was not accounted for because it is not managed by Interwaste. Scrap metal did not even reflect under the recyclable materials on the monthly volume report generated by Interwaste on-site solutions. The Maintenance department was found to be responsible for handling and managing the scrap metal but could not provide supporting documents to prove what happens to the scrap metal once it is removed from site.

4.3.10 Weighing of waste skips

Carnival City does not have a weighbridge or a scale for weighing waste that is collected on site. The unit of measurement in the collection books is limited to containers such as recyclable bags or waste skips, as waste is not weighed on site. Interwaste on-site solutions collect waste skips and the compactors at Carnival City's waste area for weighing. The weight of the skip or compactor determines the waste disposal fees. General waste is weighed at the weighbridge at the Weltevreden municipal landfill site in Brakpan which was visited during the study. Recyclable waste is taken to the recycling hub in Germiston. There is no weighing and recording of waste taking place at Carnival City's waste area. All the waste is weighed off site at Interwaste's recycling hub and at the landfill site. The types and volumes of waste are recorded by Interwaste on-site solutions. Weights recorded are provided to Carnival City in the form of a monthly report.

4.3.11 Interwaste recycling hub

No waste recycling is practiced at Carnival City Casino. However, some of the waste collected by Interwaste goes for recycling at the Interwaste Recycling Hub. Permission was obtained from Interwaste management to visit its recycling hub in Germiston (Appendix 9). The recycling hub is authorised to store, treat and recycle various waste streams. Interwaste's recycling hub is concrete paved, fenced with a lockable gate and has a security company that operates on a 24- hour basis. All the people entering the recycling hub, both visitors and employees, are required to conduct an alcohol test. The security officers use a breathalyser to test the alcohol level (Interwaste Holdings Limited, 2015). This is done to ensure the safety of every individual entering Interwaste's premises due to a lot of moving machinery and vehicles on the property.

The researcher followed Interwaste on-site solutions' pick-up trucks from Carnival City's waste sorting area to Interwaste's recycling hub in Germiston to observe what happens to the sorted waste once it is removed from site. The collection trucks report to the security when they get to the recycling hub, and then go to the weighbridge (Figure 4.8) to weigh the waste brought to the site. The weighbridge records the waste types and quantities, which are used for compiling monthly volume reports. The recycling hub has a platform scale for small weights, and a small and a larger scale at the weighbridge. The weighbridge records indicated that the types and quantities of waste that Interwaste used to compile the monthly volume reports for Carnival City were accurate.

Figure 4.8 Weighbridge at Interwaste recycling hub

4.3.12 Energy recovery

Non-recyclable plastic, paper-backed foil, aluminium, polystyrene and multi-layered packaging are other waste types generated at Carnival City and are used for energy recovery. Different dry non-recyclable waste types are compacted together into bales and used at Interwaste's refuse derived fuel (RDF) plant in Germiston (Figure 4.9). There are no rebates paid for the waste used in the RDF plant. Energy recovery is not directly Carnival City's initiative as it is implemented by Interwaste.

Figure 4.9 Refuse-derived fuel plant at Interwaste recycling hub

The interviewees explained that the RDF process is a simple but expensive two- step shredding process. Machinery is used to shred non-recyclable waste, which is fed into the shredding machine together. The cost expenditure is the reason why the majority of companies are still resorting to landfilling. The dry non-recyclable waste is transferred from a feeding platform by a conveyor belt. Waste is put into the primary shredder before being transferred to the secondary shredder to make small fine pieces. The shredded material is then baled (Figure 4.10) and stored at the plant to be distributed to cement producers.

Figure 4.10 Baled fuel source from the refuse-derived fuel plant

4.3.13 Waste disposal or landfilling

Food waste and non-recyclables at Carnival City are put into the waste compactors for disposal at Weltevreden landfill site in Brakpan. The waste compactors are collected twice a week by Interwaste trucks. Waste manifests are completed the removal of the waste compactors. Observations revealed that a lot of cooked food is wasted as meal leftovers. None of the food waste that is taken to Weltevreden landfill is composted. Documentary review showed that 70% of waste generated at Carnival City is disposed of at Weltevreden landfill site (Interwaste on-site solutions, 2016). The researcher followed the Interwaste truck to the landfill to verify the end destination of Carnival City's waste.

4.4 Effectiveness of current waste management practices at Carnival City Casino

This section evaluates the current waste management practices implemented at Carnival City Casino by comparing them to solid waste management practices deemed effective from the point of view of the reviewed literature. The waste management hierarchy presented in chapter 1 of the study and the ISO 14001 standard were used as analytical frameworks for establishing the effectiveness of waste management practices implemented at Carnival City. The findings revealed that the good current waste management practices are limited as Carnival City depends greatly on landfilling. Waste prevention, waste minimisation, reuse, recycling and recovery are implemented on a small scale.

Electronic communication and online bookings were waste prevention practices implemented at Carnival City to prevent or avoid paper usage. The most effective way to increase reuse and recycling is to separate waste at the point of generation. Separation of waste at source is done minimally and most of the food waste is not segregated from dry waste at the point of generation.

Lack of waste segregation at the source is one of the obstacles that hinders the current effectiveness of waste management at Carnival City, as waste that could be recycled is send to the landfill. Separation of waste at source needs a lot of support and dedication from top management and employees at Carnival City.

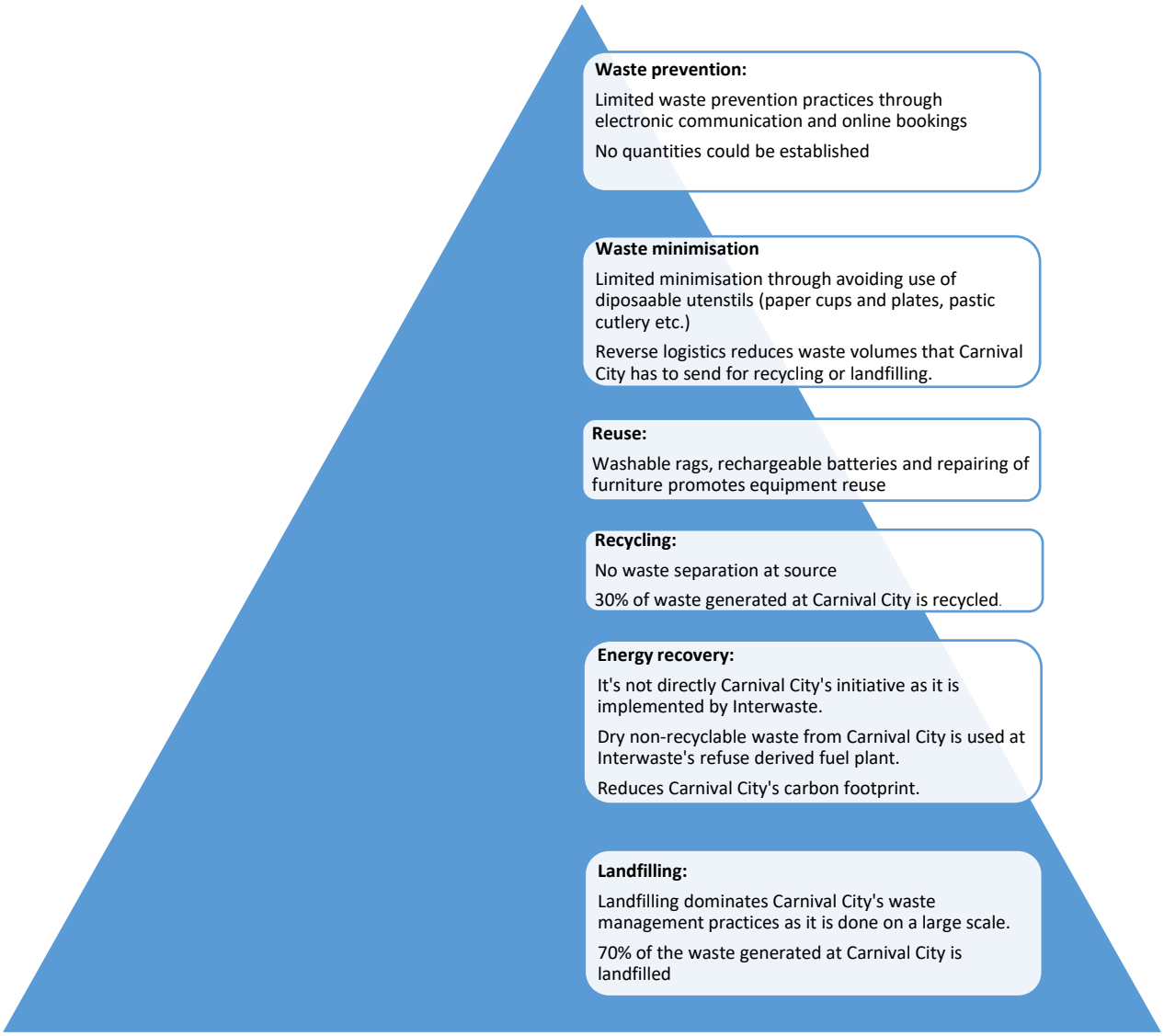

Figure 4.11 Carnival City's waste activities

The efficiency of waste separation at the source depends on awareness and perceptions of employees. Literature review revealed that South African residents' point of view is that government is responsible for managing waste (Naidoo, 2015). The research findings revealed that Carnival City's employees have a perception that solid waste management is the sole responsibility of the appointed waste contractor; hence, the waste generators do not implement separation of waste at source. Because of this perception, the majority of employees at Carnival City do not care what happens to the waste once it has left their working areas.

The success of waste separation at source relies on good practices and willingness among employees or residents (Razali *et al*., 2017). Documentary reviews, observations and the Interwaste recycling hub site visit showed that current measures implemented by Carnival City to manage glass and cardboard packaging were consistent and effective. South Africa has one of the most efficient returnable glass bottle system in the world. On an annual basis, 82% of glass packaging is diverted from the landfills through use of returnable bottles and the recycling of non-returnable bottles (Vivier, 2018). Interviews revealed that glass is easier to sort even if it is mixed with other waste types.

The researcher observed that sorting cardboard boxes was easy as separation from other waste types was done at the source of generation. Cardboard boxes were easier to separate, as they were not put in waste bins allocated in the kitchens. Cardboard boxes at Carnival City are separated at the point where they enter the waste stream. They are the placed in a cage at the waste area before being put into bales. Baling is the most effective way of compacting cans, plastic and cardboard for recycling as it compresses large amounts of recyclables into manageable bales and minimise storage space (Northstar Recycling, 2017). The interview with Interwaste site manager for Carnival City revealed that baled recyclable materials receive a much higher revenue than loose recyclable materials.

Recycling is considered the most recognized and environmentally friendly way of managing waste as it converts materials that could have been treated as waste into valuable resources (Saari, 2017). Literature review acknowledged that recycling is necessary as an alternative way of reducing waste sent to landfills as well as a way of earning a living through job creation (Maluleke, 2014). Recycling is done on a small scale as vast quantities of recyclable materials in the waste streams end up at the landfill site due to poor sorting. Documentary review indicated that only 30% of waste generated at Carnival City is recycled as waste management measures are not very effective. The researcher observed incidents were proper waste sorting was not done by the waste sorters as mixed waste was put into the waste compactors for landfill disposal. This results in the recyclables ending up at the landfill site. The total waste recycled in 2016 (Figure 4.3) raise concerns on the effectiveness of waste management practises implemented at Carnival City as more waste is still landfilled, even though disposal is the least desirable waste management practice according to the waste hierarchy. In a country with growing environmental pressures like South Africa, recycling rates are extremely low at Carnival City. This is also true when considering its commitment of ‘zero-waste-to-landfills’ by 2022.

Carnival City depends on the waste volumes received from Interwaste as there is no weighing and recording of waste taking place on its premises. The ISO 14001:2015 standard requires that documented information must be available for an effective environmental management system. No records were available to indicate how much of the waste is prevented, minimised, reused and utilised in the energy recovery process and is deviated from the landfill.

Volume records were not available to indicate an extent to which online reservations and electronic communication reduce the amount of paper usage. Only financial records were available to determine how much savings are made through waste prevention. Absence of waste volume records negatively impacted the effectiveness of waste management practices where ISO 14001 standards are concerned.

Site visits and documentary reviews undertaken during the study revealed that reverse logistics measures implemented at Carnival City were effective as none of the waste materials that are returned to the suppliers were found at the waste area. The visit to Interwaste recycling hub was done to determine the effectiveness of waste management practices implemented to Carnival City's recyclables after they are removed from site in support of the 'cradle to grave' principle. Site visit to Weltevreden landfill and documentary reviews indicated that waste disposal, in terms of transporting waste to the landfill, was properly followed in line with NEMA's (Act No. 107, 1998) 'cradle to grave' principle. All the waste collected and sent to the landfill reached its destination (even though some of the waste material could have been recovered for recycling).

Landfilling is at the bottom of the pyramid of the waste management hierarchy. There is always some residual material left over as waste that requires landfill disposal, even after all the waste management hierarchy spheres have been explored (Naidoo, 2015) and are being adhered to effectively. Landfilling has been the most common disposable practice in most South African companies (CSIR, 2017). It dominates the waste management practices conducted at Carnival City even though is the least preferred method in the waste hierarchy that must be implemented as a last resort. Documentary review revealed that 70% of the waste generated at Carnival City is disposed of at landfills. This shows an urgent need for Carnival City to change this behaviour and address its current waste management practices in order to meet Sun International's objective of 'zero-waste-to-landfills' by 2022. Considering that 2022 is just around the corner, the waste hierarchy implementation needs high prioritisation for Carnival City to be able to help Sun International to achieve its objective.

Carnival City implements the ISO 14001: 2015 standard requirements in its environmental management system. The standard helps organisations to enhance their environmental performance through efficient use of resources and reduction of waste. Previous researches revealed that organisations that have implemented certified systems tend to perform better than those with formalised systems only as they use ISO 14001 certificates for marketing strategies (Saari, 2017). The idea behind Carnival City adopting the ISO 14001 standard was to improve the organisation's environmental performance. Comparative analysis was done to establish effectiveness of current waste management practices by comparing them against the ISO 14001:2015 standard requirements.

The ISO 14001:2015 requires organisations to ensure that their employees are aware of their contribution to the effectiveness of the environmental management system. Individual employee involvement is required in waste management programmes for effective and efficient practices. Observations and interviews revealed that Carnival City employees were not contributing to waste management practices as they consider it the sole responsibility of the appointed waste contractor, which compromises the effectiveness of the process.

Organisations are required to establish controls to ensure that their environmental needs and challenges are addressed (ISO 14001:2015). Operational controls seemed to be inadequate at Carnival City's waste area as the researcher observed leaking compactors, a broken bund wall, damaged concrete flooring, a broken high-pressure hose and overflowing drip trays, which impacted negatively on the environment and depict inefficiencies in the current waste management practices. The South African Constitution (1996, s.24) emphasizes that solid waste must be managed effectively and efficiently to promote a clean environment. This was not the case at Carnival City's waste area as the fat skip area was not well maintained and contamination was visible. Waste management at Carnival City has not followed the hierarchical approach effectively despite being based on the waste hierarchy principles.

Current waste management practices at Carnival City are not fully effective as only 30% of the waste generated on the complex is deviated from the landfills. Conducted interviews revealed that management is aware that Carnival City's waste management practices are not fully effective and need to be improved. Based on the interviews, management is willing to find new solutions to their current waste management challenges. A lot of effort is required from the company to improve the effectiveness of its waste management practices. The effectiveness of solid waste management practices has become an important environmental priority and a growing challenge for further research.

The following are some of the answers to the question: **Are current waste management practices effective?**

Respondent 1: (Duty Operations Manager)

"The monthly report that we receive from Interwaste shows that current waste management practices are not effective and need to be improved. According to the report, only 30% of waste generated on site is recycled, and eish (shaking his head) that is a huge concern as the head office has set a target for us to achieve zero-waste-to-landfills by the year 2022".

Respondent 5: Maintenance Manager

"Current waste management practices implemented at Carnival City are not effective as 70% of the waste generated on a monthly basis still ends up in the landfill. More efforts still need to be made for the company to be able to achieve Sun International's commitment of zero-waste-to-landfills by the year 2022".

4.5 Waste management challenges faced by Carnival City Casino

Carnival City used ISO 14001:2015 standard as a scope to decide on the best practices for ensuring operational control. ISO 14001:2015 standard focuses on how processes interact with the environment. Most challenges related to waste management at Carnival City stemmed from operational control. Lack of hygiene, absence of proper waste separation at source and lack of support from top management, are some of the waste management challenges faced by Carnival City.

Respondents from the interviews acknowledged waste management challenges as follows:

Respondent 5: Maintenance Manager

"There is no separation at the source as waste is collected as mixed waste. Waste is put into the black round bins and wheelie bins and taken to the waste area for sorting. Interwaste employees are responsible for waste sorting. Most challenges result from managing food waste as it is generated in larger quantities. Food waste is put into the compactors. The waste compactors are leaking and result in the leachate damaging the concrete slab at the waste area. Waste is removed from site by Interwaste trucks on a call-out when skips are full. The fat skip area is not properly maintained. Ekurhuleni municipality and Bongani Cleaning Services are responsible for managing the fat skip area. Municipality trucks keep on bumping into the bund wall when they collect the fat skip. The broken bund wall renders the containment purpose ineffective".

Respondent 9: (Waste Area Site Manager)

"Waste mixing remains a huge challenge as there is no separation of waste at the source. Food waste is mixed with other waste types and reduces the amount of recyclables as contaminated waste is put into the waste compactor for disposal at the landfill. Sometimes fluorescent tubes are put into the general waste bins".

Five variables such as lack of hygiene, containment leakage, absence of proper waste separation at source, poor maintenance of the fat skip bund area and lack of support from the top management were explored.

4.5.1 Lack of hygiene

The waste area was kept as tidy and clean as possible but current hygiene maintenance was not adequate due to the lack of an operational high-pressure hose, which has been broken for more than three months. The high-pressure hose is used for cleaning the 240 wheelie bins and the waste area. Floors and walls were visibly dirty despite waste sorters' efforts to clean. The waste sorting area must have flooring that is resistant to daily activities and easy to clean. The concrete flooring was damaged (Figure 4.12) by leachate with the potential to cause storm water pollution. The concrete floor was not resistant to moisture, food waste and the daily activities carried out in the waste area.

Figure 4.12 Damaged concrete flooring

4.5.1.1 Leakage containment

Containment measures implemented at Carnival City were not adequate to prevent accidental spillage or leaks and environmental pollution as required by the waste act. Visual impacts such as discharges of liquid waste were observed as drip trays were used to contain leaks from the waste compactors. The drip trays that were used to contain the leakage were overflowing (Figure 4.13). The food waste in the compactor formed leachate, which was continuously dripping onto the concrete slab with the potential to enter the storm water drains. The state of the compactors was not meeting the general requirements for waste storage as stipulated in Section 21 of the Waste Act as the containers were not leak-tight containers.

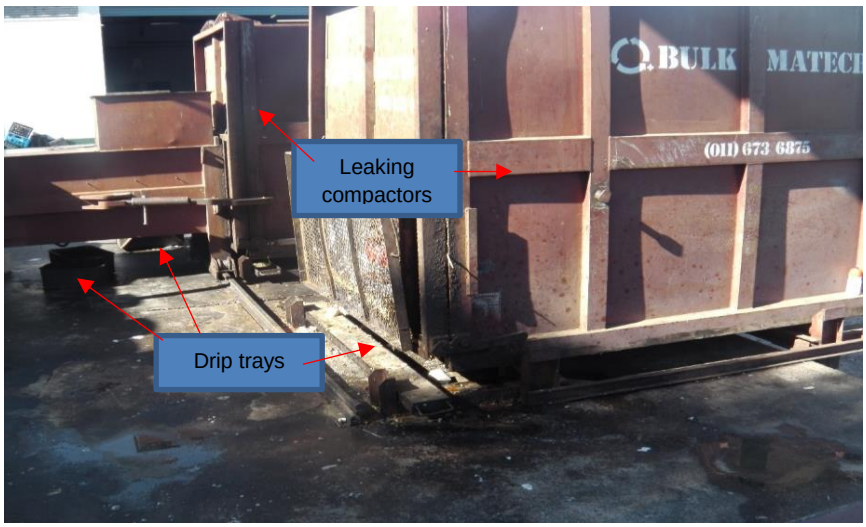

Figure 4.13 Leaking compactor and overflowing drip tray

4.5.2 Lack of proper waste separation at source

The current state of waste management at Carnival City Casino is not pleasing as most Carnival City employees do not do waste separation at the source. Management of waste at Carnival City is a major challenge during entertainment events which are held at the Big Top arena and Festival Lawns. This is because the capacity of the employees of the appointed contractor is exceeded by the waste generated during those events for effective waste handling. This is added to the challenge of low knowledge levels among the waste sorters. As a result, proper waste sorting is not done and recyclable materials are landfilled via the compactors and the waste skips. These actions by the waste sorters reflect how low levels of knowledge influence behaviour towards waste management. They also show the challenges they experience from the quantity and diversity of waste generated. This is a potential environmental disaster waiting to happen and a drawback to Sun International's commitment to 'zero-waste-to-landfills' by 2022.

4.5.3 Poor maintenance of the fat skip bund area

During the time of the study, the researcher observed that the waste skip for grease from the fat traps and fat skip bund area (Figure 4.14) were not well maintained. Contamination was visible with the potential of resulting in drain blockages and water pollution as the skip is situated next to the storm water drain. The Maintenance department and Ekurhuleni Metropolitan Municipality, manage the fat skip, not the appointed waste contractor on site. Observations from Carnival City's fat skip area revealed that the strategies implemented at the fat skip area were not effective and impacted negatively on the environment as contamination was visible (Figure 4.14). Fat from the grease traps is classified under high-risk waste streams. The maintenance department could not provide final disposal certificates to confirm that safe and correct disposal of the fat had taken place. Documentary review revealed that only the collection notes and invoices from Ekurhuleni Municipality were retained by the Maintenance department.

Bund walls must be built of materials impervious to the contents of any tank or container within the bund. Bund walls must contain spillages and leaks to prevent environmental pollution (NEMWA Act no. 59, 2008, s.21). The wall was broken, rendering the containment purpose ineffective. Interviews with Interwaste employees revealed that the maintenance department keeps repairing the bund wall but Ekurhuleni Metropolitan Municipality trucks bump into the bund wall when they collect the skip.

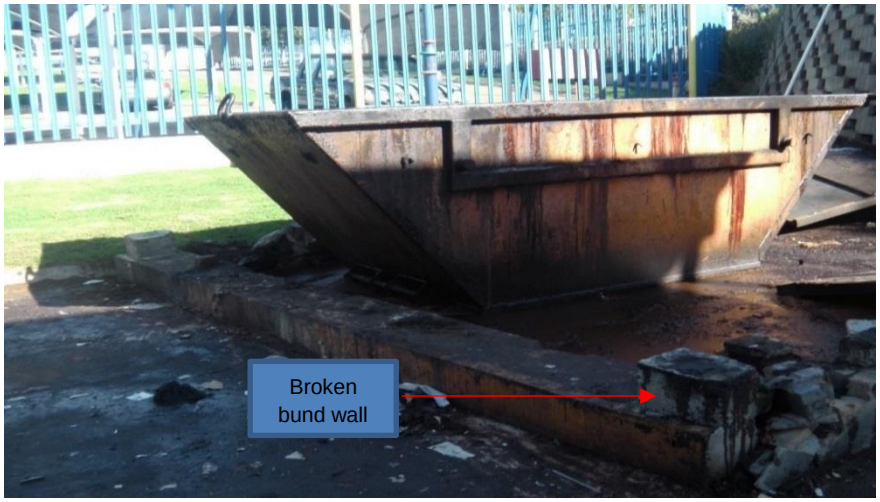

Figure 4.14 Fat skip bund area

4.5.4 Lack of support from top management

Top management's involvement is mandatory in environmental management issues (ISO 14001, 2015). Lack of commitment and support from senior management makes it challenging for the green team and the appointed waste contractor, Interwaste on-site solutions, to motivate Carnival City's employees to change their behaviour and take effective steps towards effective waste management. Separation at source and recycling are done at low levels as top management focus more on casino activities and do not communicate the company's environmental objectives to employees. Top management involvement makes achievement of waste management objectives more successful (Nolan, 2016). Carnival City's heads of departments do not take responsibility in implementing the waste management policy. Support from top management is important in ensuring that employees comply with Carnival City's waste management policies.

4.5.5 Cost efficiencies

Carnival City Maintenance department revealed that reconciliation checks made against invoices by the Finance department are done on the assumption that Interwaste is providing accurate data. Monthly waste volume reports reflect that no rebates are paid to Carnival City for common mixed paper (CWM), high-density (HD) plastics, expanded polystyrene containers and tetra recyclables as they are used in the RDF plant (Interwaste, 2016).

Interviews with Interwaste management revealed that the process of recycling polystyrene containers is more expensive and they hence decided to use these containers in the RDF process. Transport costs are one of the main factors that reduce recycling rebates (Northstar Recycling, 2017). At Carnival City Casino, recyclable waste collections were done based on call-outs when the skips are full.

4.6 Level of employee awareness on waste management at Carnival City Casino

Themes identified to be part of waste management training and awareness include awareness of waste management practices and awareness and use of PPE. These themes are discussed in the following sub-sections.

4.6.1 Awareness of waste management practices

Waste management is given a low priority at Carnival City Casino even though the company get rebates for the recycled waste. Waste management training is conducted internally by Carnival City's Environmental Officer as part of Environmental Awareness and the green team for on the job training purposes. Training records show that most of the departments do not nominate their staff for waste management training. Only employees who have attended environmental awareness training were aware that Carnival City has a waste management policy. The interviewees responded to the waste management policy question as follows:

Respondent 1: (Duty Operations Manager)

"Carnival City has a waste management policy that guide us on how to manage waste that we generate on the complex. I consider waste to be anything that the casino cannot use for its operations and those materials are send to the waste area for landfill disposal. There is a temporary waste storage area at the back of house (sic) behind the canteen. We have five waste contractors who are responsible for handling different types of waste generated on the complex. Interwaste is the main contractor operating on site and is responsible for sorting waste that is send for recycling. There are three shifts operating on a 24-hour basis. Carnival City get rebates for all recyclable waste that is collected by Interwaste trucks. We get a monthly report from Interwaste to show us how much waste did we recycle (sic) and the amount that ends up in the landfill".

Respondent 4: (Canteen Chef)

"Carnival City has a waste management policy. I think waste management is everybody's responsibility but I have never attended any waste management training or workshop. Interwaste needs support from all the employees to improve waste management practices at Carnival City".

The respondents had this to say on waste management training and awareness:

Respondent 2: (Waste Sorter)

"Interwaste does not send us to any training. The only training I have received is induction and five days' awareness when I first started working for Bin and Waste contractor at Carnival City. I was trained and showed around by my colleagues. But I don't want to be a waste sorter for life. I would love to study courses that will help me to acquire more knowledge on waste management and do a better job but shame not with our company's poor development".

Respondent 8: Health and Safety Manager

"Environmental awareness and behavioural change will help to improve the current waste management practices. Employees throwing waste on the floor at the restaurants waste bin area show that more environmental awareness is needed. But not all of them don't know the correct procedure. Others, its behavioural issues and are just being petty. Anyway, on-going training must be done to remind them about good housekeeping".

Lack of awareness and behavioural issues coupled with non-implementation of environmental policies and procedures resulted in more recyclables being put into the waste compactor by the waste sorters and sent to the landfill. Changing employee behaviour will help to increase recycling. Employees' mentality that there is an appointed contractor that is responsible for waste management reflects the negative attitude that they have. Employees know that waste separation at source is vital but they do not do it because it is not their job. From the information collected from the interviews by the researcher, employees indicated that it was not their responsibility to sort out waste in the kitchens as Interwaste on-site solutions is hired to do it at the waste area. Waste sorters believed that their jobs would be much easier and the level of recycling would increase if the people in the restaurant kitchens separated dry waste from wet waste at the source.

Respondent 3: (Restaurant General Worker)

"Waste is rubbish. That is everything that I put into a dustbin for Interwaste guys to come and collect. I throw food, cans, bottles, plastic and paper into the dustbins. Interwaste guys are waste sorters and are responsible for managing waste generated at Carnival City. They are hired to clean all the waste at Carnival City. I always see them cleaning the dustbins and the waste area behind the canteen with a hosepipe".

Respondent 7: (Landscaping Supervisor)

"Interwaste employees are hired to sort all the waste at Carnival City and put them into different waste skips and recycling bags. We only collect waste from the steel bins in the parking areas every morning and take it to the waste area for sorting. My responsibility only includes putting waste picked up from the floor, pavement or in the garden into the dustbins. More than that, it's Interwaste's problem. My main responsibility lies with maintaining the garden".

The researcher observed that demarcated colour-coded wheelie bins were provided in the staff parking to encourage employees to separate waste at the source, but it was not fully implemented as waste mixing was observed in those parking areas during the time of the study. This further indicated the need to raise awareness about waste management as the majority of the employees did not understand their roles with regards to managing waste.

4.6.2 Awareness and use of personal protective equipment (PPE)

Observations and documentary reviews such as safety checklists and medical surveillance certificates revealed that there are health and safety risks associated with waste management activities. Employers must maintain a safe working environment by providing their employees with personal protective equipment (Occupational Health and Safety Act No. 85, 1993). Interwaste on-site solutions provides full PPE to all their employees.

Provision of PPE by Interwaste to all their employees contributes towards effective waste management practices as it reduces the potential for employees to be injured and promotes safety in the workplace. Full PPE was not worn by waste sorters at Carnival City's waste sorting area as per Occupational Health and Safety Act (Act No. 85 of 1993) requirements even though the waste area was demarcated with safety signs. Some of the waste sorters were not wearing dust masks or respirators during the waste sorting process. They complained about not breathing properly when wearing dust masks. The workers undergo medical review on an annual basis.

The Occupational Health and Safety Act (Act No. 85 of 1993) requires that any employee working in a situation where they may be exposed to risks wear PPE for health and safety reasons. During the interview, Interwaste recycling hub operators were wearing personal protective equipment such as overalls, goggles, safety boots, gloves, dust masks and noise clippers as there is noise, dust and sharp objects on the property. The use of PPE enhances the effectiveness of waste management practices through minimising risks to employees. Noise generated at the hub was from moving vehicles and machinery. Interwaste does not use third parties for servicing its vehicles and machinery. Its recycling hub has a technical workshop where technicians service all their trucks, cars and machinery on site. Separation of waste done by the hub operators was for waste that goes to the destruction plant as it is collected as mixed waste.

4.7 Conclusion

The main aim of this study was to evaluate solid waste management practices at Carnival City and address the objectives set in chapter 1 of the study. Research objectives focused on identification of current waste management practices and their effectiveness, level of employee awareness on waste management and exploration of the waste management challenges at Carnival City. The collected data was analysed using Nvivo software and manual coding and categorisation. Themes that emerged from the collected data were related to sub-headings based on the study objectives. Waste prevention, waste minimisation, reuse, recycling, energy recovery and waste disposal were found to be waste management practices implemented at Carnival City.

Chapter 5: Analysis and discussion of research results

5.1 Introduction

This chapter focuses on discussing results that emerged from the study. The focus of the sections in this chapter was on determining how the research findings were informed by the theoretical consideration and literature review used in the study, and linking the methodological framework to research findings and literature review. The similarities of the research findings to existing studies of a similar nature are integrated in the discussion through establishment of parallels between Carnival City Casino waste management practices and reviewed literature.

5.2 Solid waste management practices at Carnival City

The first research objective focused on identifying waste management practices implemented at Carnival City. Waste prevention, waste minimisation, reuse, recycling, energy recovery, and waste disposal were found to be waste management practices implemented at Carnival City as summarised in Figure 4.11 (section 4.4). Interwaste on-site solutions is the main contractor responsible for handling and managing waste generated on Carnival City's property, with on-site waste sorting done on a 24-hour basis just like the casino operations. Four other waste contractors and Ekurhuleni Metropolitan Municipality are also responsible for waste removal at Carnival City's waste removal. Interwaste is only responsible for handling general waste generated at the complex, hence the other waste contractors were appointed to deal with hazardous waste. Ekurhuleni Metropolitan Municipality is responsible for collecting fat from the grease trap at Carnival City as part of the community development agreement between the two companies (Sun International, 2015b). The following sub-sections discuss each of the waste management practices.

5.2.1 Waste prevention

The first priority is given to waste avoidance or prevention in the waste management hierarchy. Waste prevention conserves natural resources and protects the environment (DEA, 2011). Electronic communication and online bookings were waste prevention practices implemented at Carnival City as they avoid the use of papers. Waste prevention minimises purchasing and waste disposal costs for Carnival City and reduces the company's carbon footprint as no waste is generated.

5.2.2 Waste minimisation

Waste reduction provides the largest gains as it does not require any energy or material. Five priority waste streams that reach the landfills and need to be reduced are glass, paper, plastic, cans, and tyres (Taiwo, Otieno & Venter, 2008). Paper, glass, plastic, and cans were four of the five priority waste streams sorted on-site to reduce the amount of waste that Carnival City sends to the landfills.

5.2.3 Reverse logistics

Reverse logistics reduces waste volumes that Carnival City has to send for recycling or disposal. This is done by returning used cooking oil, wooden pallets, paints and solvent containers to the suppliers. Used cooking oil is considered high risk due to the health hazard it poses, if distributed for reuse for human consumption (Venkata & Subramanyam, 2016). Paints and solvent containers are stored at Maintenance workshop, and used cooking oil generated at Carnival City is temporarily stored at the food and beverage warehouse, before being collected by the suppliers. Reverse logistics promotes waste minimisation and allows for possible re-manufacturing, reuse, recycling, or reselling to the secondary market, allowing the product to go backward in the chain (Alnuwairan, 2016). Reverse logistics is a constituent of a sustainable supply chain that is driven by the recovery of the economic value in the returned product (Mwanza, Mbohwa, & Telukdarie, 2016).

5.2.4 Use of waste bins and waste compactors

Rigid and durable black round plastic bins for wet waste and 240 wheelie bins for dry waste were provided for all the kitchens. None of the waste bins were broken. Waste bins have a long life duration even though they are more costly than plastic bags (DEA, 2011). Labelling of waste bins is a great way to increase participation in recycling efforts as discovered by Northstar Recycling (2017). However, none of the wheelie bins in the visited areas at Carnival City were labelled. Waste bins were not used for the intended purpose as the majority of the bins observed had mixed waste.

5.2.5 Waste separation at source

Waste separation at source is not a feasible exercise at Carnival City. Achi *et al*. (2012) argued that waste separation at source must not be left entirely to private companies and the municipalities as it is the case with Carnival City. The finding of this study is consistent with the research findings by Ma *et al*. (2014) who concluded that separation at source could increase the number of recyclables, and reduce the cost of treatment and waste disposal. Mamphitha (2011) confirmed that the sorting of recyclable materials at the source increases the value of the waste recovered. Food waste has the potential to be recycled or reused, if it is separated at source (Guerrero *et al*., 2013). The way cardboard boxes are collected for recycling has a huge impact on their value (Northstar Recycling, 2017). Cardboard boxes at Carnival City were separated at the point where they enter the waste stream and not placed in the bins provided in the kitchens.

5.2.6 Waste collection

Food waste from Carnival City depends on the types of meals prepared by the restaurants and differs from kitchen to kitchen. Collected food waste and non-recyclables are put into the waste compactors at Carnival City's waste area for landfill disposal.

Food waste is the major contributor of wet waste and the largest component of the municipal solid waste stream in the landfill sites (Lalonde, 2013). Food waste attracts rodents, flies, and cockroaches, if it is not properly managed. Food waste is deemed the source of environmental degradation as it is biodegradable and releases offensive odours during decomposition in landfills (DEA, 2011). Over 7% of the world's greenhouse gas emissions are as a result of food waste (UNEP, 2016).

5.2.7 Waste sorting

Human error played a major role in reducing the effectiveness of waste sorting and separation practices as some of the recyclable waste was not retrieved from the waste stream (Rautenbach, 2014). The researcher observed that there was inconsistency on all three shifts responsible for waste sorting as commitment seemed to be lacking on other shifts, especially at night and during busy events. Methods implemented by some of the shifts were questionable as mixed refuse bags were put directly into the compactor and proper waste sorting was not done. This resulted in some of the recyclables being disposed of with general waste.

5.2.8 Reuse

Re-use is practiced minimally with the re-used items being oxygen gas cylinders form the clinic, rechargeable batteries, repaired broken furniture and washable rags. Sustainable development principle number 4 (a) (iv) requires waste to be reused where it cannot be avoided and minimised (NEMA Act No. 107, 1998, s.2). Reuse saves money as used items are less expensive; it also saves resources and protects the environment. Reuse minimises the quantity of waste that needs to be recycled or disposed of (USEPA, 2016). Reuse requires less energy as compared to recycling (Zero Waste South Australia, 2016). Reusing an equipment or material for its original or same purpose without changing its physical form prevents waste from being sent to landfills (Taiwo *et al*., 2008).

5.2.9 Waste recycling

Recycling helps Carnival City to lessen the amount of waste destined for the landfill site. Documentary review showed that there are financial benefits from minimal recycling that is currently implemented at Carnival City as there is cash that is earned from retrieving the recyclables. These rebates give an indication the value of waste materials ending in the landfills if recycling is not implemented (Sun International, 2015b). Recycling is good for the South African economy as it reduces the need to import raw materials. Recycling is among the most visible, measurable and enforceable of the environmentally sound practices that companies can implement (Desa *et al*., 2012). About 34.6% of waste thrown away in America is recycled. Recycling waste in America reduces 186 million tonnes of carbon dioxide equivalent emissions annually (USEPA, 2016).

Recycling is still at an infant stage in most developing countries, and is mostly done by unemployed people who take the recyclables to buy-back centres. Recycling buy-back centres aim to change the public's mindset on the way waste is treated. Waste must be seen as wealth, a resource and cash (Taiwo *et al*., 2008). Recycling increases the lifespan of the landfill sites, minimises environmental impacts by decreasing the waste quantities disposed of at landfills and send to incinerators; it also conserves natural resources and creates employment opportunities (Mamphitha, 2011). Recycling waste reduces Carnival City's carbon footprint even though it is only done by Interwaste on-site solutions.

The documentary review revealed that glass was the highest waste product type that was recycled in 2016 (145 260 kg) at Carnival City. Cardboard boxes (K4) were the second-highest waste product found to be recycled at Carnival City in 2016 period. The recovery rate for cardboard packaging is at 66% in South Africa (DEA, 2015). Recycling one tonne of cardboard can save more than seventeen trees and nine cubic yards of the landfill space (IWMSA, 2014). Reduced deforestation, water use, and greenhouse gas emissions are benefits that companies can achieve through cardboard recycling (Northstar Recycling, 2017). Cans recycled at Carnival City in 2016 amounted to 13 927 kilograms. In South Africa, the recovery rate for cans is 72% (Bulbulia, 2017) while the Braziliam market recovers 97,9% of used cans and is the global leader in can recycling.

5.2.10 Energy recovery

Energy recovery is the process of converting non-recyclable waste into fuel, heat or electricity (USEPA, 2017). Energy recovery follows recycling and precedes waste disposal in the waste hierarchy (Intech Open, 2011). Dry non-recyclable waste from Carnival City is used in the RDF plant and reduces Carnival City's carbon footprint through diverting waste from landfills. Refuse-derived fuel is a fuel produced from different types of wastes with the aim of reducing quantities of waste sent to landfills. Baled fuel source from the RDF plant is used without further processing to fuel coal power stations, gasification pyrolysis plants, and cement kilns, and to generate electricity (Van Der Merwe, 2016).

Interwaste is the first South African company to develop an RDF plant (Van Der Merwe, 2016). Energy recovery is not directly Carnival City's initiative as it is implemented by Interwaste to minimise the amount of waste Carnival City sends to landfills. Interwaste RDF plant diverts 300 tonnes of non-recyclable waste from landfills to produce 300 tonnes of refuse-derived fuel per month to a cement kiln in Namibia. Refuse-derived fuel is used to replace fossil fuels like coal in a cement kiln. The level at which South African cement plants adopt alternative fuels is still low. The benefits of the RDF plant include diverting waste from the landfill (and hence reducing greenhouse gas emissions), and employment creation through resource recovery (Theunissen, 2017).

5.2.11 Waste disposal

All types of waste put into the waste compactors at Carnival City are destined for landfill disposal. Landfilling is the most traditional method of waste disposal and common practice in most countries worldwide (Taiwo *et al*., 2008). Waste is also disposed of at landfills in South Africa. Oelofse *et al*. (2016) confirmed that there is limited space for waste disposal as South African landfills are reaching full capacity. Most organisations are not concerned with the environmental impacts of the landfills (Radwan *et al*., 2012).

None of the food waste that is taken from Carnival City to Weltevreden landfill is composted. Environmental impacts such as soil, groundwater and air pollution occur during decomposition of food waste in landfills. Methane and carbon dioxide are the greenhouse gases that are emitted during food waste decomposition (Lalonde, 2013). Waste disposal must be done at well-designated and legally protected landfill sites (NEMWA Act no. 59, 2008, s.26). Carnival City applies the duty of care and cradle-to-grave principles by remaining responsible for their waste from generation to its final disposal place. Through documentary reviews, retained weighbridge tickets confirmed/corroborated this.

5.3 Effectiveness of solid waste management practices at Carnival City

The second research objective sought to establish the effectiveness of current solid waste management practices at Carnival City. The findings revealed that current waste management practices at Carnival City are not very effective as it depends greatly on landfilling and implement waste prevention, waste minimisation, reuse, recycling and recovery on a small scale. Literature review revealed that waste prevention, waste minimisation, and reuse are the most desirable methods in the waste management hierarchy, especially where there is co-operation from the manufacturers. Most organisations find it difficult to advance waste prevention and reuse methods, even though they are considered the most desirable methods in the waste hierarchy (Choi, 2016).

Incorporating waste reduction principles at the point of manufacturing products is more efficient than focusing on post-consumption responses (DEA, 2011). Waste prevention is the most effective way of managing waste as it seeks to prevent waste from being generated. Electronic communication and online bookings were the waste prevention practices implemented at Carnival City to prevent or avoid paper usage. Effective engagement of solid waste either for recovery and reuse or recycling through sorting and separation at source will guarantee proper exploitation and utilisation of the benefits in solid waste composition and enhance environmental quality and sustainability (Achi *et al*., 2012). Waste separation at source facilitates the effective recovery of valuable resources, which are otherwise destined for landfill disposal (Razali, Weng Wai, Daud, & Choong, 2017). Naidoo (2015) argued that waste should be separated at source to maximise recycling as mixed waste is often contaminated and requires extra handling effort.

Burger (2016) confirmed that clean well-sorted materials are needed for recycling to be effective and separation of waste at source ensures that the highest value of recyclables are abstracted before they get contaminated.

5.4 Waste management challenges faced by Carnival City

Waste management challenges that have been identified during the study include lack of hygiene, absence of separation of waste at source, poor maintenance at the fat skip bund area, lack of support from top management and cost inefficiencies. Supporting the findings from this study, Liquid Floors (2016) agreed that leachate from food waste has high concentrations of salts and organic acid, which have a strong corrosive effect. Corrosion could be what is seen in Figure 4.12 (Section 4.5).

Some of the practices at Carnival City Casino were not in line with the requirements of section 2 and 28 of NEMA Act No. 107 (1998), which requires environmental pollution and degradation to be avoided or minimised and remedied. Leaking compactors were not meeting the general requirements for waste storage as stipulated in Section 21 of the Waste Act, as they were not leak-tight containers. Waste storage containers must be intact and not corroded or be in any other way rendered unfit for the safe storage of waste (NEMWA Act no. 59, 2008, s.21).

The majority of waste generated at Carnival City consist of materials that can be recycled but recycling is done on a small scale, as there is no separation of waste at source. Low recycling rates resulted in increased volumes of recyclables being disposed of at the landfill. Sun International's commitment of 'zero-waste-to-landfills' by 2022, the National Environmental Management Waste Act (2008, s.17) and the Polokwane Declaration require a significant reduction in the amount of waste that goes to the landfills.

5.5 Level of employee awareness on solid waste management practices at Carnival City

One of the objectives/research questions sought to determine employee awareness of solid waste management practices at Carnival City. The research question was answered through interviewing Interwaste contractor employees, general restaurant workers, canteen chefs, managers and Interwaste recycling hub employees as presented in Table 3.1 in chapter 3. Research revealed that waste management is given a low priority in awareness training at Carnival City Casino. People performing jobs that have the potential to cause significant environmental impacts must be trained and training records should be retained (ISO 14001, 2015). Nolan (2016) agreed that organisations should provide environmental policy training to employees, as well as training on roles and responsibilities and the importance of conforming to the Environmental Management System (EMS) requirements. A greater level of employee engagement to separate waste at source is possible through education and awareness (Nuzrath & Ruzaik, 2017).

Educating and empowering employees on waste management and a conducive environment are important and needed to promote the recycling economy (CSIR, 2017).

5.6 Conclusion

The findings of this study showed that managing solid waste is still a complex task that requires adequate resources, appropriate technical solutions and employee awareness and training, and the cooperation of different stakeholders. Increased population growth, urbanisation and lack of training and awareness in best practices for solid waste management increase waste stream volumes and complexity, making it difficult for organisations to cope financially. Existing literature highlights shifts in policy from landfilling over the last decades to more improved solid waste management practices. Carnival City's parent organisation, Sun International, pushed for a broader perspective and made a commitment to the 'zero-waste-to-landfills' concept by the year 2022 to lay the foundation for addressing its waste challenges and to move away from landfilling.

This section provided the discussion of the research results presented in chapter four, and linked the literature to the research outcomes. The next chapter presents a summary, major conclusions and recommendations.

Chapter 6: Summary, conclusion, and recommendations

6.1 Introduction

The study used a qualitative approach to evaluate solid waste management practices implemented at Carnival City Casino. Observations, interviews, field notes, and document reviews were used for data collection. The research findings summarised in this chapter relate to the research objectives that were meant to be achieved in this study. Recommendations for improving waste management practices at Carnival City and suggestions for future research conclude this chapter.

6.2 Summary of findings

6.2.1 Findings from the literature review

The findings from the literature review in chapter two were summarised in line with the research objectives. The waste management practices implemented at global level include waste minimisation, sorting, waste recycling, composting, incineration and landfilling among others. Landfilling dominate waste management practices worldwide even though it is the least preferable method in the waste hierarchy. The reviewed literature showed that most countries are still searching for best waste management practices for treating and disposing of waste.

Literature review evaluated the effectiveness of solid waste management practices in South African municipalities and established challenges of lack of infrastructure and non-adherence to municipal by-laws. Municipalities were inefficient in carrying out the waste management function as in most cities, only a fraction of practices constitute proper disposal methods. The level of awareness of waste management was said to be very low in most countries. The literature revealed that waste management is a major challenge for many countries. Global records show a significant increase in solid waste generation and greater effort is needed to manage solid waste and mitigate negative public and environmental impacts.

6.2.2 Findings from the primary research

The primary research findings were aligned to the research objectives set in chapter 1 of the study.

6.2.2.1 Obj. 1: Waste management practices at Carnival City Casino

Waste management practices implemented at Carnival City are waste prevention, waste minimisation, reuse, recycling, energy recovery, and waste disposal. Waste minimisation practices that Carnival City implemented are aimed at reducing the amount of waste generated. The use of crockery, stainless steel forks, spoons and knives in the staff canteen, conference rooms, restaurants and hotel kitchens was among waste reduction practices observed at Carnival City.

Sufficient waste bins were provided in all restaurant kitchens that were visited. Observations revealed that waste separation at source was only practised in one restaurant. The practice of waste separation at source was not encouraging as large amounts of recyclables are still send to the landfill.

Waste recycling was practised to cut down on landfilling. The documentary review showed that there are financial benefits from minimal recycling that is currently implemented at Carnival City. Recycling initiatives are outsourced to Interwaste contractor. Energy recovery is implemented by Interwaste at its RDF plant in Germiston and entails converting dry non-recyclable waste from Carnival City into refuse-derived fuel. Energy recovery minimises the amount of waste sent to landfills and reduces Carnival City's carbon footprint.

The end disposal of most of the waste generated at Carnival City was found to be Weltevreden municipal landfill site in Brakpan. Waste send for landfilling include large quantities of recyclable material. This has a negative impact on meeting Sun International's commitment to the 'zero-waste-to-landfills' principle.

6.2.2.2 Obj. 2: Effectiveness of current waste management practices at Carnival City

The waste collection was found to be effective in all areas that were visited at Carnival City. Bidvest Prestige and Interwaste employees do waste collection on a daily basis in all offices and restaurants. Carnival City has collection points where restaurants temporarily store their waste wheelie bins. Servest Landscaping collects waste from the steel bins in the parking areas.

Interviews and observations revealed that waste separation at source was not effective as waste was collected as mixed waste from the waste collection areas. Waste sorting was done at Carnival City's waste area by Interwaste employees, and some of the recyclables were put into the compactor designated for landfill disposal. The effectiveness of waste sorting was found to be reasonably low as only one restaurant was sorting its waste at the source of generation.

Reverse logistics was found to be effective as used products and materials were returned to the suppliers. Reverse logistics reduces waste that Carnival City has to send for recycling or disposal. Products and materials that were returned to the suppliers at Carnival City include used cooking oil, wooden pallets, paints, and solvent containers. The products targeted for reverse logistics are however not many. Waste recycling at Carnival City was practiced minimally leaving room for improvement. Documentary reviews and interviews revealed that only 29-30 percent of the waste generated at Carnival City on a monthly basis is send for recycling. Paper, glass, plastic, and cans are recyclables that were removed from Carnival City's waste stream and sent to the Interwaste recycling hub in Germiston. Some of the recyclables were not segregated from the waste stream targeted for landfilling.

Waste disposal at Carnival City was found to be in line with the duty of care and cradle-to-grave principles. This is because the casino remained responsible for its waste from generation to the final disposal place. Waste meant for disposal at the landfill was temporarily stored in waste compactors at Carnival City's waste area before it is collected for landfilling. Waste removal is done twice a week by Interwaste trucks for disposal at the Weltevreden landfill site in the Ekurhuleni municipality. Document review revealed that waste manifests are completed each removal activity, and weighbridge tickets are retained for every landfill disposal.

Overall, based on the waste hierarchy, waste management practices at Carnival City Casino leave a lot to be desired, as they are not aligned with best practices. Management practices were, in addition, not quite compliant with ISO 14001 standards and the NEMWA Act no. 59 of 2008). Carnival City Casino observes the duty of care and cradle to the grave principles. However, some of the waste material which could be recovered for recycling is not segregated and thus ends up at the landfills.

6.2.2.3 Obj. 3: Waste management challenges at Carnival City Casino

The hygiene maintenance at the waste area remained a challenge due to a broken operational high-pressure hose. The high-pressure hose used for cleaning the waste area has been broken for more than three months. Floors and walls were visibly dirty despite efforts by waste sorters efforts to clean. The waste sorting area must have flooring that is resistant to damage from daily activities and it should be easy to clean. The concrete flooring at Carnival City's waste area is not resistant to moisture and is not conducive to handling of wet food waste and the daily activities carried out in the waste area.

Minimal waste separation at source was identified as a barrier making it difficult to reduce waste that ends up at the landfill. It is one of the waste management challenges at Carnival City. Waste separation at source affects the effectiveness of waste management practices at Carnival City as more recyclables are disposed of at the landfills as mixed waste. Of all the eleven restaurants visited during the study, waste separation at source was being implemented at only one food outlet. More effort is needed for Carnival City to be able to manage the quantity and diversity of waste generated and achieve Sun International's commitment of 'zero-waste-to-landfills' by 2022.

The state of the waste compactors at Carnival City's waste area was not meeting the general requirements for waste storage as stipulated in Section 21 of the Waste Act. The leaks from the waste compactors rendered the containers unfit for the safe storage of waste. Adequate measures were not implemented to prevent accidental spillage or leaks from the waste compactors. The drip trays that were used to contain leakages were overflowing with potential for environmental pollution.

Observations revealed that the fat skip area was not well maintained. Contamination was visible with the potential to cause drain blockages and water pollution as the skip is situated next to the storm water drain. The bund wall was broken, rendering its containment purpose ineffective. Interviews with Interwaste employees revealed that Ekurhuleni Metropolitan Municipality trucks keep on bumping into the bund wall when they collect the skip, despite the maintenance department's effort to repair the bund wall.

Reconciliation checks made against invoices by the Finance department are done based on data provided by Interwaste and on the assumption that the data is accurate. The process of recycling polystyrene containers is more expensive and hence they were used in energy recovery. No rebates are given to Carnival City for common mixed paper, high-density, expanded polystyrene containers and tetra recyclables even though they are used in Interwaste's RDF plant. Recyclable waste collections at Carnival City were based on call-outs when the skips are full.

6.2.2.4 Obj. 4: Level of employee awareness on waste management at Carnival City

Carnival City employees play no role in waste management; they see it as the responsibility of Interwaste on-site solutions, the appointed waste contractor. Employee empowerment and education on waste management is vital to advance the war on waste. More awareness on waste separation at source needs to be created for Carnival City employees to change their actions towards waste handling, and to demonstrate environmentally responsible behaviour.

Waste management training and awareness is done at a low level at Carnival City. Only employees who have attended environmental awareness training were aware that Carnival City has a waste management policy. There is a need for Carnival City to implement training, awareness, and measures that will change the negative behaviour of employees towards waste handling.

6.3 Conclusion

The summary touched on waste management practices at Carnival City and their effectiveness, employee awareness of waste management and the waste management challenges that this casino is facing. Diverting waste from landfill sites was shown to be an area of concern for the Casino and the Sun International Group at large. Waste separation and recycling initiatives at Carnival City Casino are not sufficient to meet Sun International's sustainability objective of 'zero-waste-to-landfills' by 2022. Landfilling is still the main waste management practice at Carnival City. Food waste constitutes the largest proportion of waste generated at Carnival City. It is disposed at the landfill site yet it could be segregated and used for composting, or in waste-to-energy projects. There is potential for improving the current waste management practices at Carnival City.

6.4 Recommendations

Recommendations from this research can inform waste management at other South African casinos. These recommendations were meant to address the research findings and to promote best practice approaches on managing waste at Carnival City Casino.

6.4.1 Training and awareness

Carnival City should keep records to show competencies that have been achieved through education, training or experience. Training and awareness raising related to waste management practices should be conducted for all Carnival City employees. More effort should be on educating the concessionaires about Sun International's commitment of 'zero-waste-to-landfills' as they have high employee turnover. Training and awareness can help to change employees' behaviour towards waste management. The top management should engage Carnival City employees on waste management and make them aware of its importance in casino operations. External waste management training should be arranged for heads of departments to facilitate critical thinking and to contribute heavily to the development of effective waste management practices. Carnival City's waste management objectives, waste volume reports and audit results must be communicated to all the employees to ensure that they prioritise and improve current waste management practices.

6.4.2 Waste separation at source

Waste separation at source can be accomplished and be effective if employees are encouraged to do it and monetary value is attached to the collected waste. Carnival City needs to consider compiling a separation at source policy and introduce a disciplinary action and a fine for kitchens that will deviate from the policy. The separation at source policy will help Carnival City to cut down on waste disposal costs and to increase recyclables by minimising contamination of recyclables by food waste. Demarcated colour-coded bins should be installed in all kitchen areas and all the kitchen employees should be be trained to use them correctly.

6.4.3 Waste management

Appointing one waste contractor to manage all waste generated at Carnival City will benefit the company through cost savings. Carnival City should consider increasing the manpower of the waste sorters by bringing in overtime workers during busy events to reduce the pressure on the existing crew and ensure that proper waste sorting is done. Transport costs for recyclable waste collections can be reduced by bringing in larger waste skips to collect much larger volumes at a time. Carnival City must consider buying a platform scale to compare the weights from the Interwaste recycling hub and the Weltevreden landfill site and check for discrepancies.

6.4.4 Composting

Composting food waste can be used to extend the lifespan of landfills. Waste in a compost heap decomposes quickly than waste disposed of at a landfill. Carnival City must consider using vegetable cut-offs from the restaurant kitchens, tea leaves and tea bags, garden refuse, egg shells and sawdust from the carpentry workshop to generate compost for the garden. Composting will save money for Carnival City by cutting down on waste disposal costs and on the need to buy fertilisers for the garden, and will in addition, reduce Carnival City's carbon footprint.

6.4.5 Fat skip collection

Carnival City's maintenance department should consider using Interwaste on-site solutions for the fat skip collection. Eliminating the use of Ekurhuleni metropolitan municipality for the fat skip disposal will cut down on extra costs, as there will not be a need for separate disposal fees and constant bund wall repairs. Interwaste is the main contractor responsible for Carnival City's waste management and can find alternative measures for managing the fat skip as fat can be reused or recycled.

6.4.6 Diverting waste from landfill

Diversion of waste from the landfills to alternative management options promotes changing the face of waste management in South Africa. The Polokwane Declaration on waste management aimed to divert waste from the landfills and sets targets for 'zero-waste-to-landfills' by the year 2022. Sun International is committed to this declaration. Carnival City must consider prioritising waste management in order to achieve this commitment. Investments in waste-to-energy technologies is recommended. Carnival City needs to find a company that will use food waste generated in the kitchens in waste to energy projects. Zero waste will ensure that all waste is treated and recycled for materials and energy recovery to ensure that nothing is left to be landfilled. Fat trap grease is being disposed of as hazardous waste and should be diverted from the landfill by using service providers that re-use or recycle it.

6.5 Future research

Findings cannot be generalised in terms of populations as a qualitative study was undertaken. Lack of prior research on waste management at casinos was a challenge and this gap provides an opportunity to describe the need for future research. Waste separation at the source of generation still needs to be researched as it was found to be the main barrier in minimising waste send to the landfill and maximising recycling. Findings can be generalised in terms of theoretical propositions. Propositions made in this research, including the approach and methods, can be useful in making sense of waste management practices at other casinos or related activities.

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Appendices

Appendix 1: Permission letter from the university

To:

Mr Elroy Van Blerk: Operations Manager elroy.vblerk@suninternational.com.
Mrs Annemie Turk: General Manager annemie.turk@suninternational.com

07 June 2016
Dear Sir/Madam,
Ref: Requesting Permission for student to conduct Masters' research project.

This letter serves as evidence that Annah Motshwane Pholose (Staff number: 60109) is a Masters student in the Department of Environmental Sciences at UNISA. As part of her studies, she is required to conduct a research under my supervision. Her topic's research is titled, "An evaluation of solid waste management practices at Carnival City Casino, Brakpan." The study will focus on Carnival City's waste management practices and its execution encompasses the following research methods: document review, field observations, photographs and personal interviews.

If you have any queries or reservations, please do not hesitate to contact me. The following are my contact details:

Tel: 0114713934
Email: togom@unisa.ac.za.

Thanking you in advance for your support.

Sincerely Yours,

Signed: ……

Dr Mucha Togo
Supervisor, Environmental Sciences Department

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsmile: +27 429 12 429 4150
www.unisa.ac.za

Appendix 2: Permission letter from Carnival City

Carnival City

Cnr Elsburg and Century Road
Brakpan 1540 Gauteng
Private Bag X777 Brakpan 1540
Gauteng South Africa
Telephone +27 (0) 11 898 7000
Facsimile +27 (0) 11 898 7001
www.suninternational.com

22 June 2016

Dear Dr Mucha Togo

RE: Requesting permission for student to conduct a Masters research project

I hereby grant permission for Annah Motshwane Pholose to conduct her research in support of her studies, as a Masters student.

Regards

Elroy van Blerk
Operations Manager
Carnival City

Afrisun Gauteng Proprietary Limited t/a Carnival City
Directors: AM Leeming GJ Thula NJ Mboweni (Alternate) TC Kaatze UM Govender
Company Registration No. 1997/005504/07 Company Secretary: Sun International Corporate Services Proprietary Limited

Sun International

Appendix 3: Consent form

TITLE OF THE STUDY

An evaluation of solid waste management practices at Carnival City Casino, Brakpan.

Dear Mr/Mrs/Ms……... Date:..…/..…/20.....

INTRODUCTION

You are invited to participate in a study to evaluate solid waste management practices at Carnival City in Brakpan. You are the relevant candidate to provide information on how Carnival City manages its waste.

This consent form provides you with the information that will help in understanding what the research is all about and in deciding whether to take part in the study or not. Any questions or enquiries that are not covered in the leaflet can be directed to the researcher for further clarification and you are free to withdraw from this study at any time during the study.

NATURE AND PURPOSE OF THE STUDY

The study aims to evaluate solid waste management practices implemented at Carnival City Casino in Brakpan, so as to assist in identifying gaps, assessing their effectiveness and establishing possible interventions for reducing waste send to the landfills.

POTENTIAL BENEFITS OF THE STUDY

The study strives to minimise disposal of waste to the municipal landfill site by Carnival City Casino, and maximise recycling for environmental protection. Recommendations that will be made based on the study could help to address waste management challenges at Carnival City.

RESEARCH PROCESSES

- The study will require your participation by being interviewed.
- Reasonable time will be given for you to respond to the interview questions.
- The interview questions will be asked in English, but translation can be done, when it is needed.
- You are required to give your opinion in all the questions.
- The confidentiality of the participants is guaranteed

Interview

- The researcher will be introduced to potential participants and brief background information on UNISA be provided.
- The researcher will interview employees in the waste management department.
- The research participants will be informed that their names will remain confidential and the obtained information only be used for the study.

Observation

- Observation accompanied by photographs where necessary, will also form part of the study.
- Introduction of the research participants will be made to the researcher and a brief explanation on the purpose and benefits of the study be given.
- Visits and observations of waste management practices at Carnival City will be done by the researcher without interference or disturbance of the waste sorters.
- Consideration regarding all safety precautions of wearing personal protective equipment, (PPE) such as safety boots, goggles, noise clippers and dust mask, adhering to safety signs and being aware of moving vehicles will made when visiting Carnival City waste area and Interwaste recycling hub.

NOTIFICATION THAT PHOTOGRAPHIC AND RECORDING MATERIAL WILL BE REQUIRED

The researcher will inform the participants that photographic material of the waste area and waste related incidents will be taken. A tape recorder will be used to record the interviews.

CONFIDENTIALITY

All information collected from the research participants will be kept confidential, treated in a responsible and professional manner, and names of the information sources will not be disclosed.

WITHDRAWAL CLAUSE

Participation is voluntary and research participants may withdraw from the research at any time.

STUDENT INFORMATION

Annah Motshwane Pholose

UNISA: Department of Environmental Sciences

Cell: 082 299 7521, E-mail: annah.pholose@suniternational.com

SUPERVISORS' INFORMATION

Dr Mucha Togo

UNISA: Department of Environmental Sciences

Tel: 011 471 3934

E-mail: togom@unisa.ac.za

Miss Khomotso Semenya

UNISA: Department of Environmental Sciences

E-mail: semenk@unisa.ac.za

CONSENT TO PARTICIPATE IN THE STUDY

I, the undersigned,..…… (full name) have read the above information relating to the project and have also heard the verbal version, and declare that I understand it. I have been afforded the opportunity to discuss relevant aspects of the project with the project leader, and hereby declare that I agree voluntarily to participate in the project.

I indemnify the university and any employee or student of the university against any liability that I may incur during the course of the project.

I further undertake to make no claim against the university in respect of damages to my person or reputation that may be incurred as a result of the project/trial or through the fault of other participants, unless resulting from negligence on the part of the university, its employees or students.

I have received a signed copy of this consent form.

Signature of participant: .....

Signed at …… on ……

WITNESSES

1.....

2.....

(UNISA, 2014)

A**ppendix 4: Interview guide for managers**

Thank you for agreeing to be interviewed for the research on the evaluation of solid waste management practices at Carnival City Casino in Brakpan. The interview will be recorded on a tape recorder and should take approximately 20 minutes.

A.GENERAL INFORMATION

JOB TITLE: .....

EDUCATION: .....

WASTE MANAGEMENT EXPERIENCE: .....

DATE: .....

B. INTERVIEW QUESTIONS FOR MANAGERS

1. What's your definition for waste?
2. Does Carnival City have a waste management policy?
3. How does Carnival City manage its waste?
4. Which waste type is generated in greater quantities at Carnival City?
5. How is waste temporarily stored at Carnival City?
6. How does Carnival City collect waste?
7. How often is waste collected?
8. Does Carnival City have a waste recycling company?
9. Are current waste management practices effective?
10. What challenges do you encounter when managing waste?
11. How can Carnival City improve its waste management?

NB: Participation in this interview is voluntary. All information will be treated with confidentiality and used for academic purposes only.
Thank you for your participation!

Appendix 5: Interview guide for general workers

Thank you for agreeing to be interviewed for the research on the evaluation of solid waste management practices at Carnival City Casino in Brakpan. Recording of the interview using a tape recorder should take approximately 20 minutes.

DATE: .....

A.INTERVIEW QUESTIONS

1. What do you think is waste?
2. Which waste types do you handle on a daily basis?
3. Which type of waste is generated in larger volumes at Carnival City?
4. Who do you think is responsible for managing waste at Carnival City?
5. How do you dispose of waste generated in your work area?
6. How is waste temporarily stored at Carnival City?
7. How does Carnival City transport waste?
8. Does Carnival City have a waste management policy?
9. Does Carnival have a waste recycling company?
10. Do you attend waste management training or workshops?
11. Are current waste management practices effective?
12. What measures can be applied to improve waste management at Carnival City?

NB: Participation in this interview is voluntary. All information will be treated with confidentiality and used for academic purposes only.
Thank you for your participation!

Appendix 6: Observation checklist for the waste area

This tool will be completed by the researcher and the information will be used for academic purposes only.

AN EVALUATION OF SOLID WASTE MANAGEMENT PRACTICES AT CARNIVAL CITY CASINO, BRAKPAN.

Waste Management Checklist

Researcher's name: ……

Observation date: ……

Questions	Yes	No	Comments
Is there more than one contractor or service provider rendering waste collection at Carnival City?			
What types of waste can be observed at the waste area?			
Are waste receptacles demarcated for recycling?			
Are waste bins visible for employees and guests to see?			
Are there different receptacles for different types of waste?			
Are there any observable waste management challenges?			
Is there a weighbridge at the waste area?			
Is the waste area free of spillages and leakages?			
Do workers in the waste area wear personal protective equipment (PPE)?			

Comments on other activities observed in the study area:

……

……

……

……

Appendix 7: Observation checklist for Interwaste recycling hub

AN EVALUATION OF SOLID WASTE MANAGEMENT PRACTICES AT CARNIVAL CITY CASINO, BRAKPAN.

Inspection Checklist

Researcher's name: ……

Hub name: ……

Observation date: ……

List	Yes	No	Comments
Does the recycling hub have a fence?			
Is there controlled access at the recycling hub?			
Are there security guards placed at the recycling hub?			
Is there waste separation done at the recycling hub?			
Is personal protective equipment provided to the recycling hub employees?			
Is there a weighbridge at the recycling hub?			
Is there any noise at the recycling hub?			
Is there any dust observed at the recycling hub?			

All information collected will be treated with confidentiality and used for academic purposes only.

Appendix 8: Ethical clearance

UNISA university of south africa

CAES RESEARCH ETHICS REVIEW COMMITTEE

National Health Research Ethics Council Registration no: REC-170616-051

Date: 25/11/2016

Ref #: 2016/ CAES/ E31

Name of applicant: Ms AM Pholose Student #: 46169210

Dear Ms Pholose,

Decision: Ethics Approval

Proposal: An evaluation of solid waste management practices at Carnival City Casino, Brakpan

Supervisor: Dr M Togo

Qualification: Postgraduate degree

Thank you for the application for research ethics clearance by the CAES Research Ethics Review Committee for the above-mentioned research. Approval is granted for the project.

Please note that the approval is valid for a one year period only. After one year the researcher is required to submit a progress report, upon which the ethics clearance may be renewed for another year.

Due date for progress report: 30 November 2017

University of South Africa
Preller Street, Muckleneuk Ridge, Pretoria
PO Box 392, UNISA, 0003, South Africa
www.unisa.ac.za

UNISA university of south africa

The application was reviewed in compliance with the Unisa Policy on Research Ethics by the CAES Research Ethics Review Committee on 24 November 2016.

The proposed research may now commence with the proviso that:

1) *The researcher/s will ensure that the research project adheres to the values and principles expressed by UNISA Policy on Research Ethics.*
2) *Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the CAES Research Ethics Review Committee, An amended application could be requested if there are substantial changes from the existing proposal especially if those changes affect any of the study-related risks for research participants.*
3) *The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study.*

Note:

The reference number [top right corner of this communique] should be clearly indicated on all forms of communication [e.g. Webmail, E-mail messages, letters] with the intended research participants, as well as with the CAES RERC.

Kind regards,

Signature

CAES RERC Chair: Prof EL Kempen

Signature

CAES Executive Dean: Prof MJ Linington

Appendix 9: Permission letter from Interwaste on-site solutions

2 Brammer St, Industries Site
Germiston East
Republic of South Africa
Telephone: +27 11 323 7300
Fax: +27 86 576 8152
Email: sales@interwaste.co.za
www.interwaste.co.za

21 August 2017

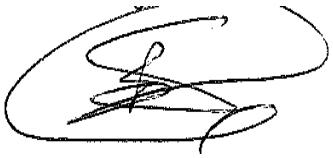
To: UNISA Environmental Sciences Department 21 August 2017

Re: Interwaste site visit by Annah Pholose

This letter hereby confirms that Annah Pholose, Environmental Officer at Carnival City, visited our premises on 11th May 2017.

With regards to the research that Annah did on Waste Management at Carnival City, Annah visited our Recycling Warehouse and RDF Plant at our Germiston Head Office. She was granted permission to do a walk-about and take photographs where they were required for academic purposes.

Kind regards



Grant Bertram

Business Unit Manager – Onsite

Appendix 10: Turn-it-in report

Turnitin Originality Report

An evaluation of solid waste management practices at Carnival City Casino, Brakpan by Annah Motshwane Pholose

From Complete dissertation/ thesis for examination (M&D Student 2018)

- Processed on 16-February-2019 13:28 SAST
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Appendix 11: WasteCon 2018 Accepted Paper

ISBN: 978-0-6399541-0-3 WasteCon 2018 Proceedings

AN EVALUATION OF WASTE MANAGEMENT PRACTICES AT CARNIVAL CITY CASINO, BRAKPAN

PHOLOSE AM*, TOGO M** and **SEMENYA K*****

*College of Agriculture and Environmental Sciences, University of South Africa, Pretoria, 0003 requirements, Tel:(011) 8987039, Cell:082 299 7521, Email: annah.pholose@suninternational.com

** College of Agriculture and Environmental Sciences, University of South Africa, Corner Christiaan de Wet Rd and Pioneer Ave, Roodepoort, 1709 , Tel:(011) 4713934, Email: togom@unisa.ac.za

*** College of Agriculture and Environmental Sciences, University of South Africa, Corner Christiaan de Wet Rd and Pioneer Ave, Roodepoort, 1709, Tel:(011) 4712138, Email: semenk@unisa.ac.za

ABSTRACT

Waste management is a global concern and landfill sites are facing a waste crisis of reaching full capacity. This study evaluated waste management practices at Carnival City Casino in Brakpan. Qualitative methods including interviews, observations, photographs and document reviews were used to collect data. Observations were used to identify waste management practices implemented at Carnival City Casino. Document reviews were used to collect information on waste volumes. Semi-structured face-to-face interviews using open-ended questions were used to solicit information describing the Carnival City employees' experiences in dealing with waste management. The researcher conducted face-to-face interviews to collect data on issues that could not be covered by field observations. Data was collected in eleven kitchens: the Carnival Club hotel kitchen, the Carnival City staff canteen kitchen and from the nine restaurants' kitchens. Content analysis was used to analyse the collected data.

The findings showed that majority of waste still ends up in the landfill site and recycling was done at a lower level. Waste was not separated at the source of generation and was taken to the waste sorting area as mixed waste. Food waste resulting from food preparation, cooking and serving dominated the quantity of waste generated in the restaurant kitchens and was disposed of at the landfill. Entertainment activities that took place in the Big Top Arena, Sun Park and Festival Lawns made it difficult for the waste sorters to handle the capacity of waste generated. Waste generation exceeds the capacity of the employees of the appointed contractor to effectively handle it. The study revealed that the amount of waste generated at Carnival City increases during busy events and proper waste sorting was not done. Observations revealed incidents where the recyclable waste was put into compactors and sent to the landfill site. Minimal recycling currently practiced at Carnival City Casino had financial benefits in the form of rebates that were earned from retrieving the recyclables and sending them to Interwaste on-site solutions' recycling hub in Germiston.

The waste management hierarchy was used as a framework for analysing and presenting the collected data. The waste hierarchy sets out the preferred order of waste management practices, from the most favoured to the least preferred option. Waste minimisation, reuse, recycling and disposal were found to be the waste management practices implemented on waste generated at Carnival City. The researcher noted areas of conformity to South African legislation pertaining to waste management, international standards and Carnival City's standard operating procedures, and areas of good practice. The waste statistics were presented in tables and figures.

The study showed that there is room for improvement concerning the way Carnival City is managing its waste. It is recommended that waste management training and awareness be undertaken on a continuous basis for current waste management practices to improve and ensure that more waste is diverted from landfill sites. Investment into waste to energy technologies must be considered to help Carnival City to meet Sun International's commitment of "zero waste to landfills by 2020". Recycling must be maximised and its environmental and financial benefits be highlighted.

Absence of policies has resulted in recycling activities experiencing significant challenges about waste separation at source. The research recommends compiling of a separation at source policy and enforcement by the Environmental Committee as the absence of the documented procedure led to deviations from environmental objectives. Offenders are to be duly punished. A disciplinary action and a fine are to be introduced for kitchens that will deviate from the policy.

Keywords

Waste management practices, Carnival City Casino, Waste storage, Recycling, Waste disposal, Zero waste, Landfill site, Qualitative research, Content analysis

1. INTRODUCTION

Waste management is a challenge that many countries face. Waste continues to be a burden to the environment and remains a potential threat to human beings irrespective of having controls in place or not (Davidson, 2011). Waste management service delivery is a local government function in South Africa (Gumbi, 2015). South African municipalities are mandated by the country's constitution to provide waste management as a basic service to their citizens (Constitution of South Africa, 1996). Waste management is one of the municipalities' functions which focuses on collecting, transporting and disposing solid waste generated by different users. Various disease outbreaks, environmental pollution and degradation can occur if this function is not carried out (Maluleke, 2014).

Sustainability and improvement of waste management services remain significant challenges for many countries around the world (Lalonde, 2013). Many cities lack the resources to meet the demand for waste management services. The implementation of adequate waste management services in South Africa is exacerbated by lack of proper planning (Gumbi, 2015). Environmental pollution and unpleasant living conditions occur as a result of poor planning and inadequate waste services (DEA, 2011; Zhakata, Gundani, Chauke & Odeku, 2016). Increasing practices of littering, dumping and burning of household solid waste are as a result of inadequate management and service delivery (Naidoo, 2009). The waste management system remains inadequate and expensive even though governments allocate and spend a substantial amount of resources (Badgie, Samah, Manaf & Muda, 2012). The Waste Management Summit acknowledged that waste management service delivery and infrastructure require urgent attention (DEA, 2015).

Generated municipal waste increases as people migrate to urban areas for a better life and employment opportunities. Increased population exerts pressure on the level of service that the cities can deliver (Kubanza, 2010). Driving past any of South Africa's informal settlements, open fields and streams, the urgent need to develop and implement waste management strategies that would improve the impact of waste on the environment is evident. Informal settlements' residents are of the opinion that waste management is the government's responsibility. These residents perceive dumping waste along the roads as a call to attract the municipalities' attention that removal services are needed (Moiloa, 2007). Heaps of uncontrolled garbage, illegal dumping sites, drains blocked with rubbish and health hazards to residential areas emanating from the disposal sites are aspects of waste management problems in South African cities (Kubanza, 2010).

Waste management in South Africa still relies heavily on landfilling as a waste management option despite the target of zero waste to landfills by 2022 set by the Polokwane Declaration in 2001 (DEA, 2011). The vision of Polokwane Declaration on waste management was to encourage all South Africans to be committed towards the effective reduction of waste (DEAT, 2001). Five priority waste streams that reach the landfills and need to be reduced are glass, paper, plastic, cans and tyres (Taiwo, Otieno & Venter, 2008). The value of waste that could have been reused or recycled and currently lost to South Africa's economy through landfilling is estimated to be in excess of R17 billion per annum (CSIR, 2017).

1.1 Waste Management Perspective in South Africa

Waste management service delivery is a local government function that bounds municipalities to deliver waste collection services (Municipal Systems Act, 2000). Collection, transportation and disposal of waste are the functions of the municipality which are extended to the waste contractors appointed by the private sector and the municipalities due to an increase in waste volumes and lack of capacity. Municipalities face major challenges with regard to capacity, waste collection planning and administration, separation at source, refuse collection, and illegal dumping (IWMSA, 2014).

The receptacles that are used for waste collection services are wheelie bins, waste skips, compactors, trucks and dumpers (Mandevere, 2015). Mechanical breakdown of the compactors and trucks, industrial strikes and service delivery protests are some of the reasons why municipalities do not render waste collection services. Waste collection efficiency is determined by manpower availability and transport capacity (Keisham & Paul, 2015). The collection systems that are currently used need to be revised as they are not conducive to waste separation at source. Separation at source will provide higher quality recyclables and a cleaner working environment (CSIR, 2011).

1.2 Waste Management Legislation

The driving forces for ensuring that responsible waste management practices are implemented are legislation and enforcement (Davidson, 2011). Legislation without enforcement does not yield compliance. The South African Constitution (1996), Hazardous Substances Act (1973), National Environmental Management: Waste Act (2008), National Health Act (2003), Occupational Health and Safety Act (1993), National Water Act (1998), National Environmental Management Act (1998), Air Quality Act (2004), Plastic Bag Regulation R543 and municipal by-laws are pieces of South African legislation governing how to deal with waste. These pieces of legislation are supposed to control littering and illegal dumping of waste, yet all prohibited actions are evident all over the country (SAWIC, 2015).

The effectiveness of environmental legislation depends upon its authorisation and permitting or licensing of persons to carry out certain waste management activities (NEMWA, 2008, s.43).

Equity, efficiency, effectiveness and sustainability of municipal solid waste disposal were compromised as the implementation of South Africa's national municipal solid waste legislation policies and strategies are inconsistent with local government practices and procedures (Naidoo, 2009, p.ii). The implementation of legislation is not easy but it enforces companies to exercise the environmental right in carrying out sustainable waste management practices. Changes are noticed in pollution prevention, minimising ecological degradation and improving efficiency in waste management (Moiloa, 2007).

Municipalities encounter numerous challenges in enforcing waste management policies. Efficient implementation of waste management strategies remains a challenge for most South African companies despite the establishment of several good waste management policies and legislation (Mnisi, 2008, as cited in Tshimbana, 2014,p.4). Lack of suitable waste expertise and practices have made the enforcement and monitoring of the South African waste legislation difficult even though it is in line with the global trends (Mannie, 2017). The waste management standards are deteriorating in most provinces despite the waste legislation being acknowledged (Mandevere, 2015).

1.3 Waste Management Hierarchy

The waste management hierarchy is an internationally accepted guide for prioritising waste management practices (Zero Waste South Australia, 2016). The waste management hierarchy (Figure 1) sets out the preferred order of waste management practices, from the most favoured to the least preferred option (Intech Open, 2011). The National Waste Management Strategy outlines the hierarchy of waste management in South Africa, which dictates that waste avoidance and reduction should be the first preferences before reuse, recycling, recovery and treatment and disposal (DEA, 2011). Waste avoidance or prevention is the foundation of the waste management hierarchy and is given first priority in the implementation of waste management practices. The primary focus for solid waste management and mitigating negative public and environmental impacts should emphasise on reducing, reusing and recycling of waste before disposal at landfills (Badgie *et al*., 2012). The general principle of the waste hierarchy is to implement waste disposal as a last resort (DEA, 2011). Promoting the waste hierarchy approach will avoid the need for establishing new landfills or expanding existing facilities (DEA, 2011).

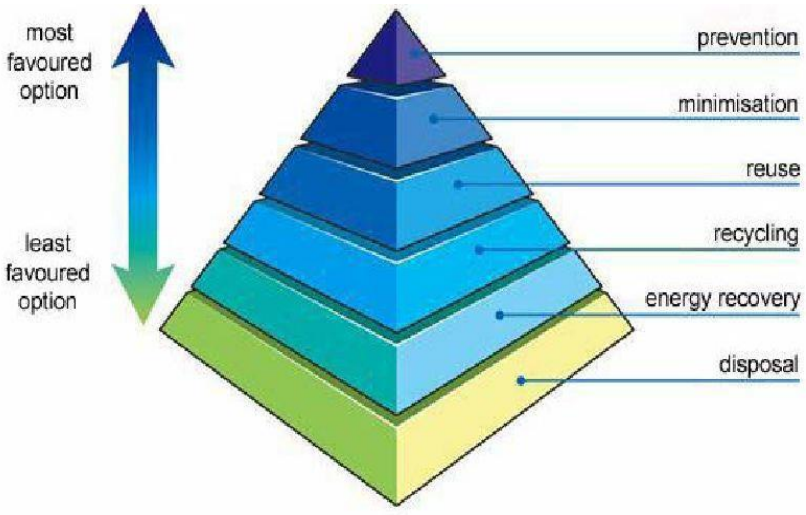

Figure 1. Waste Management Hierarchy

(Intech Open, 2011)

1.4 Waste Management at Carnival City

The casino industry deals with a wide variety of materials, large volumes of waste, and behaviours of many customers and visitors from within and outside the province (Davidson, 2011). Carnival City Casino and Entertainment is a 24-hour operation with a wide selection of restaurant outlets, a cinema, bars, a hotel and the Road Lodge, generating wet and dry waste. Sun International is Carnival City's motherboard and its commitment to zero waste to landfill lay the foundation for addressing waste challenges at Carnival City Casino (Sun International, 2015b. Waste generated at Carnival City is classified as general and hazardous waste (Table 1).

Table 1. Carnival City Waste Classification

General Waste	**Hazardous Waste**
1. Recyclable waste: Glass, plastic, cans, paper, cardboard boxes, wood, scrap metal, magazines,	1. Electronic waste: Televisions, toasters, irons, microwaves, refrigerators, dishwashers, washing machines, air conditioners, vacuum cleaners, computers, cameras, fax machines, calculators, telephones, printers, two-way radios, fluorescent tubes, LED lights, batteries, scanners, keyboards, photocopying machines, toner and ink cartridges.
2. Organic waste: Food waste and garden waste	2. Organic waste: Fat from the grease traps.
3. Non-recyclable waste: Paper towels, plastic,	3. Medical waste: Blood soaked bandages, swabs, contaminated gloves, expired medicine, needles and syringes
	4. Recyclable waste: Used cooking oil and fluorescent tubes

Carnival City Casino generates more than 900 000 kilograms (kg) of general waste on an annual basis as reflected on Carnival City's waste statistics for the year 2016 (Interwaste on-site solutions, 2016). Food waste and non-recyclable waste are put into the waste compactor for landfill disposal. The volumes of waste types generated for the year 2016 are indicated in figure 2. Paper is 20348 kg, plastic 15360 kg, cardboard boxes 61914 kg, glass 145260 kg, cans 13927 kg, and food waste and non-recyclabes 647490 kg. Collection, transportation and disposal of waste are costly exercises for Carnival City's operations.

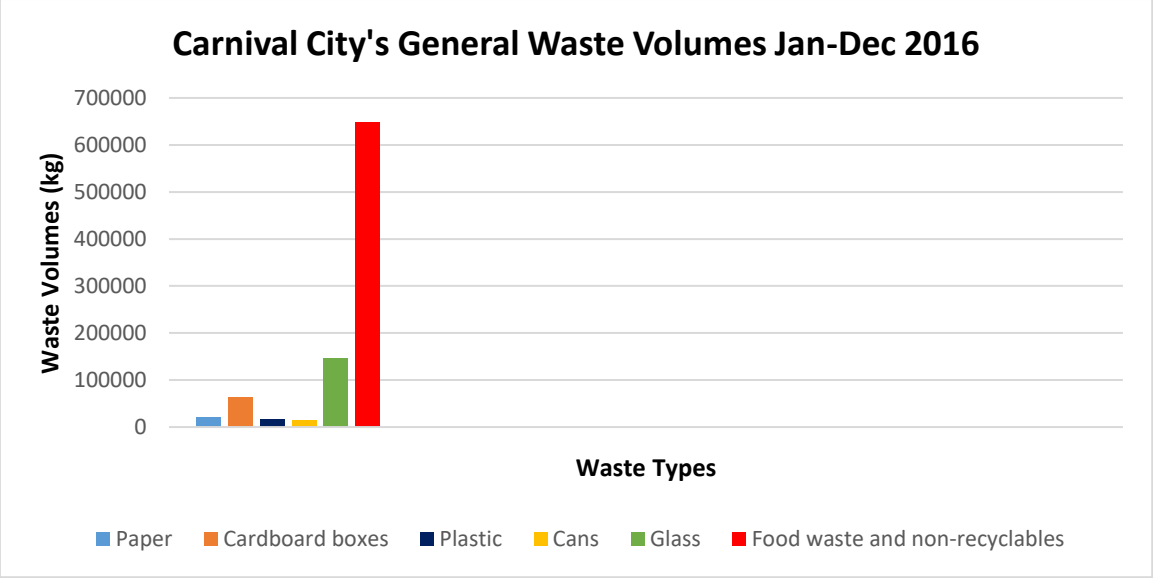

Figure 2. Carnival City's General Waste Volumes for 2016

(Interwaste on-site solutions, 2016)

Five waste contractors are appointed to handle and manage waste generated on Carnival City's property (Table 2). Interwaste on-site solutions is the main contractor responsible for waste sorting on the complex and operates on a 24-hour basis at the casino operations. Four other waste contractors and Ekurhuleni Metropolitan Municipality are other companies responsible for Carnival City's waste removal. The previous waste contractor was only responsible for handling general waste generated on the complex, hence, other waste contractors were appointed to deal with hazardous waste. Ekurhuleni Metropolitan Municipality is responsible for collecting fat from the grease trap at Carnival City as part of the community development agreement between the two companies (Sun International, 2015b).

Table 2. Waste Contractors at Carnival City

Waste Contractor/ Municipality	Waste Types	Collection	Sorting & Recycling	Treatment	Landfilling
1. Interwaste on-site solutions	Paper, glass, plastic, cans, food waste,	✓	✓	X	✓
2.Temple waste contractor	Fluorescent tubes	✓	✓	✓	X
3.Xperien	IT assets and equipment	✓	✓	✓	✓

4. Sharpmed waste contractor	Medical waste	✓	X	✓	✓
5. Bongani Cleaning Services	Fat from the grease traps	✓	X	X	X
6. Ekurhuleni Metropolitan Municipality	Fat from the grease traps	X	X	X	✓

This study was conducted to evaluate waste management practices implemented at Carnival City Casino and to identify management challenges and environmental impacts. The study aimed to provide information on management of solid waste in casino operations and complement existing knowledge to improve current waste management practices (Kudoma, 2013).

2. MOTIVATION FOR THE STUDY

Environmental concerns are not at the forefront when people think about casinos. Waste management impacts are significant and not unique in the casino industry but they are given little consideration (Chazin, Goldman, McAuliffe & Onuzo, 2012). It has been established from the monthly reports generated by Interwaste on-site solutions that majority of waste at Carnival City end up in landfills. Organic waste dominates the quantity of waste dumped at Weltevreden landfill site yet its moisture content makes it more suitable for composting (Kadir, Azhari & Jamaludin, 2016).

Most African countries are reluctant to implement reduce, reuse and recycle methods even though it is known to have positive environmental, social and financial benefits (Badgie *et al.,* 2012). Increased volumes of waste in South Africa result in more pressure exerted on waste management facilities and is due to the growing economy and population (Mathe, 2014). South African landfills are rapidly filling up as the majority of waste ends up in the landfills as mixed waste (CSIR, 2011). The value of waste that could have been reused or recycled and currently lost to South Africa's economy through landfilling is estimated to be in excess of R17 billion per annum (CSIR, 2017).

Different types of waste are generated throughout the life cycle of a casino. The construction, operational, demolition and the refurbishment stages are four different stages that majority of business operations go through. Literature review shows that the operational stage generates the highest amount of waste compared to all other stages even though waste is generated in all the four stages (Machete, 2015). The majority of the space is allocated to the public and guest areas including the lobby, restaurants, banquet halls, a health club and the gardens during the design and construction phase of a hotel or casino. The small remaining areas are left for back-of-house staff to dispose and sort waste (Lalonde, 2013).

Casino industries are resource-intensive operations and generate many waste streams from the multi-function facilities (Chazin *et al*., 2012). Operating a casino generates a huge amount of waste. Although waste composition and waste management practices are similar for most organisations, investigations have not been done on the waste management practices at Carnival City Casino. Only non-conformances that were raised during the audits were noted.

Casinos are destinations that attract a wide variety of people and should be perfectly poised to serve as exemplary institutions of what sustainable and environmental consciousness means (Chazin *et al*., 2012). A holistic and integrated effort must be made to minimise the quantity of waste generated and avert potential environmental impacts (Badgie *et al.,* 2012). Thus this study will be undertaken to evaluate the casino's waste management practices and look at the alternatives which could be implemented to minimise waste disposal and potential pollution.

2.1 Aim and Objectives

The aim of the study was to evaluate waste management practices implemented at Carnival City Casino in Brakpan.

Objectives include:

6. To identify waste management practices at Carnival City Casino.
7. To establish the effectiveness of current waste management practices at Carnival City Casino.
8. To explore waste management challenges faced by Carnival City Casino.
9. To determine the level of employee awareness on waste management at Carnival City.
10. To recommend improvement measures for Carnival City Casino's waste management standard.

3. STUDY AREA

The study was carried out at Carnival City Casino and Entertainment which is located on the outskirts of Johannesburg East, in Brakpan in the Ekurhuleni Metropolitan Municipality, in Gauteng Province. Carnival City is one of Sun International's operational units in Gauteng. Carnival City has a geographic area of about 150 hectares. The geographic coordinates of the area are 26° 15´ 35.9´´ South, 28° 18´ 49.6´´ East (Sun International, 2015b). Carnival City has a wide variety of restaurants, bars, a gaming floor, a cinema, a hotel, the lodge, games arcade at Magic Company, conference facilities, a clinic and supporting activities responsible for office duties, all generating vast quantities of waste on a daily basis. The core business of Carnival City casino is gaming, and there is a Carnival Club hotel and the Road Lodge responsible for providing accommodation. Carnival City is renowned for hosting a variety of live performances and star-studded events in the Big Top Arena, Festival Lawns and Mardi Gras Theatre.

Non-gaming revenues from various entertainment and leisure activities offered at Carnival City generate a great amount of waste even though they are important sources of revenue and employment, and contribute to the country's economy (Sun International, 2015b).

4. RESEARCH METHODOLOGY

4.1 Research Design

A qualitative research approach triangulating multiple sources of data was followed. Qualitative methods such as interviews, observations, photographs, field notes and document reviews were used to collect data. Semi-structured face-to-face interviews using open-ended questions were used to solicit information describing the Carnival City employees' experiences in dealing with waste management. The researcher conducted face-to-face interviews to collect data on issues that could not be covered by field observations. Photographs were taken at Carnival City and Interwaste recycling hub and RDF plant to support notes collected during observations. Secondary data saved time for the researcher as it was acquired from existing literature and secondary data sources.

4.2 Sampling Technique

The study evaluated waste management practices at Carnival City's natural setting, as they were no laboratory experiments undertaken. Non-probability sampling technique was used as a selection strategy as the chance of every employee from the study area being selected was not known or guaranteed. Purposive sampling was used to select areas that were visited at Carnival City as the researcher was working with small samples. Purposive sampling method helped the researcher to select informative field areas and participants who would best answer the research questions (Matthews & Ross, 2010). The researcher used personal judgment to select participants who were considered to be representative of the population (Saunders, Lewis & Thornhill, 2012).The focus was on employees from Interwaste on-site solutions as they have vast experience, knowledge, skills and exposure to waste generated at Carnival City.

4.3 Data Collection and Analysis

The researcher was a key instrument in collecting data and interpreting research participants' meanings. The research used primary and secondary data sources to collect data on waste management practices at Carnival City Casino. Site visits were conducted during the study to collect data using interviews, observations, photographs and documentary review. Data was collected from the office blocks, temporary waste storage areas, eleven kitchens, parking lots, grease trap areas, Sun Park, festival lawns, Big Top arena and waste sorting area at Carnival City. Collected data was transcribed, coded and categorised. Weltevreden landfill site and Interwaste on-site solutions recycling hub were visited to see what happens to the waste once it has left Carnival City Casino's premises.

Data analysis is a process of bringing order, structure and meaning to the mass of collected data (De Vos, Strydom, Fouche & Delport, 2011). The waste management hierarchy was used as a framework to analyse data. The study used content analysis and comparative analysis to analyse collected data, presents the results of the study and draw conclusions. Comparative analysis was used to compare the findings and establish the effectiveness of current waste management practices at Carnival City against the ISO 14001:2015 standard requirements. Comparative analysis compares the practices on the ground to the standard.

5. RESEARCH RESULTS AND DISCUSSION

The amount of total waste generated by Carnival City Casino from January to December 2016 is presented in Figure 2 as compiled by Interwaste on monthly waste volume reports. Total waste generated at Carnival City includes general waste and recyclable waste managed by Interwaste on-site solutions. General waste was 647 490 kilograms (kg), total waste recycled was 256 809 kg and total waste 904 299 kg, for January to December 2016. Food waste and non-recyclables are put into the compactor and send to the landfill. The monthly waste volume reports show that more than 70% of waste is disposed of at the landfill on a monthly basis (Interwaste on-site solutions, 2016).

The total waste recycled for January to December 2016 raise concerns on the effectiveness of waste management practices implemented at Carnival City as more waste is still disposed of at the landfill site, even though disposal is the least desirable method to treat waste on the waste hierarchy.

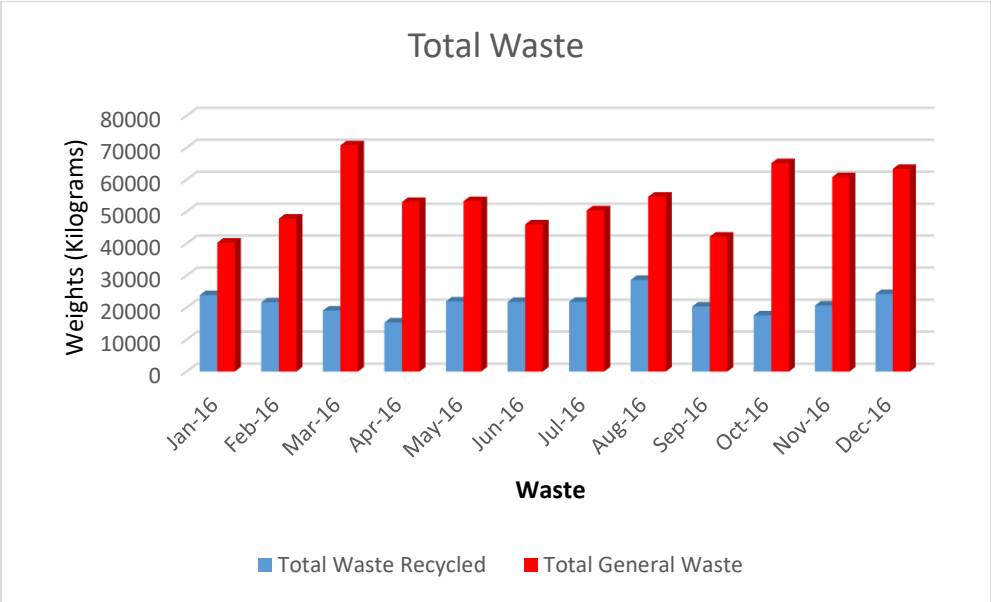

Figure 2. Total waste (January – December 2016)

Interviews' questions were substantiated by the words spoken verbatim by the interviewees. The interviewees defined waste as follows:

Respondent 1: (Duty Operations Manager)

"I consider waste to be anything that the casino can't use for its operations and the materials are send to the waste area for landfill disposal".

Respondent 2: (Waste Sorter)

"Waste is everything that is placed in the bins that we collect from the restaurants and offices and take to the waste area for sorting".

Respondent 3: (Restaurant General Worker)

"Waste is rubbish. That is food, cans, bottles, plastic and paper that I put into a dustbin for Interwaste guys to come and collect".

Respondent 4: (Canteen Chef)

"Waste is everything that is thrown into the waste bins and taken to the waste area for recycling and disposal".

Respondent 7: (Landscaping Supervisor)

"Waste is all the bottles, cans, plastic, paper and food left-overs that we remove from the bins that we empty from the parking areas every morning".

The study revealed that employees saw food waste as the type of waste that was generated in larger volumes. The following were the responses to the interview question: Which type of waste is generated in larger volumes at Carnival City?

Respondent 1: (Duty Operations Manager)

"Food waste is the type of waste that is generated in larger volumes and is put into the compactors at the waste area. Interwaste trucks are called to collect the compactors when they are full and dispose them of at Weltevreden landfill site".

Respondent 4: (Canteen Chef)

"Food waste is generated in large quantities and Interwaste must consider starting a compost project to minimise the amount of waste send to the landfill site".

Respondent 7: (Landscaping Supervisor)

"I think food waste is generated in larger volumes as it is put into the compactors at the waste area and I always see dirty water dripping from the compactors onto the concrete. The liquid dripping from the compactors is damaging the concrete at the waste area".

The challenges encountered by Carnival City with regards to waste management were explained as follows:

Respondent 2: (Waste Sorter)

"Food waste is generated in large quantities and the staff from the restaurants are giving us problems as they always mix all the waste together. We give them enough bins and ask them to separate food waste from the bottles and papers, but they don't do it. They tell us it's not their job to separate waste. Sometimes they even pour water into the bins when they wash their pots. We have even reported the matter to Operations but nothing changes".

Respondent 5: (Maintenance Manager)

"There is no separation at the source as waste is collected as mixed waste. Most challenges result from managing food waste as it is generated in larger quantities. Food waste is put into the compactors. The waste compactors are leaking and result in the leachate damaging the concrete slab at the waste area".

Respondent 9: (Waste Area Site Manager)

"Waste mixing remains a huge challenge as there is no separation of waste at the source. Food waste is mixed with other waste types and reduces the amount of recyclables as contaminated waste is put into the waste compactor for disposal at the landfill. Sometimes fluorescent tubes are put into the general waste bins".

The responses to the interview question: "Are current waste management practices effective? were substantiated by the words spoken verbatim by the interviewees.

Respondent 1: (Duty Operations Manager)

"The monthly report that we receive from Interwaste shows that current waste management practices are not effective and need to be improved. According to the report, only 30% of waste generated on site is recycled, and eish (shaking his head) that is a huge concern as the head office has set a target for us to achieve zero waste to landfill by the year 2020".

Respondent 3: (Restaurant General Worker)

"I think the current waste management practices are effective and Interwaste must hire more people if they want to improve waste management at Carnival City".

Respondent 5: (Maintenance Manager)

"Current waste management practices implemented at Carnival City are not effective as 70% of the waste generated on a monthly basis still ends up in the landfill. More efforts still need to be made for the company to be able to achieve Sun International's commitment of zero waste to landfills by the year 2020".

Respondent 7: (Landscaping Supervisor)

"The current waste management practices are not effective. Carnival City must consider implementing a compost project to reduce the amount of food waste send to the landfill. The compost will help to cut down on operational costs as it will be used in the garden".

The aim of the study was to evaluate waste management practices at Carnival City. The waste management hierarchy was used as a framework for analysing and presenting the collected data. The results were presented in different formats such as photographs, tables and graphs. Waste prevention and minimisation are given first preferences before reuse, recycling and recovery, and disposal is implemented as a last resort in the waste management hierarchy (DEA, 2011). Waste prevention, waste minimisation, reuse, waste handling and sorting, waste recycling and landfilling are waste management practices implemented at Carnival City. Waste management strategies used at Carnival City conform to ISO 14001:2015 environmental management system requirements.

5.1 Waste Prevention

Waste prevention or avoidance is given first priority in the waste management hierarchy. Waste prevention is the most effective way for managing waste as it seeks prevent waste from being generated, conserves natural resources and protects the environment (DEA, 2011). Electronic communication and online bookings were waste prevention practices implemented at Carnival City. Online reservations and electronic communication avoid the use of papers. Waste prevention minimises waste disposal costs for Carnival City and reduces the company's carbon footprint as no waste is generated.

5.2 Waste Minimisation

Waste minimisation focuses on practices that organisations implement to reduce the amount of waste generated. Five priority waste streams that reach the landfills and need to be reduced are glass, paper, plastic, cans and tyres (Taiwo, Otieno & Venter, 2008). Plastic straws were handed out only on request to minimise wasteful behaviour of handing out a straw with every drink. Restaurants were still in the process of phasing out the use of plastic straws completely. Employees from the restaurants were aware that plastic straws contribute to waste to landfill and environmental pollution.Crockery and cutlery usage of porcelain plates and cups, and stainless steel forks, spoons and knives were among waste reduction practices observed at Carnival City. This minimises the amount of waste generated from using polystyrene food containers.

Electric air-hand dryers in the restrooms reduce the use of paper towels. Paper towels are still used in the staff designated restrooms, the canteen and the restaurants. Glass jugs and glass water bottles used in the conference rooms reduce the amount of plastic water bottles disposed as plastic waste and eliminate disposal costs. Plastic bottled water is still sold on the casino floor and the bars. Paper usage is reduced as electronic mails are used for interdepartmental communications. Back-of-house screens are used for employees without access to emails and eliminate the need for printing and posting communications on the notice boards. Short message service (SMS) is used to communicate with most valued guests (MVGs). Rechargeable batteries minimise waste generated from using disposable batteries.

5.3 Reuse

Sustainable development principle requires waste to be reused where it cannot be avoided and minimised (NEMA, 1998, s.2). Clothing items that are not claimed six months after being kept in the lost and found storeroom are donated to local charity organisations by the Corporate Social Investment (CSI) department. Bidvest Prestige cleaners use washable rags instead of paper towels to clean the casino complex. Rechargeable batteries used for two-way radios have a long lifespan and saves money as they are reused.

The batteries are returned to the suppliers for recycling and disposal at end of their lifespan. Maintenance department repairs broken restaurants and office furniture for reuse and to minimise frequent replacements.

5.4 Waste separation at source

Separation at source increases the number of recyclables and the value of the waste recovered, and reduce cost of treatment and waste disposal (Ma, Zhan & Zhang, 2014). Segregation of waste was observed in the offices as paper recycling boxes were provided. Cardboard boxes at Carnival City were easier to sort as they were separated at the point where they entered the waste stream. Consistency was observed in separating cardboard boxes from all types of waste generated. Observations showed that cardboard boxes were not put in waste bins allocated in the kitchens, but were placed in a cage at the waste area (Figure 3) before being put into bales, and placed in a skip for transportation to Interwaste recycling hub.

Waste separation at source was identified as a barrier in minimising waste to the landfill and one of the waste management challenges that Carnival City has to deal with. Black round plastic bins in the food outlets kitchens were intended for food waste separation but there were huge inconsistencies in their use as the majority of bins observed had mixed waste. Waste that is not separated at the source impact negatively on recycling as mixed waste is often contaminated. Waste separation at source affects the effectiveness of waste management practices implemented at Carnival City as more recyclables are disposed of at the landfills as mixed waste. Of all eleven restaurants visited during the study, waste separation at source was found to be implemented at only one food outlet. The efficiency on waste separation at the source depends on the awareness of employees on the impacts of waste management systems at Carnival City. Observations revealed that more efforts need to be made for Carnival City to be able to manage the quantity and diversity of waste generated and achieve Sun International's commitment of zero waste to landfills by 2020.

Figure 3. Cardboard boxes' cage at the waste area

5.5 Reverse logistics

Reverse logistics focuses on waste generated at Carnival City and returned to suppliers. Reverse logistics promotes waste minimisation and allows the product to go backward in the chain for possible re-manufacturing, reuse, recycling, or resell for secondary market (Alnuwairan, 2016).

Reverse logistics reduces the amount of waste that Carnival City has to send for recycling or disposal. Wooden pallets, paints and solvent containers and used cooking oil are returned to the suppliers. Paints and solvent containers are temporarily stored at Maintenance workshop, and used cooking oil at food and beverage warehouse before being collected by the suppliers. Used cooking oil is considered high risk due to the health hazard it poses if distributed for reuse for human consumption (Venkata & Subramanyam, 2016). Site visits and documentary reviews undertaken during the study revealed that reverse logistics measures implemented at Carnival City were effective as none of the waste materials that are returned to the suppliers were found at the waste area.

5.6 Recycling

Recycling reduces Carnival City's carbon footprint even though is outsourced to Interwaste on-site solutions. Recycling helps Carnival City to reduce the amount of waste that needs to be landfilled. Paper, cans, glass and plastic are four of the five priority waste streams that Carnival City send for recycling. Tyres are the fifth of the five priority waste streams that are not sent for recycling by Carnival City. Waste tyres are generated during motor racing events and are managed by the event organisers.

Paper generated at Carnival City includes white office paper (HL1), coloured paper (HL2), common mixed paper (CMW) and magazines (Interwaste on-site solutions, 2016). Boxes for recycling paper are placed in offices by Interwaste employees. Finance and Surveillance departments use the document shredder for confidentiality purposes before they discard the paper into the recycling boxes. Recycling paper reduces the need for raw materials and saves trees and energy. Less energy is used in making recycled paper as compared to virgin paper (Greenworks, 2017). Cardboard is sorted into cardboard boxes (K4) and tetrapak (milk, juice and wine cartons). Plastic includes shrink wrap, low-density mixed plastic (LD mix), high-density plastic (HD post), low-density clear plastic (LD clear), cold drink and mineral water bottles (PET), and polypropylene post-consumer (PP post). Glass consists of glass bottles and jars, and cans include beverage and food cans. Beverage cans include steel and aluminium cans (Interwaste on-site solutions, 2016).

The baling system compresses cardboard boxes and plastic into manageable bales and minimises storage space at Carnival City. Waste skips and recyclable bags are temporarily stored at the waste area and taken to Interwaste recycling hub in Germiston when the skips are full. Waste that was recycled at Carnival City for the period of January to December 2016 is shown in Figure 4. The presented results shows that glass was the highest waste product type that was recycled for January to December 2016 at 145 260 kg at Carnival City, followed by cardboard boxes at 61 020 kg (Interwaste on-site solutions, 2016).

Documentary review showed that there are financial benefits from minimal recycling that is currently implemented at Carnival City as there is cash that is earned from retrieving the recyclables. Carnival City gets rebates for the recyclables retrieved on a monthly basis. These rebates indicate the value of waste materials ending in the landfills if recycling is not implemented (Sun International, 2015b).

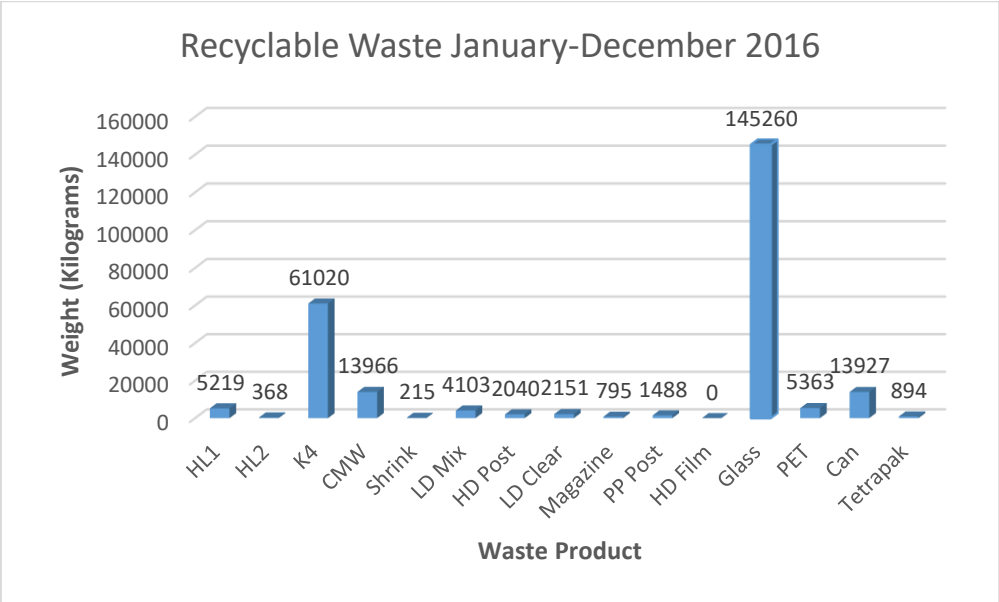

Figure 4. Recyclable waste

5.7 Energy Recovery

Energy recovery is the process of converting non-recyclable waste into fuel, heat or electricity (USEPA, 2017). Energy recovery follows recycling and precedes waste disposal in the waste hierarchy (Intech Open, 2011). Energy recovery is not directly Carnival City's initiative as it is implemented by Interwaste but it reduces Carnival City's carbon footprint. Dry non-recyclable waste from Carnival City used in the energy recovery process at Interwaste's refuse derived fuel (RDF) plant in Germiston (Figure 5), includes plastic, paper-backed foil, aluminium, polystyrene and multi-layered packaging. There are no rebates paid for the waste. Refuse-derived fuel is a fuel produced from various types of wastes with the aim to reduce quantities of waste sent to landfills. Interwaste is the first South African company to develop an RDF plant. The RDF process is a simple but an expensive two-step shredding process. The cost expenditure is the reason why majority of companies are still resorting to landfilling (Van Der Merwe, 2016).

Figure 5. Refuse-derived fuel plant at Interwaste recycling hub

5.8 Waste Disposal

Landfilling is the most traditional method of waste disposal and common practice in most countries worldwide (Taiwo et al., 2008). Waste is also disposed of at landfills in South Africa and there is limited space for waste disposal as South African landfills are reaching full capacity (Oelofse, Muswena & Koen, 2016). Most organisations are not concerned with environmental impacts from landfills (Radwan *et al*., 2012). Documentary review showed that 70% of waste generated at Carnival City is disposed of at Weltevreden landfill site in Brakpan on a monthly basis (Interwaste on-site solutions).

Carnival City' food waste and non-recyclables are put into the waste compactors for landfill site disposal. Observations revealed that more cooked food is wasted as meal left-overs. None of the food waste that is taken to Weltevreden landfill is composted. Organic waste dominates the quantity of waste dumped at Weltevreden landfill site yet its moisture content makes it more suitable for composting (Kadir, Azhari & Jamaludin, 2016). Food waste decomposition in landfills emits greenhouse gases such as methane and carbon dioxide, and results in environmental impacts such as soil, groundwater and air pollution (Lalonde, 2013).

6. CONCLUSION

Waste prevention, waste minimisation, reuse, recycling, energy recovery and waste disposal were found to be waste management practices implemented at Carnival City. The implementation of the waste hierarchy at Carnival City still needs improvement to ensure that more waste is diverted from the landfill sites. Carnival City diverts four of the five priority waste streams being glass, paper, plastic and cans from the landfills. Findings revealed that more than 70% of waste generated at Carnival City is still disposed of at the landfill on a monthly basis.

Recyclables that have been contaminated with wet waste at Carnival City are left with general waste for disposal at the landfill site. The progress made with waste separation at source was not encouraging and showed that economic benefits of moving up the waste management hierarchy are integral to meeting Sun International's commitment to zero waste to landfill. Current waste management practices need to be improved to ensure that more waste is diverted from the landfill sites. Separation at source policy, investment into waste-to-energy technologies and waste management training and awareness are recommended to help Carnival City to meet Sun International's commitment of "zero waste to landfills by 2020". With only two years left, more effort is needed and significant drastic measures be implemented to make the set goal attainable.

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