

**Green strategies for Health Care Waste Management in the healthcare facilities in Pietermaritzburg, KwaZulu-Natal province, South Africa: A stakeholder analysis.**

By

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**December 2022**

## **DECLARATION**

I hereby declare that this dissertation is entirely my original work unless otherwise indicated in the text. All citations, references, and borrowed ideas have been duly acknowledged. This dissertation has not been submitted to any other University for any degree or examination purposes.

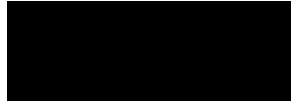
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## **DEDICATION**

To God my Almighty, to my loving family and my supportive partner for the sacrifices they made towards this academic journey.

## ABSTRACT

**Background:** Around 5.2 million people die each year from healthcare waste-related diseases worldwide, including 4 million children, and the amount of waste generated by health facilities is increasing, which is a cause for concern. Due to a growth in the number of healthcare facilities and the usage of disposable medical products, South Africa produces 45 000 tons of healthcare waste each year. Hence, there is a need for sustainable interventions to reduce medical waste. The aim of this study was to explore sustainable strategies that exist on healthcare waste management (HCWM) from stakeholders' perspectives.

**Methods:** Purposive sampling was used to recruit participants. Eleven participated in the study including waste officers, a hospital Chief Executive Officer (CEO), provincial healthcare waste coordinator, an environmental officer, an infection prevention control officer, and a healthcare waste Non-Governmental Organization (NGO) official. Semi-structured interviews were conducted using a semi-structured guide. Interview topics included the role of stakeholders in formulating policies, experiences on policy development, and sustainable strategies for HCWM. Audio recording was used and transcribed verbatim to isiZulu and translated into English.

**Findings:** Participants reported that recycling of papers is the only HCWM sustainable strategy that hospitals have which is still at the infant stage and faceted with challenges such as mixing of waste and no service providers to sort-out waste. This is further exacerbated by that there is no policy on general waste recycling. Furthermore, participants mentioned that hospitals are planning to use Global Green Healthy Hospital (GGHH) international network to support HCWM sustainable strategies. Lastly, participants stated South African government is not taking a leading role in encouraging waste reduction strategies.

**Conclusion:** Stakeholders agreed that, in general, the Department of Environmental Affairs (DEA) is the custodian of waste management policies, however, the Department of Health (DOH) is responsible for developing healthcare waste policies. Thus far, health facilities have adopted recycling of general waste which still runs on an ad hoc basis because there is no general waste policy. It was suggested that the GGHH initiative had the potential to provide technical support to DOH in reducing waste production, advocate

recycling and develop policies that promote green strategies. Interventions aimed at facilitating and supporting healthcare waste reduction are needed, more importantly, there is a need for government to develop policies at national, provincial, and local levels to guide sustainable strategies on HCWM.

**Keywords:** Health Care Waste Management (HCWM), South Africa, Medical waste, green strategies

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## **Chapter One**

### **Introduction**

#### **1.1 Background of the study**

Health Care Waste (HCW) can be defined as all waste produced in healthcare facilities which is related to administration operations and medical procedures (Olaniyi, Ogola, and Tshitangano, 2018). Therefore, health care waste can be categorised as general waste and health care risk waste (Chartier, Emmanuel, Pieper, 2014). General waste is produced in health care facilities during administrative work, and it is non-infectious. Examples include papers, metal, glasses, food waste, plastics etc. while health care risk waste which is sometimes referred to medical waste, biomedical waste or clinical waste is produced in the health care facilities while performing medical treatment or medical scientific research and it grouped as infectious (Chartier, Emmanuel, Pieper, 2014). In South Africa, the overall health care risk waste generated is approximately 40 000 tons to 45 000 per year, and of the 45 000 tons of the health care risk waste, 2 500 to 4 500 is infectious (Olaniyi et al, 2018).

Health Care Waste Management (HCWM) is defined as all administrative and operational events involved in the handling, storage, transportation, and treatment, this includes recovery and recycling of health care general waste (Standards South Africa, 2008). HCWM is a strategic method meant to effectively handle and process HCW to reduce its effects on occupational safety, public and environmental health (Caniato, Tudor, and Vaccari, 2015). HCWM management forms an integral part of 17 sustainable development goals, by that it promotes the safeguarding of healthcare waste effects against occupational safety, public and environmental health.

Sustainable HCWM can be defined as a health care waste strategic plan that seeks to introduce means of preventing high rates of waste production through proper separation of general waste from health care risk waste for recycling and designing products that are eco-friendly and which in turn can minimise waste in health care facilities (The Global

Fund, 2020). This helps in reducing the use of materials that would normally result in surplus waste which cannot be reused or be recycled. Moreover, sustainable HCWM in the health care sector has been proposed as having the potential to promote environmental health while transforming the economy and social welfare of the public (Department of Forestry, Fisheries and the Environment, 2020). However, most low- and middle-income countries (LMICs) countries do not have adequate funding for this approach and as a result they lack secure and reliable infrastructure for sustainable HCWM (Azmal, Kalhor, R., Dehcheshmeh, Goharinezhad, Heidari,. and Farzianpour, 2014).

South Africa has insufficient capacity to treat the amount of health care risk waste produced which also results in illegal dumping (Olaniyi et al, 2018). Furthermore, lack of training for waste generators working in hospitals and clinics, especially the medical practitioners, waste collectors and transporters, results in improper separation and handling of waste from the point of generation to the disposal stage. According to Olaniyi et al, 2018 in South Africa there is a lack of communication between Department of Environmental Affairs and the Department of Health, in national, provincial, and municipal authorities tasked with developing policies to manage HCW, this is seen with non-uniform standards for HCWM at a national, provincial, and municipal level. Furthermore, the lack of uniform standards with regards to offering tenders for service providers dealing with health care risk waste has been a challenge.

There have been calls around the world for health care facilities to become a sustainable environment through waste reduction energy and resource conservation (Azmal et al, 2014). Agencies such as the World Health Organisation (WHO) and the World Bank have developed a document known as Blue Book which acts as a guiding document for sustainable HCWM particularly for the LMICs (Chartier, 2014, Caniato et al., 2015). South Africa is part of these international conventions and has therefore put in place policies that govern HCWM. These policies include, the National Environmental Management Act, Environment Conservative act, Hazardous Substances act, National Health Act and the HCWM policy (KZN health, 2008). The main stakeholders in the HCWM sector in South Africa are the Department of Health, Department of Environmental Affairs, Department of

Science and Technology, a non-governmental organisation (NGO) called the Groundwork, and a healthcare risk waste company called Compass Waste, responsible for health care risk waste treatment and disposal in KwaZulu-Natal province. This study, therefore, explored the sustainable health care waste management strategies used by healthcare facilities in Pietermaritzburg, KwaZulu-Natal province. The position and influence of stakeholders in the formation of sustainable HCWM strategies for healthcare facilities in South Africa was also explored.

### **1.2 The problem statement.**

Literature on HCWM in South Africa shows that there are challenges with HCWM, ranging from lack of training of waste generators to lack of adequate policies and insufficient capacity to treat the amount of HCW that is produced in the country (Olaniyi et al, 2018). Despite having the Department of Health, Department of Environmental Affairs and Tourism, Department of Science and Technology and the NGO, Groundwork as stakeholders in the HCWM sector, there is a lack of literature on the exact sustainable strategies that exist for HCWM in South Africa. This study, therefore, explored the sustainable health care waste management strategies used by healthcare facilities in Pietermaritzburg, KwaZulu-Natal province. The position and influence of stakeholders in the formation of sustainable HCWM strategies for healthcare facilities in South Africa was also explored.

### **1.3 Significance of the study**

Understanding the sustainable health care waste management practices as well as the position and influence of stakeholders in the formation of sustainable HCWM strategies for healthcare facilities in KwaZulu-Natal province helped to gain more insights on the types of sustainable/green strategies that are available in the HCWM sector. It also assisted in understanding the enabling components that permit sustainable HCWM policies in the country. The available insights from this study will help in building consensus and effective communication among all stakeholders involved. Findings from this study can be used by policy actors in advocacy for holistic efforts in creating uniform

standards for sustainable HCWM strategies in South Africa. Findings can also help in solving the HCWM problems and to help stakeholders to develop initiatives towards sustainable HCWM as a way of greening the economy in South Africa.

#### **1.4. Aim of the study**

To explore the sustainable health care waste management strategies used by healthcare facilities in Pietermaritzburg, KwaZulu-Natal province.

#### **1.5 Objectives**

1. To explore the sustainable strategies that exist FOR HCWM in healthcare facilities in the city of Pietermaritzburg under uMgungundlovu district from the stakeholder's perspectives.
2. To explore the stakeholder's experiences in the development of sustainable strategies for HCWM in healthcare facilities within the city of Pietermaritzburg under uMgungundlovu district from the stakeholder's perspectives.
3. To explore the stakeholder's level of influence in developing sustainable HCWM strategies in the City of Pietermaritzburg under uMgungundlovu district from the stakeholder's perspectives.

#### **1.6 Research Questions**

1. What are the green strategies that exist for health care waste management in the city of uMgungundlovu district from the stakeholder's perspectives?
2. What are the stakeholders' positions and level of influence in developing sustainable health care waste management strategies in the city of Pietermaritzburg under uMgungundlovu district?
3. What are the stakeholders' experiences in the development of sustainable health care waste management in the city of Pietermaritzburg under uMgungundlovu district?

## **1.7. Chapters outline.**

CHAPTER ONE: Introduces the study and provides an outline of the content to expect in the body. It gives a highlight on the methodology used to collect and analyze data, the study's main aim, research questions, the problem statement as well as the significance of the study, ending with a short summary of the chapter.

CHAPTER TWO: this is a review of literature. It includes local, national, and international peer-reviewed articles, different forms of publications including abstracts, dissertations, newspapers as well as media information.

CHAPTER THREE: This chapter is the Theoretical Framework. It develops and integrates the Ecological Systems Theory which aids in the analysis of the data and discussion of results in the study.

CHAPTER FOUR: this chapter comprises the method and methodologies utilized in the study. It describes and justifies the adoption and use of qualitative method and the descriptive design, the sample and sampling strategies used as well as the type of data collection method used. The chapter includes a section as well on the ethical consideration for the study, the limitations and ends with a short conclusion.

CHAPTER FIVE: In this section, the researcher presents the results. The presentation is in a qualitative form with quotes that are interpreted by the research to make more sense to the reader.

CHAPTER SIX: Presents to discussion of findings. In doing so, the researcher uses secondary literature to support some arguments advanced by the participants in the study.

CHAPTER SEVEN: This is the conclusion and recommendations based on the findings from the literature review, theory and approach used in the study, and altogether shaping the results. This section comes as an instinct summary to the entire dissertation.

## **1.8 Conclusion**

This chapter introduces the study, it provides the background of the study topic. It also provides a brief literature review of healthcare waste management practices in South Africa, a problem statement that highlights the importance of conducting this study, as well as the main objectives and research questions of the study. The next chapter will provide a broad understanding of existing literature relevant to the study topic.

## **Chapter Two**

### **Literature review**

#### **2.1 Introduction**

This chapter provides the state of knowledge with regards to the key-concepts used in this study namely, sustainable strategies and health care waste management (HCWM) from a global and South African point of view. The importance of this chapter is to provide the research context and illustrate how the current study relates to previous research conducted on sustainable strategies and HCWM. The chapter highlights the gaps in the field and provides a holistic view of the subject area.

#### **2.2 Literature review search strategies**

The researcher used Google Scholar to find research publications, and Google was used to find policy documents under the government organization domains. Furthermore, papers and textbooks from reputable health websites that contained important information on the area of interest were used. Other research papers were found using databases registered with the University of KwaZulu Natal library site (EBSCOhost, A-Z

Publication Finder, JSTOR, and so on). The following key terms were used to find articles that were relevant to the topic: *green strategies, health care, waste management and South Africa.*

### **2.3 Definitions of waste health care**

According to the Health Profession Council of South Africa (HPCSA) (HPCSA, 2016) guidelines for good practice and good management of health care waste, Health Care Waste refers to *“any undesirable or superfluous by-product, emission, residue or remainder generated by in the course of health care by healthcare professionals, healthcare facilities and other non-healthcare professionals, which is discarded, accumulated and stored with the purpose of eventually discarding it, or is stored with the purpose of recycling, re-using or extracting a usable product from such matter.”* The definition highlights that there are two types of waste produced in health facilities, this is general waste and health care risk waste. General waste is largely produced by the administrative functions in the healthcare facilities (Azmal et al, 2014). General waste is categorized as non-infectious, and according to WHO, 85% of waste generated in healthcare facilities is general waste (Padmanabhan and Barik, 2019, WHO 2018). Furthermore, Ghasemi and Yusuff (2016), define general waste as non-hazardous solid waste which includes among others, paper, cardboard, food waste, metal, glass, and plastic. However, when general waste is mixed with infectious waste it becomes hazardous and needs to be treated and disposed of as infectious waste (Du Toit and Bodenstein, 2014). In a recent study conducted in South Africa by Olaniyi et al, (2018), it was reported that improper waste segregation from the point of generation is common in South Africa and has led to mixing of general and healthcare risk waste (HCRW). Contact with HCRW can cause infectious disease or harm to people and animals, and it can contaminate the environment with microbes and non-eco-friendly materials, posing serious harm to both (Khobragade, 2019).

### **2.4 Health Care Risk Waste (HCRW)**

The terminology health care risk waste (HCRW) varies greatly in the literature as it is sometimes referred to as medical waste, biomedical waste, or clinical waste (Chudasama, Rangoonwala, Sheth, Misra, Kadri, and Patel, (2013); Jansen, Kocks, and

Roberts, 2017). However, for the purpose of this study, HCRW will be used. HCRW is defined as the materials generated while performing health practices such as medical treatment or medical scientific research (Masimula and Senekane, 2020). Khobragade (2019) categorized HCRW into the following groups:

#### **2.4.1 *Infectious waste***

This refers to waste that comes from health care facilities, which contains disease causing organisms or their toxins in sufficient concentration to cause diseases to people who come in contact with the waste (Makajic-Nikolic, Petrovic, Belic, Rokvic, Radakovic, and Tubic, (2016); Oli, Ekejindu, Adje, Ezeobi, Ejiofor, Ibeh, and Ubajaka,, 2016). Infectious waste includes all the discarded materials or equipment, which is used by health care professionals in the prevention, diagnosis, and treatment of disease (Miyazaki and Une, 2005). This waste becomes infectious when it is in contact with body fluids of patients such as urine, mucus, pus, saliva, blood, and swabs (Kumar et al., 2015). It is therefore important that infectious waste is treated with care from the point of generation, as it poses health risks to patients, hospital staff and the environment (Olaniyi et al 2018).

South Africa is reported to have poor handling and processing of HCRW in the health facilities (Olaniyi et al, 2018). Most importantly, South Africa is reported to generate 40 000 tons to 45 000 tons of HCRW annually and 2 500 to 4 500 ton is considered to have the potential for creating several environmental, health and safety risks (Schenck, 2019). Therefore, the practice of HCRW management needs to be strengthened with strategies that consider sustainable development.

#### **2.4.2 *Pathological and anatomical waste***

Pathological waste refers to the waste products containing human organs, tissues, or fluids for such as blood (Dias-Teixeira, Domingues, Dias-Teixeira, Teles, and Delerue-Matos, 2016). Pathological waste can be further divided into another group called anatomical waste. This type of waste comprises infected or uninfected recognizable human body parts. Pathological and anatomical waste should be considered as potential infectious waste and should not be carelessly disposed (Jansen, Kocks, and Roberts,

2018).

#### **2.4.3 *Pharmaceutical waste***

This includes medical supplies that are not used, those that have expired, spilt, and contaminated, for example, vaccines and other drugs (Smith, 2002). Other discarded materials used in the handling of these medical supplies are also included under pharmaceutical waste for example tubes, vials, and others (Sanborn, McGee, Macdonell, and Kosch, Clear River Enviro, 2018).

#### **2.4.4 *Health facility chemical waste***

According to Ali et al. (2017), health facility waste carries chemicals that are produced while performing medical procedures. This type of waste can be in liquid, solid or in a form of a gas. Chemical waste may be very hazardous because it is poisonous, corrosive, and flammable (Inamullah, Memon, and Azizullah Channa, 2018). It is imperative to ensure that all chemical waste is disposed precisely as indicated on the containers (Adeoye and Lateef, 2018).

#### **2.4.5 *Heavy metal waste***

This refers to waste which contains heavy metals, for instance, chromium, lead, mercury, arsenic, and their products which could also be highly toxic (Liu, Liu, Wei, Zhang, and Zang, 2017). They are regarded as a sub-group of health facility chemical waste and they should be treated with caution, as they are highly toxic nature (Banerjee., Hazra, Ghosh, Ganguly, Murmu, and Chatterjee, 2019).

#### **2.4.6 *Waste from pressurized containers***

Many medical supplies and surgical aids are packed and delivered using pressurized containers (Abdulla et al 2008). Health care waste includes containers with pressurized liquids, gas or powdered solid materials (El-Salam, 2010). These pose a significant risk as

they contain propellants which can be highly toxic and should be disposed with caution.

#### **2.4.7 Sharps**

This category includes waste that can cause cuts, wounds on the human body (Matee and Manyele, 2016). Examples of these includes razor blades, needles, syringes, broken vials, tubes etc. (Blenkharn, 2014). It does not matter whether they are infected or not because they are regarded as very dangerous and have the potential to cause injury or infection (Oli Ekejindu, Adje, Ezeobi, Ejiofor, Ibeh, and Ubajaka, 2016). They must be handled with utmost caution to ensure the safety of the health care professionals, patients as well as the public (Aghapour Nabizadeh, Nouri, Monavari, and Yaghmaeian 2013).

#### **2.4.8 Highly infectious waste**

This refers to microbial cultures and stocks of infectious materials, usually from the laboratory (Joseph et al., 2015). This type of waste is normally liquid waste from people with highly infectious diseases and ought to be handled or disposed with caution (Makajic-Nikolic et al., 2016).

#### **2.4.9 Genotoxic and cytotoxic waste**

This type of waste is normally generated from drugs used in the treatment of cancer or radiotherapy units (Masood and Malik, 2013). It has a high potential to cause mutations and affects cells within the human body (Chartier, 2014). Waste which includes residues from these cancer drugs, feces, vomit, or urine from patients taking cancer drugs or chemicals, as well as radioactive materials and is referred to as genotoxic (). Proper disposal of this waste should be dealt with cautiously.

#### **2.4.10 Radioactive waste**

According to Peterson et al. (2018), radioactive waste contains radioactive material which emit ionizing radiations having genotoxic effects and this could be in solid, liquid, or gaseous state. In health care facilities where radiation therapy takes place, medical equipment is normally contaminated with trace amounts of certain isotopes, clothes, the actual radiation source for example a cobalt block (Banerjee and Mitra, 2013). Radioactive waste has the potential to cause genetic mutations and requires specialized waste management processes (Acharya v Gokhale, and Joshi, 2014; Awodele, Adewoye,

and Oparah, 2016).

## **2.5 Health Care Waste Management**

Health Care Waste Management (HCWM) is the proper management of all types of waste from the point of waste generation, segregation, transportation, storage, treatment, and final disposal in the health care facilities (Wafula Musiime, and Oporia, 2019). Inadequate HCWM in health care facilities can usually be attributed to a lack of policies and regulations governing the process of the collection of waste and the on-site transport to a temporary storage location (Debere Gelaye, Alando, and Trifa, 2013). Other causes of poor HCWM have been attributed to lack of proper waste treatment and disposal of HCRW and insufficient training of personnel (Olaniyi et al,2018). Yet another reason for poor HCWM has been identified as insufficient personal protective equipment and lack of knowledge about the proper use of such equipment (Collins, 2008).

### **2.5.1 Sustainable strategies and Health Care Waste management**

Health care facilities have hitherto been the central point of social systems identity; therefore, they can be referred to the *"mirror of the community"* (Kamath et al., 2019). Globally, health care facilities have been perceived as one of the main sources of contamination; unintentionally putting the general populace at risk of infection (Septimus et al., 2014). *"Sustainable strategies in health care facilities,"* are now recognized as the mainstay in addressing environmental challenges and meeting community needs in health-related matters (Suwasono et al, 2013; Azmal et al., 2016). In this approach, all the environmental aspects of waste management are important and must be addressed. This implies that administrators in health care facilities and stakeholders in the HCWM sector have a critical role in the management of wastes disposal without impacting the environment (Voudrias, 2018).

Sustainable strategies entail the continuous upgrading of public health by reducing environmental impacts and ultimately eliminating health facility roles in the burden of disease (Dhillon and Kaur, 2015). Sustainable strategies recognize the link between

human health and the environment, implying that we could understand it only through governance, strategy, and its operations (Hampton, 2007). Sustainable strategies also bridge the gap between local needs and environmental initiatives and primary prevention methods through involvement in community and environmental health and justice in health (Kasemsap, 2017).

### ***2.5.2 A global perspective on green strategies and health Care waste management***

Globally, management of Health Care Waste (HCW) has received attention. Datta et al, (2018), conducted a study in India, and found that around 82% of primary, 60% of secondary, and 54% of tertiary health care facilities had no credible HCW management systems. It was reported that in 2009, approximately 240 people in India had been infected by hepatitis B after reuse of syringes which were not sterilized (Seetharam, 2009). Several studies (Deepika, 2019; Saha, and Bhattacharjya, 2019; Anand et al, 2016) conducted in India which show that the country has a dire need to start initiatives for reinforcing the existing systems toward safe disposal health care waste.

In terms of sustainable strategies adopted, the green supply chain management (GSCM) has been extensively implemented by different sectors in India with the aim of decreasing waste and maintaining the quality of product-life and the country's natural resources (Govindan et al., 2016). The inception of GSCM is regarded as a paramount invention that helps various sectors develop "win-win" sustainable strategies (Luthra Garg, and Haleem, 2015). Through the reduction of environmental risks and impacts, along with raising the ecological efficiency, different sectors can realize revenue and market share goals (Gandhi Mangla, Kumar, and Kumar 2015).

China is grappling with significant challenges related to the management of health care waste (Zhang et al., 2013). According to Gao et al. (2018), annually China's health system generates approximately 650,000 tons of health care waste. Gao et al. (2018) adds that the amount of health care waste generated annually is growing at the rate of approximately 20% and this is mainly in rural areas. In response to this, China has been implementing several national regulations that seek to address the control of health care

waste (Zhang, Wang, Yang, Zhang, Wang, and Wang 2013). These regulations seek to reduce infectious diseases that are linked to general waste as well as health care waste. There are regulations in place with regards to the management of different types of health care waste in China (Ruoyan, Lingzhong, Huijuan, Chengchao, Jiangjiang, Yoshihisa, Wei, and Chushi 2010). However, regardless of these regulations there is no evidence of compliance, making it difficult to really understand how health care waste is managed in China (Gao et al., 2018).

Cetrulo et al. (2018) conducted a study in Brazil where they were evaluating the infectious waste management. It was reported that health care facilities were inappropriately adopting waste management practices, for instance the storage of infectious waste, transportation, treatment, and disposal (Cetrulo et al., 2018). Even though Brazil has well-established regulations regarding health care waste management, the regulations address the issues of management and disposal of waste in the country. However effective implementation must be enabled to guarantee that the environment is protected (Moreira and Günther, 2013) as there has been situations where waste has been randomly disposed posing as a risk health factor.

### ***2.5.3 Sustainable strategies and health care waste management in Sub-Saharan Africa***

There is significant challenge of health care waste management in sub-saharan Africa (Doumtsop, 2014). HCWM also continues to be a major challenge, particularly in most healthcare facilities in Sub-Saharan countries due to technological, economic, social challenges and poor training of personnel responsible for HCWM (Rothe et al 2013). Communities are thus exposed to infections due to inappropriate management and disposal methods of health care waste in Sub-Saharan Africa (Dzekashu et al., 2016). A study by Wafula et al, (2019), in Uganda reported that there is lack of training when it comes to waste management in Uganda. The study thus recommended that there is need to organize HCWM training to improve waste management practices in health facilities (Wafula et al, 2019).

Udofia et al, (2015), also conducted a survey in the region and reported that there is lack of periodic trainings of health care staff responsible for the handling and management of health care waste. Most Sub-Saharan countries commonly use incineration, which was in some cases not working properly, causing serious air pollution (Udofia et al 2015). Salam (2010) conducted a study in Damanhour city of El Beheira, Egypt on waste management also reported that incineration was being used to get rid of waste and they indicated that this old method was an ineffective way of disposing waste. Furthermore, in a study conducted in Southeast Nigeria to assess healthcare workers' involvement in healthcare waste management in public and private hospitals, Oli et al (2015) reported poor waste management was as a result of lack of involvement of healthcare workers in the all the waste management processes.

#### ***2.5.4 Policy Acts and Guidelines on HCWM in South Africa***

There are number of national policies and guidelines in South Africa that guide the management of health care waste. These include the (1) National Environment Management act, 1998 (107 of 1998) which focuses its efforts on shifting towards an approach that encourages the combination of waste minimization and waste prevention, and as a last resort, manage the impact of waste by treating, destroying and/ disposing of the waste and remediating the polluted environment (KZN health, 2008), (2) Environmental Conservation act, 1989 (act 79 of 1989), which sets the standards of disposal by landfills, the handling, classification and disposal of hazardous waste, and water monitoring at waste management facilities (KwaZulu Natal health, 2008), (3) Hazardous Substance act, 1973 (act 15 of 1973) provides for the control of hazardous substances that might cause injury or ill health to or death of human beings and cause harm to the environment due to their toxic, corrosive, and irritant nature (KZN health, 2008), (4) National Health act 2003 (act 61 of 2003) provides that a minister must regulate the disposal of human bodies and tissue as well as blood and related substances. Therefore, this shows that South Africa has been progressive in establishing legal frameworks regulating HCWM, although cohesion among these policies remain unknown and unexplored.

Health Care Waste Management (HCWM) in South Africa is governed and shaped by many stakeholders, this includes World Health Organization (Hangulu and Akintola, 2017), which informs the country's regulatory framework, planning issues, waste minimization and recycling, handling, storage and transportation, treatment and disposal options, and training. The Department of Health as a generator of Health Care Risk Waste (HCRW), is legally responsible and liable for the management of HCRW from generation to disposal. The Department of Environmental Affairs and the Department of Tourism, which are ultimately responsible for ensuring that the National Environmental Management Waste Act (NEMWA) is implemented and that the various provisions are harnessed in the most appropriate and effective way possible (Ceronio, 2019) and Groundwork, a civil society organization which is committed to the process of reducing the impact of health care waste and incineration and the potential impacts that it poses towards enhancing a sustainable society (Groundwork, 2022). Thus far, consensus between these stakeholders in advocating efforts towards sustainable HCWM remain unexplored. The two departments were separated in 2009 during the reign of President Jacob Zuma. Instead of heaving one department (Environmental affairs and tourism-DEAT), they were separated to make the two different ones cited above.

Non-governmental organizations are playing a crucial role in HCWM with more emphasis on developing sustainable HCWM. NGOs have shown leadership in promoting sustainable community development, particularly in LMICs. Furthermore, NGOs were regarded as effective when it comes to carrying out projects more efficiently and at lower costs than Government agencies and, most importantly, they do so by engaging on initiatives that promote sustainable development (UN Agenda 21). In South Africa, Groundwork as a civil society organization has been one of the key NGOs that is advocating efforts of sustainable HCWM.

Health care facilities outsource their HCWM to a lot of companies in the country. ClinX Waste Management is one of the companies in the Health Care Risk Waste industry that offer their service for waste management in various health related facilities such as Hospitals, Clinics, Medical and Traditional Doctors, Hospices, Laboratories, Nursery and

Day-care Centers, Funeral Parlours and Private Companies (Hangulu and Akintola, 2017). Vikela Afrika Waste Care is a young and dynamic company in South Africa which has been formed with individuals who have vast experience in the Medical Waste business. They offer their services to government and private health care facilities. Wasteman is a waste management established company which has been in operation for over 35 years offering their services across various key industries such as the health care, municipal, automotive, mining and petrochemicals sectors, to name a few. In Gauteng Province, South Africa Compass waste services is also an established company offering HCWM services to various facilities. Waste Xpress also offers HCWM services to various facilities in private and government health care for all categories of health care risk waste.

However, problems with the outsourcing of HCWM to private companies have been reported (News24, 2011) As government departments outsourced risk waste management services, they lacked common standards for risk waste tender specifications and the desire to enforce them. According to News 24 (2011), this has led in heated competition amongst organizations hired to dispose such waste, this as a result have created frightening criminal acts that have harmed people and the environment. This has added to the burden of challenges in the HCWM sector which involves a multitude of stakeholders, showing signs of competing interests and agendas and several policies with no cohesion. This study seeks to determine the involvement of stakeholders in HCWM issues because they are regarded as fundamental people towards achieving sustainable HCWM.

### ***2.5.5 Health Care Waste Management in South Africa***

In South Africa, there is paucity of literature related to systematic and comprehensive management of health care. It is in recent times that studies relating to health care waste management in low-income countries have been published (Ferronato and Torretta, 2019). This is due to the growing burden caused by improper management of healthcare waste on environmental health and to the human health (Olaniyi et al, 2018).

In a study conducted by Semenya (2016), assessing management of health care waste in private medical facilities in Pretoria South Africa, it was found that from the point of generation; it is the responsibility of waste generators to oversee all stages of waste in an environmentally and responsible manner. This should be done in reference to appropriate legislations, regulations, and procedures. Semenya (2016) recommended that for effective HCWM, waste generated should be measured to know what kind of waste is generated more than the other.

Furthermore, a systematic review of scientific literature on global HCWM that aimed to identify key policies, practices, challenges, and best practices found that first factors to consider when improving the governance structures for HCWM in any country are national strategy, appropriate regulations, and policies (Caniato et al, 2015). Moreover, Caniato et al (2015) found that the involvement and commitment of government at a national level is fundamental, as well as creating regular systems for effective inspections and monitoring to ensure that procedures are implemented effectively, and staffs are kept focused. Caniato et al (2015) established those global efforts should be dedicated in ending the relationship between economic resources and healthcare waste management through the development of new and sustainable healthcare waste management systems.

In a study using structured interview and observations conducted by Mahasa and Ruhiiga (2014) in Northern East Free State of South Africa to describe the current state of operational procedures regarding the handling of medical waste on the awareness of any legislation relating to hospital waste management. Mahasa and Ruhiiga (2014) found that 77.5 percent of respondents said they were unaware of any legislation relating to hospital waste management, while 22.5 percent said they were. Of those who were aware of the legislation controlling hospital waste management, 15.9% correctly identified the relevant legislation as the National Environmental Management Act (NEMA) of 2007, 6.5 percent were unsure, and 77.5 percent did not respond. According to Mahasa and Ruhiiga (2014), the operational practices of medical facilities in the area lack a clear medical waste management policy. There appeared to be no clear protocol in place for managing

medical waste, according to the findings. Despite of the guidelines that have been provided by Department of Environmental Affairs and other stakeholders such as Medical Research Council, there is no defined policy or plan in place for procuring the essential equipment and providing the facilities with proper medical waste management (Mahasa and Ruhiiga, 2014). Therefore, Mahasa and Ruhiiga (2014) recommended that the Department of Health should exercise greater and more active control and regulation over the management of medical waste.

#### ***2.5.6 Green strategies in health care waste management in South Africa***

Health care waste management has been recognized as one of the sectors that can contribute largely to the implementation of sustainable development in the health care sector (Ferronato and Torretta, 2019). This can be achieved through the implementation of sustainable waste management strategies. Such strategies should encourage low carbon creation and a recyclable economy, whereby the generation of waste and harmful substances is minimized, and maximization of utilizable, recycled and recovery processes to avoid damage on environment and human health (Higgs and Hill, 2019). However, Higgs and Hill (2019) note that the current health waste management practices vary in the globe with the LMICs still struggling to implement appropriately. Furthermore, there are still many challenges experienced in the waste management sector which among others include: funding and capacity to handle infectious waste (Nemathaga et al, 2008). Although policy stimulation has been strengthening in the waste sector, much development must be done, and funding is still needed for development of infrastructure, equipment, and provision of services (UN-Habitat, 2014).

South Africa is committed to sustainable development through practices that encourage green stimulus packages such as sustainable HCWM practice (Jansen et al, 2017). The South African HCWM focuses on raw material use, product design, resource efficiency, waste prevention and/or minimization (Godfrey and Oelofse, 2017). This has given birth to what is known as green strategies aiming at introducing initiatives that seek to minimize waste through nature conservation and ensuring safety on human health.

Health care waste is regarded as the significant source of pollution, and health care waste and its substances have been globally categorized as hazardous to the environment and human health (Shi et al., 2017). According to Azmal et al (2014), health care waste puts more than half of the world's population at risk of health effects. Therefore, this has made necessity around the world for health care facilities to become a sustainable environment (Kamath et al., 2019). Negligence of health care waste is among the many challenges associated with HCWM in the health sector particularly in the low- and middle-income countries (LMICs) (Udofia and Nriagu, 2013). Lack of data in waste generation and its characteristics is another challenge that has made it difficult for health facilities to make appropriate management solutions that are sustainable overtime (Caniato et al., 2015). According to Nwachukwu et al, (2013) lack of national legislature that stipulate guidelines is another challenge that exacerbates the challenges in healthcare waste management in LMICs. There is also an increase in waste generation and resource consumption as there is poor attention dedicated to waste minimization and pollution prevention in the health care sector (Nwachukwu et al, 2013).

## **2.6 Conclusion**

The chapter provided the state of knowledge regarding green waste management strategies from a global, regional as well as South African perspective. It also gave an overview of what the government of South Africa is doing in terms of addressing the challenges associated with the management of health care waste. The purpose of the chapter was to set the research backdrop and demonstrate how the current study fit into the larger scheme of studies on the study's core ideas. The following chapter will be a description of the theoretical approach that was adopted for this study.

## **CHAPTER THREE**

### **Theoretical Approach**

#### **3.1 Introduction**

The purpose of a theoretical framework is to provide a structure that supports the theory of a study. It provides the motivation as to why a study is conducted and the purpose it serves (Osanloo and Grant, 2016). This study adopted by the ecological systems theory by Bronfenbrenner to describe waste management from a socio-ecological perspective. This chapter will provide an overview of this theory and how it has been applied in other disciplines as well as to this study. Its connection to the literature review and

#### **3.2 The ecological systems theory**

Bronfenbrenner's ecological systems (1974) framework was developed to study human development. Bronfenbrenner (1974) argues that for science to provide vitality and valid facts on social policy and human development, researchers need to engage in ecological approaches which put emphasis on the additional importance of relations between the systems that a person interacts with. During Bronfenbrenner's time, existing theoretical

models in human development typically and solely focused on one-person system, which are processes occurring within a single setting (Bronfenbrenner, 1974). The problem with this orientation was not about validity or vitality but that attention was limited to the direct effect of A and B, with less interest in the possibilities of examining how A and B interactions can be influenced by a third party (Bronfenbrenner, 1977). Bronfenbrenner referred to this as second-order effect (Bronfenbrenner, 1977).

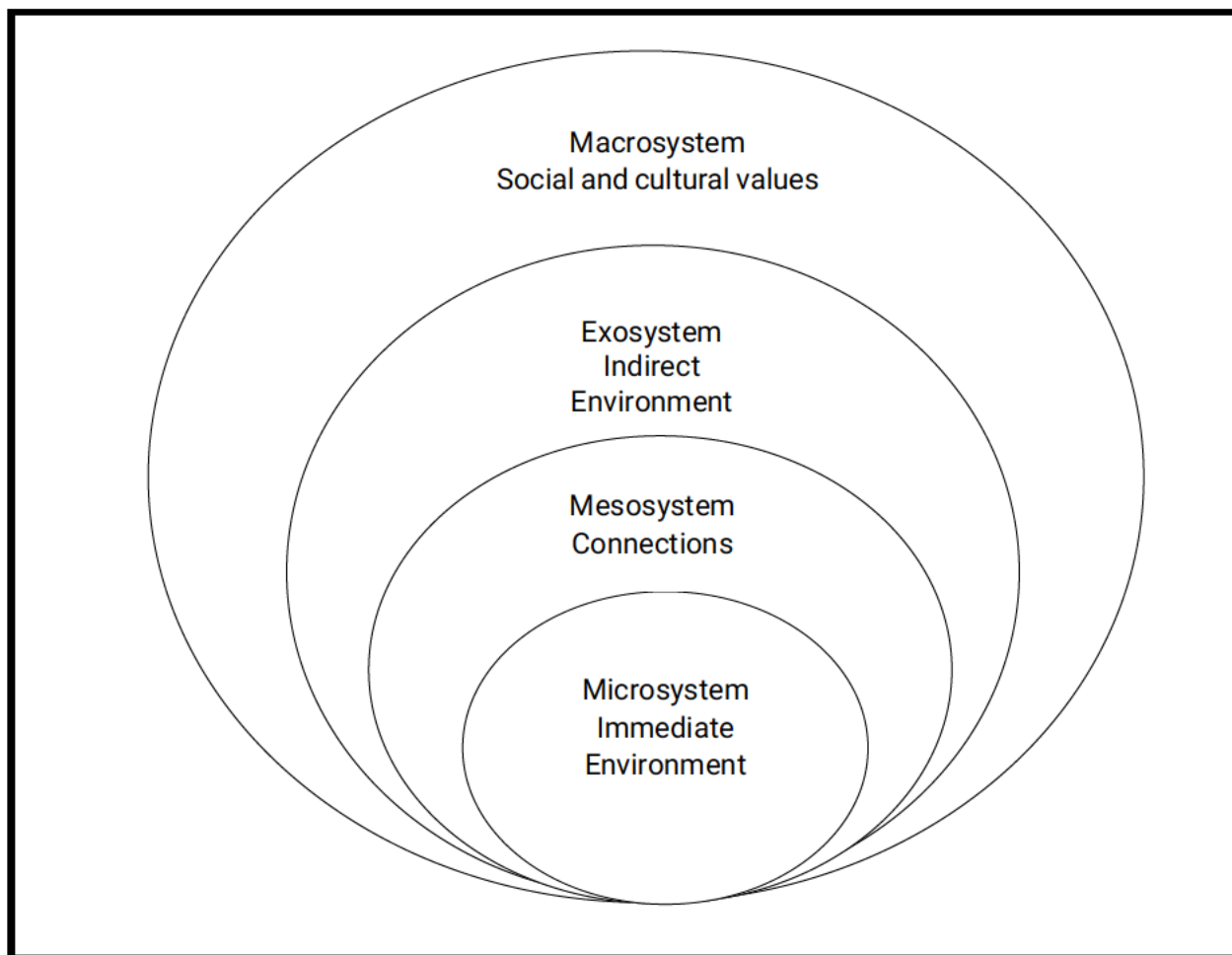
Systems which involve only two people can be challenged because they are premised on the assumption that they exist in isolation from any other social contexts that could have a direct effect on them (Marshall and Farahbakhsh, 2013). This does not only hinder rich knowledge creation on the scientific field but also limits the scope in which research can provide to social policy which might lead to policy restructuring that may have an enormous potential in human development (Onwuegbuzie Collins, and Frels, 2013). Therefore, if much involvement can be dedicated in the ecological approach, it can help in understanding the interaction between two phenomena and understand the why the interaction happens in other ways, focusing on the root cause of the matter by going beyond the surface (Onwuegbuzie Collins, and Frels, 2013).

### **3.3 How the ecological systems theory has been applied to other disciplines.**

Bronfenbrenner's ecological systems theory has been used in other disciplines for example, in health promotion. Health promotion practitioners have used it in the designing of interventions targeted at changing public health policies at various levels that is, individual, relationship, community, or societal level. This theory has been applied in other studies which include Child mental-health policy development in sub-Saharan Africa by Atilola (2014), understanding suicide among sexual youth in America by Hong et al, (2011) and Health education from an ecological perspective by Cala and Soriano (2014). The theory explores the association between individual and contextual factors and in health promotion; *health* is regarded the product of multiple levels of influence. The ecological system has four levels of influence which include: micro-system, meso-system, exo-system, and macro- system (Bronfenbrenner, 1974). Figure 1 shows the

ecological theory for human development by Bronfenbrenner.

The micro-system, according to Bronfenbrenner (1974), is where the individual belongs, and it consists of the individual's influences. These influences originate from the individual's family, friends, and surroundings, and these are referred to as the social agents. There is direct interaction between the individual and the social agents, and an individual's behaviour is either positively or negatively influenced. The social agents belong to the meso- system and this is related to the micro-system where the family experiences are related to the peers' experiences, and the peers' experiences to the neighbourhood experiences (Caniato, Tudor and Vaccari, 2015). Organisations belong to the exo-system. This can also affect an individual's life positively or negatively and vice-versa. Finally, the macro-system is basically a description of the nation that is., the culture within the nation where the individuals live (Chifari et al., 2018). This level also includes developing and industrialised countries' socio-economic status, poverty, and ethnicity (Janmaimool, 2017).



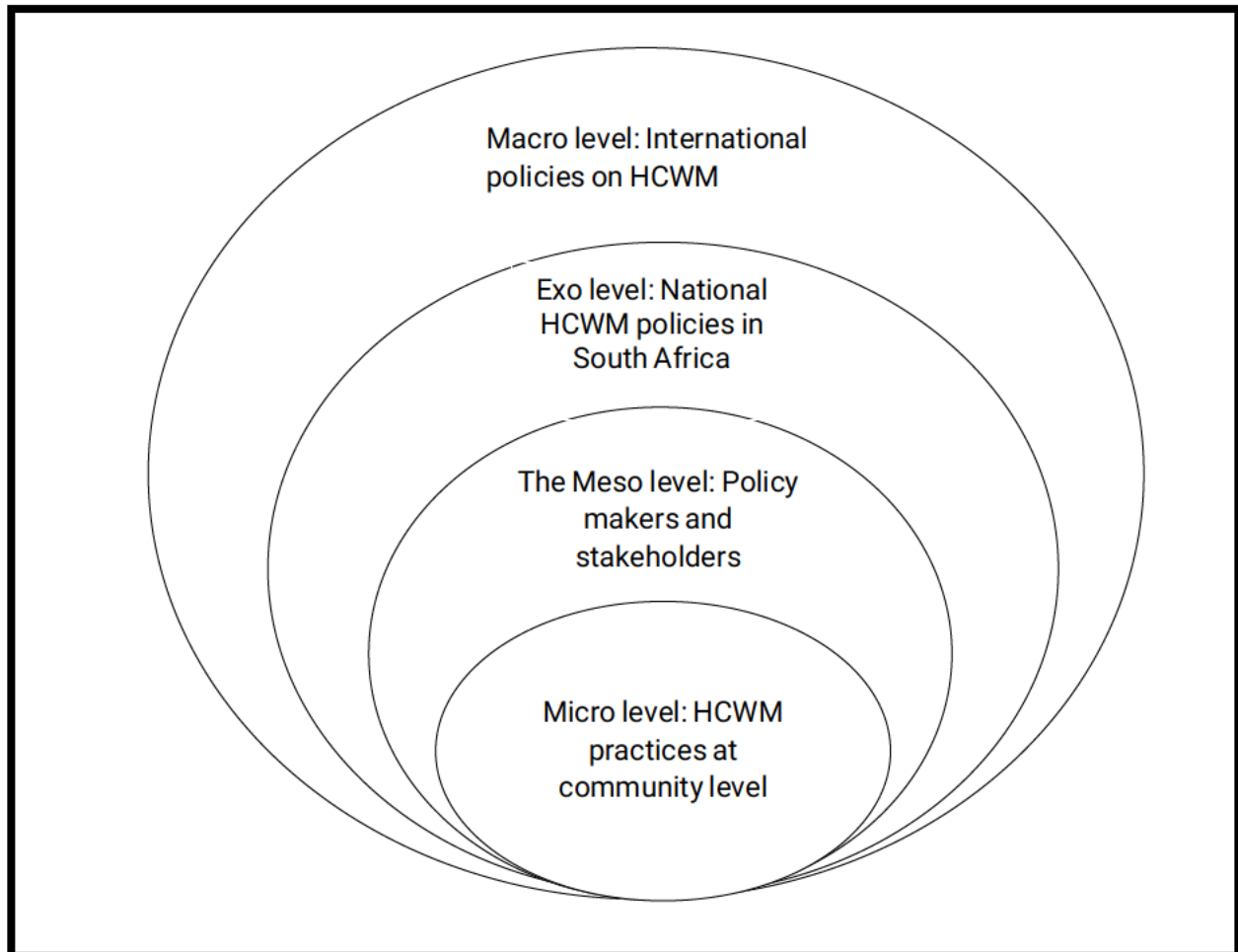
*Figure 1: Ecological theory for human development by Bronfenbrenner, 1974*

### **3.4 Assumption of the ecological systems theory**

The ecological systems theory assumes that, when a person or group is connected and engaged in a supportive environment, the functioning of that person or group also improves (Mischo, 2014).

### **3.5 How the ecological systems theory applies to this study.**

This study adopted the four levels of the ecological systems theory. The macro level: applied to this study, refers to the international policy level, the exo level is the South Africa's national policies level, the meso level is the policy makers and the stakeholder's level. All levels are summarized in Figure 2.



**Figure 2: Ecological systems theory as applied to this study adopted from (Bronfenbrenner, 1974)**

*The international policy level:* This macro-system level assisted in reviewing and providing an understanding of the international policies that regulate HCWM. The review of international policies was done to determine how the policies are developed, who is responsible for the development of these policies and the contexts in which they were developed. Exploring international policies governing healthcare waste management was critical in understanding the context and how such policies influence the development of policies within the South African context.

*The national policy level:* This exo-system level will assist in reviewing and understanding national policies that govern HCWM in South Africa. The review of policies at this level was critical in determining the policies governing health care waste and to understand how they are translated and implemented into practice by other health care waste stakeholders.

*The stakeholder and policy maker's level:* This meso-system level where the stakeholders responsible for HCWM and policy makers are found. In this study, the stakeholders were: provincial Department of Environment Affairs which deals with formulation of policies and management of pollution and waste in the province, Groundwork organization which works as an independent healthcare waste management enforcer and the Provincial Department of Health which is responsible for formulating HCWM policies and implementation of these policies in healthcare facilities.

*The health care facility's level:* They belong to the micro-system level. They provide healthcare services to patients in health care facilities within the community. Healthcare facilities are involved in diagnosis and treatment procedures that are responsible for generating health care waste. This level is important in determining the policies that are implemented by the healthcare facilities in South Africa. The challenges faced, and how these challenges are handled with were explored. Understanding this level is critical in determining how HCWM practices are in line with the international and the national policies on HCWM in South Africa and to identify some inconsistencies.

In chapter 2, the literature review showed that there is poor HCWM on the micro-systems level where health care facilities are found. Secondly, on the meso-systems level where policy development, literature indicated that there are that policies are insufficient. On the macro-system level, where international policies are found; it remains unclear how such policies are integrated at the exo-systems level into national policies. There is also a dearth in literature of the exo-systems level in South Africa that explain the role of the stakeholders in designing policies for HCWM.

The ecological systems theory provides a better understanding of the enabling mechanisms which promote sustainable health care waste policies in South Africa. Findings of the study must be used in determining the reasons why there is poor HCWM in health care facilities. The findings must be used in the development of strategies used to promote proper HCWM.

### **3.6 Conclusion**

The assumption of this study is that there is consistency among all levels when it comes to policy and implementation of HCWM, implying that if there are international and national policies that regulate HCWM, those who develop policies and stakeholders are more likely to implement them, thereby improving green HCWM at health facility level.

## **CHAPTER FOUR**

### **Methods**

#### **4.1 Study design**

This study used qualitative exploratory research design to answer the research questions of the study, as they have not been previously studied. The design therefore provided an in-depth understanding of all stakeholders involved in the field of health care waste management and sustainable strategies. Qualitative research design ability to get a full account of a studied phenomenon in its context, makes it distinct to other research designs by the virtue of capturing full insights about the studied phenomenon (Tracy, 2013). Qualitative research allows us to uncover most important issues that can later be studied using more structured methods (Tracy, 2013). Moreover, Qualitative research aids people in gaining a better understanding of the world, their society, and its institutions (Aspers and Corte, 2019). Therefore, it was imperative to use a qualitative exploratory research design to explore sustainable strategies for HCWM in healthcare facilities around Pietermaritzburg, KwaZulu-Natal province as well as to determine the position and level of influence of stakeholders in the formation of sustainable HCWM strategies for healthcare facilities in South Africa.

#### **4.2 Study approach**

The stakeholder analysis approach was used to gather information about policy actors and their interests, formal and informal relationships, power distribution, and available resources (Brugha and Varvasovszky, 2000). By understanding the nature of stakeholder's interests and motives makes it possible to understand why certain policies are implemented while others are not. Stakeholders can be understood as actors with direct or indirect impact on policy issues as they can enhance or weaken the authority of

decision makers and influence the implementation process (Schmeer, 1999). Therefore, stakeholder analysis offers knowledge that can be applied in various settings, context, and policy levels (Schmeer, 1999). This study took a broad stance by not focusing on single policy in HCWM but looked at power dynamics across all relevant policies.

#### **4.3 Study context**

The study was conducted in Kwa-Zulu Natal (KZN) Province, which is the country's third-smallest province, covering 7.7% of the country's land area. With a population of 10.3 million people, KZN is the second most populous province in South Africa. (District Health Plan, 2015/2016). The principal language is isiZulu, followed by English and Afrikaans. The aim of the study was to explore the position and influence of stakeholders in the formation of sustainable HCWM strategies. This study component was carried out in the City of Pietermaritzburg under uMgungundlovu district, with six hospitals and two community health centres, two government departments and one non-governmental organization for waste management. Public health care facilities located in uMgungundlovu district, are characterised by high volumes of waste generation (District Health Plan, 2015/2016).

This study was conducted in Pietermaritzburg the capital and second-largest city in the province of KwaZulu-Natal. It is also known with its Zulu name—uMgungundlovu, with an estimated current population of 500,000. Pietermaritzburg presents a good opportunity to study HCWM and sustainable development initiatives as it is an urban area and a capital city, which means all head departments of the province are found here. The province of KZN is the third smallest (7.7% of SA land area) while having second largest population (with 10.3 million population) make it an interesting study area to understand health care waste management strategies that are in place for human wellbeing and environmental sustainability. Therefore, the aim of this study was to explore sustainable HCWM strategies used by healthcare facilities in Pietermaritzburg, KwaZulu Natal province as well as the position and influence of stakeholders in the formation of sustainable HCWM strategies.

#### **4.4 Study participants and sampling techniques**

Sampling in qualitative research design is the selection of a subset from the population in each study (Mack et al., 2005). Moreover, selection of a sample in qualitative research is based on the objectives and the characteristics of the study population (such as size and diversity) which in turn determined which and how many people to be selected (Mack et al., 2005). This study used purposive sampling, which is the most common sampling technique in qualitative research because of its ability to provide valuable participants (Mack et al., 2005). Purposive sampling strategy selects participants according to the preselected criteria relevant to the research questions (Mack et al., 2005). This ensures that the study will get participants that are relevant and that will give valuable information. Purposive sampling size is flexible because it is not set in stone; the researcher can use it until data saturation is achieved. Purposive sampling also works effectively when data evaluation and analysis are done concurrently with data analysis (Mack et al., 2005). As a result, purposive sampling was the most appropriate strategy to apply in this study to identify relevant stakeholders who were willing to participate until data saturation, data review, and analysis were conducted concurrently with data collection to guarantee that all information was covered.

In this study, six hospitals, three community health centres, the provincial department of Environment Affairs, provincial department of health and HCWM non-governmental organisation were purposively sampled to be part of this study. These institutions were chosen because they were either the producers of healthcare waste, they were involved in the management of healthcare waste or developing policies that govern the HCWM sector.

Institutions that were part of this study include Edendale hospital, which is a district regional hospital; Greys hospital, which is a regional tertiary hospital; Northdale hospital, which is the district hospital; Richmond hospital, which is a TB specialised hospital, Townhill hospital, which is psychiatric specialised hospital; the provincial environmental Affairs pollution and waste office, which deals with formulation of policies and

management of pollution and waste in the province; the provincial health department office, which coordinates health care risk waste, the environmental health directorate responsible for environmental health, malaria control and communicable diseases, and lastly, an non-governmental organization called Groundwork, which works as an independent healthcare waste management enforcer.

Since the study was to explore sustainable HCWM strategies used by healthcare facilities in Pietermaritzburg, KwaZulu Natal province as well as the position and influence of stakeholders in the formation of sustainable HCWM strategies. Recruitment selection criteria for participants were hospital waste officers overseeing management of waste, hospital CEO's, department of environmental affairs officers working with waste management, department of health officials at the provincial level working with HCWM, hospital infectious prevention control officers, healthcare waste non-governmental organization's officials.

The primary source of data for this stakeholder analysis study was initially planned to be 20 semi-structured interviews, however due to unavailability of participants and others declining to be part of the study, 11 participants agreed to take part in the study, six participants were hospital waste officers and were selected to participate in the study because they are in charge with healthcare waste management at the healthcare facilities and are involved in the formulation and implementation of healthcare waste management policies. One participant was from the provincial department of health, under environmental health directorate; he is also the coordinator for health care risk waste, and he oversees the formulation of healthcare waste policy development. One participant from the provincial department of environmental affairs under waste and pollution directorate was also involved in waste policy development. One hospital CEO who sit in the healthcare waste management committee for policy development. One official from the HCWM non-governmental organisation that also sit at the committee that develop policies for healthcare waste management. One participant was an infection prevention control officer who worked closely with waste officers as a healthcare waste management policy implementer. Participants' working experience ranged from 6

months to 18 years, and all waste officers were Black females from the ages of 25 to 40 years. Semi-structured interviews were complemented by a review of policy documents (including government, donor and NGO reports and programme documents), and academic literature on HCWM policymaking in South Africa and worldwide.

### ***Inclusion criteria***

Recruitment selection criteria for participants were hospital waste officers overseeing management of waste, hospital CEO's, department of environmental affairs officers working with waste management, department of health officials at the provincial level working with HCWM, hospital infectious prevention control officers, healthcare waste non-governmental organization's officials

Only policy implementers from healthcare facilities.

### **4.5 Data collection procedure, tools, and technique**

Visits were done to health facilities, organizations, and governmental departments to introduce the study, then using the techniques of purposive sampling and snowballing, a list of major stakeholders in the HCWM sector was constructed, and key informants were selected. The ability to provide insightful answers to the posed questions, as well as the informants' professional knowledge and experience, as well as their influence and involvement in HCWM policymaking, willingness, and availability to participate in the research, and willingness and availability to provide insightful answers to the posed questions, were all used as selection criteria. Participants that were willing to participate were recruited in the study. Each interviewee signed a consent form (appendix 1) before the interview and confidentiality was ensured by storing all collected data in a protected computer using code identifies, not real names.

Data collection was done using a semi-structured guide and probing was used to elicit more information. The interviewer was fluent in both English and isiZulu and used semi-

structured questions which allowed participants to share their experiences and their roles in the HCWM sector. The interview guide that was used was first developed in English and was translated into isiZulu; it was also back translated to English for quality purposes. The construction of the interview guide was done after a review of literature and policies that were found in the healthcare waste management sector. Furthermore, a review of Bronfenbrenner's ecological systems (1974) framework for the study of child development was also done. To frame open-ended questions, themes were extracted from healthcare waste management literature review and Bronfenbrenner's framework to develop questions that could illicit relevant data. The interview guide had open-ended questions which offered the interviewer the opportunity to probe by asking follow-up questions. The interview guide covered themes like demographic information of participants, work experience, collaborating partners, knowledge about policies and green strategies, processes involved in the formulation of policies for health care waste and who was responsible for developing and implementing policies. Interviews were conducted in isiZulu and each interview lasted from 30 to 45 minutes. An audio recorder was used to record the interviews, and this allowed the interviewer to pay full attention and take notes of emerging themes from the interview. Recording also enabled deep interaction with the participants and provided the interviewer the opportunity to obtain in-depth understanding of the participants' experiences. After the interview, a summary was written to note emerging themes and all the interviews were later transcribed and translated into English.

#### **4.6 Data analysis**

This study analyzed data using thematic analysis. A process for detecting, interpreting, and reporting patterns (themes) within data is known as thematic analysis (Braun and Clark, 2006). Thematic analysis is in line with the research design of this study, which is qualitative design as it minimally organizes and describe the data set in rich details. Thematic analysis is said not to require a theoretical detailed approach or technological knowledge of an approach; it is able to offer more accessible forms of analysis. In contrast with other forms of analysis such as Interpretative phenomenological analysis, discourse analysis, narrative discourses, or grounded theory, thematic is not bound to

any pre-existing theoretical framework, this allows it to be flexible as it can use different theoretical frameworks and can be used to do different things with them (Braun and Clark, 2006). Therefore, thematic analysis was essential in this study, as this study aimed to understand where the power of influencing HCWM policy resides through analyzing events, realities, meanings, and experiences of relevant stakeholders using thematic analysis.

Data analysis for this study followed the six-step process recommended by Braun and Clark (2006). These steps involve; familiarization with data, generating initial codes, search for themes, reviewing themes, defining and naming themes. The researcher familiarized herself with data through continuously re-reading of the data set until the initial analytic interests were captured thus familiarizing with the depth and breadth of the content. The researcher used data collection, transcription of data and re-reading of transcripts to get familiarity with data and to achieve initial analytic interest.

After familiarizing with the data, codes were generated as the researcher identified features of data that are of good interest. This formed part of analysis to organize data into meaningful categories. In this study, this was achieved through identifying and grouping quotes that were relating to research questions. Quotes were identified across all data sets and were grouped according to their meanings. This brought the researcher to searching for themes which involved sorting out different codes into potential themes. In this study, the researcher analysed these codes looking at the relationships and differences between codes to sort them as main themes, sub-themes, and others were discarded or merged. Revising themes involved refinement of the devised set of candidate themes. In this study, the researcher revised themes by scrutinizing them, others were made main themes, while other themes were collapsed, and others were broken down into separate themes. The analysis also involved defining and naming themes, whereby the researcher defines and continues to refine themes, and data was analysed using these themes. In this study, themes were defined by identifying the essence of what they meant and determining what aspects of data were captured in each theme or sub-themes.

#### **4.7 Ethical considerations**

This study was granted full ethical approval with the reference protocol number - HSS/1502/016M by the Human Social Sciences Research Ethics Committee of the University of KwaZulu-Natal [HSSREC]. Also, the departments of health and uMgungundlovu health district in Kwazulu-Natal province granted permission [reference number: HRKM020/17 K2\_2017RP57\_332] to carry out the study. Prior to the interviews, participants' informed consent was sought through an informed consent letter (appendix 1). The contents of the letter were explained to the participants before obtaining informed consent from them. A detailed explanation about the nature of the study was also provided to each participant, and they were assured of both confidentiality and anonymity. Permission to use an audio-recorder was sought and obtained from each participant. All interviews were confidential, and the respondents remained anonymous as the interview transcripts were labelled using codes such as participant identification number, occupation, and date. Audio files were stored in an external hard drive that required a password.

#### **4.8 Validity, Reliability and Rigour**

Reliability, validity, and rigor are synonymous with quantitative research design, they are used to measure extent to which findings from research are of good quality, they are not biased, they remain consistent when repeated over time, and they accurately represent the total number of population (Golafshani, 2003). In qualitative research all these assessment criterions assess the quality of research. Good qualitative research provides a full understanding of a situation that is not clear, hence the purpose of these criterion in qualitative research is to generate understanding. Qualitative research uses many terms to assess quality of research such as Consistency or Dependability and Applicability or Transferability and credibility or trustworthiness (Golafshani, 2003).

Validity and reliability in this study was maximised by selecting most relevant personnel in the sector of HCWM and green strategies, who deals directly with policies and

strategies in these fields (Shenton, 2004). Reliability was further enhanced by requesting an independent assessment of the transcripts by a skilled qualitative researcher and comparing the findings to those of the researcher (Mays and Pope, 1995). Credibility was ensured through (1) prolonged engagement—the researcher invested time to familiarize himself with the study topic and all departments and organisations that were involved in the study by conducting a literature review (both grey and white literature) to get an extensive background of the study topic, and to build knowledge around the research questions, in addition, the researcher had constant debriefing sessions with project supervisors to widen the visioning of the project as they have experience in the study area (Shenton, 2004) (2) persistent observation—the researcher observed characteristics related to the aims and objectives of the study during the data collection and analysis phase (3) triangulation—other data sources were used to provide in-depth understanding of the topic, and to confirm findings.

To ensure dependability in this study, all processes within the study is reported in a detailed transparent manner. An in-depth report on research design and its implementation was provided (Shenton, 2004). Furthermore, everything that was in the field during data collection was recorded, and notes were taken; the evaluation of the whole research inquiry process was undertaken (Shenton, 2004). Transferability was ensured by using thick description, thus providing enough contextual information of the study (Barusch et al, 2011; Shenton, 2004). Trustworthiness of this study was measured using all the criterions mentioned above.

## **CHAPTER FIVE**

### **Findings**

#### **5.1 Introduction**

This chapter presents the findings of the study based on the semi-structured interview guide (*see* appendix 1): The study findings were obtained from 11 in-depth interviews as described in the previous chapter. The first section of this chapter provides a brief overview of the study participants. This is followed by a presentation and description of research findings that is., themes and sub-themes that emanated from the analysis of data. These themes were discussed with literature integration; this allowed the researcher to review the study findings based on similar studies that were done on the topic and to show how the present study fits into the gap that was identified in literature.

#### **5.2 Overview of study participants (stakeholders)**

This study on healthcare waste management was conducted in five healthcare facilities in Pietermaritzburg KwaZulu-Natal province and stakeholders from Department of Environment Affairs, Groundwork organization and provincial department of health who are directly and indirectly involved with healthcare waste management. Eleven participants took part in the study, six were hospital waste officers, one provincial coordinator for health care risk waste, one environmental affairs waste and pollution officer, one Hospital CEO, one HCWM NGO official and one infection prevention control officer. The participants' work experience ranged from 6 months to 18 years and all waste officers were females from the age of 25 to 40 years. Table 1 gives a summary of the demographic characteristics of participants.

**Table 1: Profile of stakeholders**

<b>Participant demographics</b>	<b>Frequency</b>
<b>Gender</b>	
Male	3
Female	8
<b>Total</b>	<b>11</b>
<b>Age</b>	
25-30	1
31-39	3
40-49	4
50-59	3
<b>Occupation</b>	
Hospital waste officers.	6
Provincial coordinator of health care risk waste.	1
Environmental affairs waste and pollution officer.	1
Hospital CEO.	1
Infection prevention control officer.	1
NGO waste officer	1

<b>Years of experience</b>	
6 months to 1 year	1
2 years- 5 years	5
6 years to 9 years	3
10 years to 13 years	1
14 years to 18 years	1

The main aim of this study was to explore sustainable HCWM strategies used by healthcare facilities in Pietermaritzburg, KwaZulu Natal province as well as the position and influence of stakeholders in the formation of sustainable HCWM strategies. The specific objectives of this study were (1) To explore the sustainable strategies that exist FOR HCWM in healthcare facilities in the City of Pietermaritzburg under uMgungundlovu district from the stakeholder’s perspectives; (2) to explore the stakeholder’s experiences in the development of sustainable strategies for HCWM in healthcare facilities within the City of Pietermaritzburg under uMgungundlovu district from the stakeholder’s perspectives; (3) To explore the stakeholder’s level of influence in developing sustainable HCWM strategies in the City of Pietermaritzburg under uMgungundlovu district from the stakeholder’s perspectives, and (4) to determine which stakeholders yield the most power in shaping the sustainable HCWM policies.

Specific objectives of this study were used as the main themes, and sub-themes emerged from these themes. These main themes are green strategies that exist in health care facilities for HCW management, stakeholders’ position, and level of influence in developing sustainable HCW policies, stakeholders that yield the most power in shaping sustainable HCWM policies in South Africa, and factors hindering green strategies in health care facilities.

**Table 2: Summary of themes and sub-themes**

<b>Main theme ‘your research question</b>	<b>Sub-theme</b>
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<p>1. Green strategies that exist in health care facilities for HCW management</p>	<ul style="list-style-type: none"> <li>• Recycling as a greening strategy.</li> <li>• Global Green and Health Hospitals (GGHH) as a green initiative.</li> <li>• The role of Government in reducing carbon footprint.</li> </ul>
<p>2. Stakeholders' position and level of influence in developing sustainable HCW policies.</p>	<ul style="list-style-type: none"> <li>• Department of Environment Affairs is the main organ responsible for waste management.</li> <li>• Health care waste NGO position and level of influence in developing sustainable HCW policies.</li> <li>• Provincial department of health position and level of influencing in developing sustainable HCW policies.</li> <li>• Health care facilities position and level of influence in developing sustainable HCW policies.</li> </ul>
<p>3. Stakeholders that yield the most power in shaping sustainable HCWM policies in South Africa.</p>	<ul style="list-style-type: none"> <li>• Department of Environment Affairs has most power in shaping sustainable HCW policies.</li> </ul>
<p>4. Factors hindering green strategies in health care facilities.</p>	<ul style="list-style-type: none"> <li>• Improper segregation of infectious and non-infectious waste from the point of generation.</li> <li>• Ignorance and negative attitude among health care workers</li> <li>• Lack of budget</li> <li>• Shortage of staff</li> <li>• Unclear service provider contracts.</li> </ul>

Table 2: Summary of themes and sub-themes

### **5.3 Green strategies that exist in health care facilities for HCW management.**

Green strategies on HCWM involve all initiatives that see the environment as part of a quality service that needs to be sustained (Azmal et al., 2014). Green strategies are orientated on green products, non-toxic environment, green cleaning, and waste reduction (Kaiser, Eagan and Shaner, 2001; Azmal et al., 2014). Main principles that drive green strategies are the protection of the environment and the safety of public health (Muduli and Barve, 2012). Green strategies are understood to be the first step in creating what is termed green hospital which can be characterized as one that consistently improves public health by minimizing environmental consequences and doing away with hospitals' contributions to the burden of disease (Nichols et al., 2011; Hasan and Rahman, 2018).

According to the WHO (2018), most of health care waste (75 %) is general municipal waste, which poses an elevated risk of infection when burnt. The remainder is composed of more hazardous types of medical wastes, including infectious and sharps waste, chemical and radioactive wastes, and hospital wastewaters (WHO. 2018). Recycling is one of the strategies used in the HCWM sector to try and minimize waste that is disposed by reusing it (Hao et al., 2018). However, in many middle- and low-income countries, lack of recycling has resulted into a substantial percentage of general waste being dumped in landfills, adding to the millions of tons of waste that pollute the land annually (Ferronato and Torretta, 2018).

#### **5.3.1 *Recycling as a greening strategy.***

Participants indicated that hospitals have already started with recycling of general waste as a waste reduction strategy. This type of waste is referred as domestic waste because it is produced during the administrative processes and from other activities that are non-medical in the healthcare facilities. However, recycling in healthcare facilities is still at infant stage, and challenges such as mixing of waste and not getting service providers

still prevail. These challenges have made it hard for hospitals to recycle different types of general waste such as plastics, metals, and glass. Hence hospitals are now solely focusing on recycling papers, which seems to be a progressing practice, according to participants. One participant mentioned that although recycling of papers is underway, they are still trying to find a service provider who is going to sort the waste before it goes to landfills so they can dispose material which is not recyclable and put everything that is recyclable into different containers.

*“We have just started now, you will see maybe if you have walked on the passages there are orange and yellow bins, we are trying but we got the challenge of public because they don’t care what you wrote they must dispose there, they just put anything they want to put. But the one that I can say we are progressing we have purchased these boxes whereby we have put in the offices to say every paper that you generate in the office put it there, then we collect it then we have a service provider that will collect it for us with box like this we have a service provider that collect and pay for us. What we are working on, we are working on getting the service provider who will sort every waste before it goes to the landfill site, and we will dispose the general waste only things that are not recyclable but those that are recyclable you will sort them and put it into correct containers and go to sell it on the recycling company.” (Waste officer, 3).*

The waste officer responsible for the management of healthcare waste when asked about what health care waste management sustainable strategies they have, she mentioned that they run a weekly campaign where they go around the facility collecting papers and storing them together with an intention of recycling it at some point in the future.

*“We have anti-litter campaign that we are busy with like every Wednesday we collect papers, and we are going to start recycling whereby we going to recycle papers” (Waste officer, 2).*

Another waste officer who deals with management of healthcare waste when asked about sustainable strategies for waste reduction in the healthcare facility she works in

she noted that they have started recycling their general waste and they are not using paper trailers anymore.

*“We already recycling our waste we trying to be recycling most things and we trying to not use the paper trailer anymore” (Waste officer, 1).*

However, the hospital CEO responsible for overseeing the proper management of hospital waste when asked about the adequacy of health care waste management policy, he raised that there is no specific policy that deals directly with recycling of general waste; he further mentioned that there are no full-time service providers because they are unable to make contracts with service providers. Thus, the municipality is used to collect general waste from the facility to dump it in landfill sites.

*“For me I don’t have any problem the main problem is the general waste there is no proper program or proper policy for the general waste because currently we are using municipality to collect our waste it a huge problem ... The recycling we are having a huge challenge because there is still one company that is doing it on ad hoc basis we have tried to make a contract if it be a company... and municipality that is an everyday headache because they can come today and collect and then tomorrow, they will say their trucks are not working and strikes then you find yourself having lots of general waste pilling up” (Hospital CEO).*

According to an environmental officer from the NGO which work as a strategic partner on HCWM with healthcare facilities, he mentioned that hospitals should start and consider recycling as a strategy that will help them reduce their waste. However, the participant also noted that recycling depends on proper segregation which has been hospitals’ weakest point. Furthermore, according to the participant, recycling will not only play a role in the reduction of waste, but will also provide economic benefits to hospitals, since they will be able to reuse what they have procured.

*“Hospitals must start to develop a whole strategy for zero waste. so when I say zero waste I mean nothing goes to waste, so everything has to be categorized accordingly and they need*

*to look for a service provider who is going to pick up. Hospitals spend the second largest expenses on the hospital budget due to procurements after the hospital have spent salaries, salaries are the first second is the procurements, procurements that buying stuff. All the stuff that hospital buy more than 90% of it goes to waste because they buy do what they want to use it but majority of it goes to waste out of that waste more than 80% is domestic waste so they can categories that waste, these are all a hazardous waste majority of it follows under non-hazardous waste so if they can categories it then they will realize that just 15% is what where this other waste falls in to” (Healthcare waste NGO).*

### **5.3.2 GGHH as a green initiative.**

According to the GGHH’s annual report (2018), Global Green and Healthy Hospitals (GGHH) is a global network of hospitals, health-care institutions, health-care systems, and health-care organizations committed to lowering their environmental footprint and boosting public and environmental health. The healthcare waste NGO in the KZN province is a strategic partner of the international organization called Healthcare without Harm, and it implements GGHH as green initiative in the health care waste sector. GGHH is based on ten goals which are linked to each other to enable the health sector to address and promote better sustainability and environmental health; waste management is also integrated into these ten goals. In waste management, the focus is on reducing waste production, making use of treatment technologies which are environmentally friendly, and safe disposal of health care waste (GGHH, 2018).

A GGHH implementing officer mentioned that the whole idea behind waste management is to reduce waste generated by hospitals, recycle generated waste, and ensure protection of the environment and people from infectious waste. All this is done by first conducting a baseline assessment and having a checklist of the item’s hospitals have and those that hospitals do not have, and this is done by an environmental health officer.

*“The role of Groundwork when it comes to HCWM is to try and make these hospitals to take responsibility so Eeh... first of all when we introduce the initiatives (GGHH) it is ten*

*goals, there are ten different goals for the Global Green Healthy Hospitals, so those goals one of it is waste management and in that waste management the whole idea behind it is to ensure that your waste is reduced, you reduce your waste, you recycle your waste and also to ensure that your infectious waste doesn't end up in the environment and make people sick so the first thing that we do when we go to a hospital is to conduct a baseline assessment on waste management so the baseline assessment is the checklist and that checklist is what exactly you and what you do not have, so it a set of questions and the environmental health officer should do a survey in a hospital” (Healthcare NGO official).*

Thus far, there are only two hospitals that are part of GGHH initiative. One participant raised that they have just joined GGHH simply because they want to start adopting green strategies and minimize their carbon footprint, and they have chosen waste and energy as part of their core responsibility to make their hospital green. They are currently on the entry level since they have just joined the initiative.

*“..... we just we registered with the organisation it called the GGHH which is the Global Green Healthy Hospitals organisation basically their focus is trying to assist hospitals around the world to go green and to reduce the carbon footprint so we still new members in that committee but the things we have chosen as part of our core responsibilities because there is quite a lots of things that you could chose but we choose on the waste and energy on how we can try and use waste and energy to make our hospital green, it still in the foundation phase it still in the earl childhood stage that project...” (Waste Officer, 6).*

Another participant raised that they are also part of GGHH initiative, and they have chosen waste and energy as their two goals, with the vision to reduce the volume of general waste that ends up on landfill sites. Hence, they are still looking for a service provider to recycle and they want to ensure proper segregation from a point of generation to avoid large volumes of healthcare risk waste that will require more water to treat. The participant raised that there will be less water to use, and they will reduce pollution to the environment, hence proper segregation must be enforced, and recycling of waste must be implemented. According to this participant, the long-term goal is to propose to the

provincial health department to add on their contracts that waste service providers must also provide materials that are eco-friendly and recyclable, as they are paying a lot to dispose these materials that are not recyclable, but if they were recyclable, they would only dispose what is inside and take containers for recycling. The participant then concluded that it would be a lengthy process and can only be implemented by provincial department.

*“Yes, Grey’s is part of GGHH and one of the goals we have chosen we have two goals which is energy and the second one is waste and our vision is to reduce volumes of general waste which is landing to the landfill sites. As I said early that we are trying to get service provider who is going to sort our recyclables that it doesn’t go to landfill site but it be recycled. Secondly to ensure that waste is properly segregated because we know that for health care risk waste if it goes from here. The more we generate healthcare risk waste the more water will be used to treat but if it was small and if it actual what it supposed to be in the box we can use less water than what lots of water we were going to use and secondly for the burnt one we can pollute less the environment if we are actually incinerating what we suppose to incinerate”. (Waste officer, 5)*

### **5.3.3 The role of Government in reducing carbon footprint.**

Government leadership in waste management is regarded important since government is a stakeholder that holds the highest power in influencing initiatives that promote environment and public health sustainability (Legg, 2019). Participants noted that in other countries, the government is more involved in reducing the carbon footprint and helping hospitals to recycle. However, the South African government is not involved, and if the government could be fully involved it could get better quicker. Hence now they are planning to use the partnership with GGHH to push the government to be more involved to have green strategies. Moreover, it was motioned that government does not really care because they regard carbon dioxide as something that goes to the atmosphere, and they perceive air pollution as a problem that does not have immediate effects and can take up to 15 years for it to have effects that are detrimental to health.

*“You know if you go to other countries government is very much involved special in reducing the carbon footprint they are very much involved they are helping the hospitals to recycle you know is just here is not yet... if you come national government get involved is going to be going somewhere quicker ...we are planning maybe with the GGHH because the... because the public also has been already involved so maybe we are going to partnership with the GGHH so that they can push the government the department for us to go green” (Hospital CEO).*

*“It very important but people don’t care you know government doesn’t really care because they think they look at it as just going to the atmosphere but it going and coming back, and the problem is that because people... wait the problem with air pollution is that it doesn’t happen immediately, if you hearing something now there is toxic you not going to faint now and die it will take maybe 10 to 15 years you just find yourself (god forbid) person will find himself in the hospital having lung cancer, how can you get lung cancer but he was living closer to that incinerator, so those are the things we talk about because people don’t see you don’t see the effects now, now, now, government doesn’t care about it they” (Healthcare waste NGO official).*

#### **5.4 Stakeholder’s position and level of influence in developing sustainable HCWM policies in South Africa.**

Participants were asked to describe their position and influence in the development of sustainable HCWM policies, and it was mentioned that the Department of Environmental Affairs (DEA) had the highest level of influence in South Africa as a country.

##### ***5.4.1 Department of Environment Affairs’ position and level of influence in developing sustainable HCW policies.***

Different stakeholders have different positions and levels of influence in the development of sustainable HCWM policies (Makgae, 2011). Participants raised that in general, the Department of Environmental Affairs (DEA) has a prominent position and level of influence in developing waste policies, meaning it is the main organ that deals with waste management issues. But regarding health care waste, the health department is

responsible for developing policies according to their operation in reference to what the department of environment affairs stipulates.

*If you talking on the health space it is a health department, if you talking general it is with the environmental affairs that is how it is, but like I said health is not really... it internalize what environment has put out as the direction the country is taking in terms of waste management so they then take it and translate it then say that what does it mean for an operation like ours you see so that how it works. But the department of environmental affairs is the one that is the main organ of state that deals with waste issues. (DEA official)*

#### **5.4.2 Healthcare waste NGO's position and influence in developing HCW sustainable HCW policies.**

The position of healthcare waste NGO in the province is of an independent enforcer trying to assist hospitals to be responsible and take full account of their waste; this includes assisting hospitals to ensure proper segregation according to waste categories and ensuring that infectious waste does not end up affecting the environment and making people sick. They are also trying to make hospitals realize that there are other alternative treatment methods that can be used rather than incinerators.

*“The role of this NGO when it comes to HCWM is to try and make these hospitals to take responsibility, our work is to try and make hospitals realize these different categories and also to make them to separate their waste properly and also to be accountable because as a hospital and as a health institution your responsibility is to provide care and make sure that people are not sick and make sure that people are not infected but if you do not treat your waste properly then your workers are at risk, your patients are at risk, and the community is also at risk . So, we make them to understand that you know you suppose to provide care you not supposed to make people sick, so that whole idea that our work. Our work is kind of broad. also, to ensure that your infectious waste does not end up in the environment and make people sick... .... there are so many things here that could have been dealt with in an alternative treatment method like autoclaves like a what you call it lunary dieresis, like a there is another method that is being used am trying to remember the*

*name of this method again now a... alkaline hydrolysis that method people use to dissolve body parts and all of that, but we still see those incinerators...*

On sustainable HCWM policies, the NGO opposes the incineration treatment method because they believe it discourages recycling and reuse. They are of the view that there are other alternative treatment methods that can be used to reduce risk from health care waste in a manner that is eco-friendly.

*“... So we make comments Groundwork made comments with that policy we add somethings to it specifically on the area of incineration because we don’t believe on the incineration, incineration is something that we fight against we are opposing because we believe incineration does not encourage recycling it doesn’t encourage reusing it doesn’t encourage people that are working on the dome sites to get a source of livelihood you know so we just against incineration, you know so that is our stand. So, we specifically mentioned that there are alternative treatments methods that can be used for health care risk waste so those are part of the things that we’ve been very particular about”.*  
*(Healthcare waste NGO official)*

The healthcare waste NGO described their level of influence to be difficult, the problem being that healthcare risk waste policy has not been published or gazette in South Africa. The reason for the policy not being published is that Department of Environmental Affairs (DEA) and Department of Health (DOH) are fighting on who should take the full charge of the policy and since the two departments are not agreeing on the ownership it has since been put in limbo. Which means in South Africa thus far, there is no healthcare risk waste policy which speaks about green strategies. Moreover, according to healthcare waste management NGO there is a poor communication on the policy development meetings as sometimes they are told too late about the meetings or after the meeting date has passed.

*“It difficult because we’ve contributed actually the last policy on HCWM. we contributed, the problem now is that in terms of policies the health care risk waste policy, so you have*

*two policies in South Africa, the health care risk waste policy there has been many challenges, it has not been published it has not been gazetted in South Africa due to departments clash”. (Healthcare waste NGO official)*

*“So sometimes they do but sometimes they just make an announcement to say aa... there was a sitting in and people did not pitch or people pitched up but now they have given it up again to the public and make comments. Most times we just makes comments we hardly go for those sittings because sometimes it either in Johannesburg or anything and there is no point travelling all the way to make some input that might be taken in or might not be taken in so it better to just sit back and”. (Healthcare waste NGO official)*

#### **5.4.3 Provincial Department of Health’s position and level of influence in developing sustainable HCW policies.**

Health Environment directorate within the provincial health department is responsible for developing or reviewing all health care waste policies. The office forms a task team of district coordinators to review the policy every after three years. However, in the past years due to the financial constrains the health department has been facing; district coordinators’ positions are vacant in the meantime and the directorate is using waste officers to review the policy as they deal with it at the hospital level. The health department has a prominent position in shaping the policies that speak about green strategies.

*There is one policy that is there for now I just created a task team to review it because now it is outdated it was created in 2013 the regulations have not been approved yet but are made at national level. ...I have set the task team to check the policy and see where it must be improved to match the time because it was developed in 2013 which means it has three years now and we have agreed that with policy in every three years it must be reviewed. ...it that of lack of staff that is there for policy now I must form a task team from the waste officers that are working in hospitals to deal with policy, if there were district coordinators it would be them who are doing the policy you see. I take waste officers from the hospital to try and work on the policy review. (Health environment officer)*

#### **5.4.4 Health care facilities' position and level of influence in developing sustainable HCW policies.**

Hospital CEO's and waste managers are at a center stage of policy development as they are tasked with reviewing the KZN health care risk waste policy. However, poor coordination at the provincial level is a challenge as they are not sure what they will be doing with the policy.

*“Sometimes you get invited sometimes they develop the policy as a draft, and they send to us for inputs mainly they do a policy in form of draft then they send to us for inputs.”*  
(Hospital CEO)

*“In terms of influence we sit in district meetings and we also sit in provincial waste management meetings and we try to say that these are the things we looking at in terms of where we are based and the problems that are there but that just a waste management provincial meeting where it just ourselves and the head in the province of the environmental health so we do site some of the things that we note from time to time and I know that there are supposed to be from last year end of last year they have been saying that they need us to form part of the reviewal because our provincial policy was due for reviewal from that time but we still haven't gotten together”.* (Waste officer, 2)

### **5.5 Stakeholders that yield the most power in shaping sustainable HCWM policies in South Africa.**

#### **5.5.1 Department of Environment Affairs has most power in shaping sustainable HCW policies.**

Department of environmental affairs and department of health have power in shaping sustainable HCWM policies in south Africa. However, Department of Environmental affairs yields the most power.

*“Then I deal also with environmental affairs at national level because it is the law enforcement, they are responsible to draft all legislature that deal with medical waste and all the waste that is there.”* it because environmental affairs are the custodian of all acts and regulations that relate to waste management that is why it is so important. (Health

environment officer)

*“But environmental affairs are the one that the main organ of state which deals with waste issues.” and I would even call it the influence it their responsibility and everybody else must toe the line according to what the environmental affairs is saying because remember if you have any objections to what they are saying as they are not the specialist in your processes you object through the consultation processes so it will be there, (DEA official)*

## **5.6 Factors hindering green strategies in health care facilities.**

Participants were asked to indicate the factors which they perceived as hindering the green strategies in HCWM within health facilities and the following factors were mentioned:

### ***5.6.1 Improper segregation of infectious and non-infectious waste from the point of generation***

According to participants the problem that hospitals are facing is mixing infectious and non-infectious waste and as a result this increases the volume of infectious waste. This is due to negligent, lack of knowledge and no proper procedures for waste management. The challenge of improper segregation is experienced sometimes because of people who do not have experience on proper segregation. Employees such as intern doctors do not have waste management experience, and the other challenge is that “carefree attitude” because they have the view that waste is the same.

*“The problem that hospitals face is that they do not separate their waste properly, so they end up mix the infectious and non-infectious and once you have the non-infectious mixed with infectious it becomes an infectious waste” ...it is negligent in part of the staff’s lack of knowledge ah... What else and no proper procedure.” (Healthcare waste NGO official)*

*“With regard to medical waste the big challenge that we are facing is that the management of waste depend so much on human attitude the big challenge is the people’s attitude of not wanting to segregate the waste the way they supposed to do it that is the big challenge.” (Environmental Health officer)*

*“it will be waste segregation it one of them we did we also trained them on recycling make them aware of the different types of waste that we have that goes to recycling like the colors which colors like you suppose to put which waste and all that, but we failing there that I can tell you we failing with the staff members because they still just put anything in the waste containers.” (IPC)*

*“They do listen, but the implementation part is lacking yes especial with doctors they got a negative attitude, I don’t know if I can call it attitude or it being negligence I don’t know, but they got this don’t care attitude.” (Waste officer, 4)*

### **5.6.2 Ignorance and negative attitude among health care workers**

Participants raised that there is a problem of ignorance even if people are trained, they still do wrong things. Particularly nurses and doctors have the attitude that waste management is not their responsibility, they are only concerned with treating patients not understanding how improper waste management can affect patients in a long run.

*“Hha... obviously when you work with human of different types the problem will be also the ignorance, ignorance is the biggest problem that we are facing because even with training people will still do the wrong things, for instance a nurse will believe that they got no part to play in waste management because they are not waste management representative or whatever, the doctor will tell you that their patients are more important than finding the closest correct bin to use you know that kind of stuff so it just ignorance of how bad waste management affect the health of their patients in the long run so that the problem we have, the biggest problem is ignorance I could say.” (Waste officer, 3)*

*“The challenge within the hospital is mainly when we have in doctors’ sides when we have new interns, they don’t have that experience of proper segregation and then the other challenge is just I don’t care attitude, when you tell someone, you can’t put this here others they just say I don’t care it just waste or waste is waste. ... is the lack of knowledge yes it lacks knowledge and bad attitude.” (CEO Hospital)*

### **5.6.3 Lack of budget**

All participants mentioned that the department of health is currently constrained by issues of budget, which have led to vacant positions at a district level and in hospitals.

Participants mentioned that the lack of budget goes a long way to hinder recycling initiatives. However, some participants noted that people who control budget do not have a will to prioritize good management of waste.

*“...we currently don’t have waste officer because of the budget...” (Waste officer, 2)*

*“Lack of funds, budget and it beyond us it not something that get decided here it decided at the top level.” (IPC)*

*...But the main cause of that is the lack of budget to appoint people. ... we can say it the budget there is no money to appoint people to fill up these other vacancies from district level ... the key is budget as we mentioned at the beginning, we need budget to hire people who can deal with policy directly you cannot do anything without the budget. (Environment Health officer)*

*“I find that the officials don’t have a problem in fact we are looking for same things because we all know what should be done but finance does not always have the muscles to execute what it is that needs to be done so the fight is always between those two that as much as we would like to but the reality is we don’t have funds you see what am saying but I mean that does not necessarily means that people will be running away from the forums because there is no money, because peoples still want to voice out their challenges” ... on the government side they will tell you about the budget then you can’t really move without the budget, okay that one thing but through this the issue is not so much about budget in anything, the truth is that where there is a problem like with many of the issues we have it is on the will to do what is right because the budget is there, but how you priorities reflect on the will that you have. Whether you really want to do what you want to do you see what am saying and really that the main problem we have it the will to do it nothing more the will is just not there. (DEA official)*

#### **5.6.4 Staff shortages**

Participants mentioned that shortage of human capital as a challenge that constrains proper waste collection within the health care facilities. Participants mentioned that at district level there are no waste management coordinators and they have been tasked to

formulate recycling policy which end up failing because they did not have the skill and capacity to do it.

*“Yes, there is shortage of staff, but it not even at my level it an issue everywhere I think everyone knows it departmental things so it a national issue right now.” (Waste officer, 5)*

*“I think the fact that we don’t have district committee because this is a provincial waste manager because he is very busy, he got his hand full we use to have meetings with him also at one stage and that just died away I haven’t seen him in a year or two maybe. So, I think the fact at provincial level he got busy, but he has tried to come down to district and provincial it just too much, cause even at province is doing like three posts so I little pit too much... .. I don’t know if there is something, I can add I think it is important to have district coordinator.” (IPC)*

*“The challenge is that we don’t have enough people to collect waste.” (CEO hospital)*

#### **5.6.5 Unclear service provider contracts.**

Participants mentioned that there are inconsistencies on how the infectious waste service providers charge hospitals in KZN as it is not clear from the contract how they supposed to charge. Sometimes service providers charge per box and sometimes they charge using weighing scale. Contracts are given at a provincial level and the problem is that the contracts are not regularly reviewed and there are some disputes over the new contracts. This has resulted in hospitals being ripped off, as they pay too much money, and it discourages hospitals to reduce volumes of infectious waste. Also, it makes proper segregation pointless as the waste is not weighed but taken per box. Participants described this as an unfair advantage to waste service provider.

*“I think our biggest challenges they are contractual challenges which we can’t deal with them as waste officers because the contract was given at the provincial level so there are things that we want to change in the contract and everything and you find that the contract was last reviewed many years ago and it on the month to month basis and the new contract that was supposed to be in place there is disputes but I can’t speak about those things*

*because I don't have full information it a here-say type of information". (Waste officer, 2)*

*"In KZN people have to be... first of all this thing has to be clarified, the contracts have to be clear, waste has to be weighed you know. ... The challenges is that like I have said because these hospitals are paying so much money the fact that even if they separate their waste, and the waste is still being counted per bag then there is no point especially in KZN because you are telling them okay guys put you plastics in this bag put this in this bag you know so you can reduce the quantity of the waste that is in your red bag there will tell you okay we going to do that but when these guys come they will still going to look at the bag and just point it and say that bag will cost you R70 they don't weigh it, but if they were actually weighing it they will be dropping the cost it a big challenge". (Healthcare waste NGO official)*

*"These guys sometimes they will charge you per box sometimes they charge with the weight of the box so we always tell them that no they must come up with one thing." (CEO hospital)*

## **5.7 Conclusion**

This chapter gave a presentation of data that was analysed using both explicitly qualitative methods as discussed in chapter 4. It gives an interpretation and description of study findings presented in tables; taking cognisance of the study's specific objective which is to get a better understanding of the stakeholders in HCWM's perspectives regarding the green strategies for HCWM in the healthcare facilities in Pietermaritzburg, KwaZulu-Natal province, South Africa. The following chapter will be a discussion of this study's findings.

## **CHAPTER SIX**

### **Discussion of findings**

#### **6.1 Introduction**

This chapter provides a discussion to the findings that were reported in the previous chapter. This is done through literature integration, comparing the current study's findings with what was reported in the previous studies.

The study drew on Bronfenbrenner's ecological systems (1974) framework on stakeholder's position and level of influence in developing sustainable HCWM policies for health care facilities. By doing this, the study hoped to facilitate an in-depth understanding on stakeholders' experiences and perspectives in developing sustainable HCWM policies in health care facilities, by bringing the sustainable development strategies into perspective.

This study reveals that there are basically two sustainable development strategies which are being implemented by the healthcare facilities in uMgungundlovu district which include: *recycling and Global Green and Health Hospitals (GGHH)*. Recycling is considered one of the best practices of healthcare waste management. However, there are challenges with regards to separation of waste and getting the appropriate service providers. According to Haslam and Waterson (2013), some of the important aspects to consider when recycling includes, human characteristics, behaviour, performance, and human relations with technology. In general, South Africa produces more than 65 million tonnes of hazardous waste annually, of which only 6% is recycled (Linnenkoper, 2019). The feasibility of healthcare waste recycling is depended on efficient waste separation from a point of generation. In most cases separation involves physical handling of the waste, and this causes a lot of accidents. Healthcare facilities in uMgungundlovu district are still trying to find a service provider who is going to sort the waste before it goes to landfills so they can dispose that material which is not recyclable and put everything that is recyclable in specified containers. Now they are only sorting waste papers for recycling.

According to the study findings, uMgungundlovu district has only two hospitals which are part of the Global Green and Healthy Hospitals (GGHH). As described in the previous chapter the GGHH is a global network of hospitals, health-care institutions, health-care systems, and health-care organizations committed to lowering their environmental footprint and boosting public and environmental health. (GGHH, 2018). At each healthcare facility there is a GGHH trained officer who is responsible for managing healthcare waste. This initiative is good as it focuses on reducing waste production, making use of treatment technologies which are environmentally friendly, and safe disposal of health care waste. It will be ideal if all the hospitals in the district could become a member of the GGHH.

However, the involvement of government in reducing the carbon footprint was reported to be lacking, while this is considered indispensable to achieve sustainable development in the healthcare waste sector. It appears the government support is lacking in terms of healthcare waste management not only in KZN but across South Africa. According to literature the problem is not unique to South Africa alone; most developing countries face challenges when it comes to healthcare waste management. This could be attributed to lack of resources, poor management of available resources and lack of transparency in administration (Zafar, 2019)

Stakeholders in uMgungundlovu district has different levels of influence when it comes to the development of sustainable HCWM policies. According to the study findings the Department of Environmental Affairs (DEA) has the highest level of influence in South Africa as a country. This is consistent with what is reported in other studies (Olaniyi et al, 2018). However, when it comes to the development and enforcement of a National Policy to guide the management of medical, the Department of Health should be on the forefront (Olaniyi et al, 2018). In KZN, the Health Environment directorate within the provincial health department has the mandate of developing or reviewing all health care waste policies.

Non-governmental organizations they aid hospitals by ensuring that they take responsibility and accountability of their waste. Some of their activities include assisting

hospitals with proper segregation according to waste categories and ensuring that infectious waste does not end up affecting the environment and harming people.

When applying the Ecological Systems Theory, the HCWM in KZN is influenced at all levels of the theory that is., macro level (*international policy*). Through the Global Green and Healthy Hospitals (GGHH, best practices in healthcare waste management are shared through this network of international hospitals (GGHH, 2018) and these are indispensable in policy development. The exo-system level (*national policy*), the Department of Environmental Affairs (DEA) develops the policies for waste management in the country and the KZN Department of Health develops its policies guided by the national policy from the DEA. The meso-system (*stakeholders' level*) this is where all stakeholders in healthcare waste management fit-in, for example the NGOs who are ensuring that the healthcare facilities are accountable and compliant with the policies and regulation in healthcare waste management. Finally, there is the micro-system which is the healthcare facility level. The management of healthcare facilities takes part in the development and review of healthcare waste management policies. However, poor coordination at the provincial level is a challenge as they do not have the knowledge of what should be done when it comes to policy development (Hangulu, 2016).

Some of the challenges associated with green healthcare waste management that have been identified in this study include:

*Improper segregation of infectious and non-infectious waste from the point of generation*

The initial step in the healthcare waste management cycle is the most critical step as it defines the ultimate amount of waste that will be treated and disposed. To avoid a build-up of healthcare waste at the point of generation, there is a need to designate storage areas within each of the wards and a central storage site for all the wards inside the health facility where they can be provisionally stored while waiting to be transported offsite (Vumase, 2009).

*Ignorance and negative attitude among health care workers*

Healthcare workers who are implementing the green strategies in healthcare waste management are not trained. However, there are some workers who have a negative attitude towards the management of healthcare waste because they feel it is not their responsibility.

#### *lack of budget*

In general, the department of health is currently constrained by issues of budget, which have led to vacant positions at a district level and in hospitals. The lack of budget goes a long way to hinder recycling initiatives. However, in some cases it is matter of prioritizing other issues by those who control budget.

#### *staff shortages*

Findings show that shortage of human capital as a challenge that constrains proper waste collection within the health care facilities. It was reported that at district level there are no waste management coordinators and that the district was supposed to formulate recycling policy which they could not do because they did not have the skill and capacity to do it.

#### *Unclear service provider contracts*

It was reported that there are inconsistencies on how the healthcare waste service providers charge hospitals in KZN as the contracts do not indicate how much they are supposed to charge. Contracts are issued at a provincial level and the challenge is that the contracts are not regularly reviewed and there are some disputes over the new contracts. This has resulted in hospitals being ripped off, as they pay too much money, and it discourages hospitals to reduce volumes of infectious waste. Moreover, it makes proper segregation pointless as the waste is not weighed but taken per box.

The limitations of this study should be put into consideration when interpreting the findings of this study. Although the study sought to explore the sustainable strategies that exist in the HCWM sector from the stakeholder's perspectives, there are stakeholders who declined to be part of the study making it hard to understand the state

of sustainable strategies from other facilities and stakeholders. furthermore, the fact that the study was not conducted in all facilities and institutions that were initially planned for, this limited the study in fully exploring the state of HCWM in uMgungundlovu district.

## **6.2 Conclusion**

The chapter provides a discussion to the study findings in relation to the Ecological Systems theory as well as compared the current study findings with the previous studies. The following chapter will be the conclusion and recommendation based on the study findings.

## CHAPTER SEVEN

### Conclusion and Recommendations

#### 7.1 Conclusion

Stakeholders agreed that in general, the Department of Environmental Affairs is the custodian of waste management policies, however, the Department of Health is responsible for developing healthcare waste policies. Thus far, health facilities have adopted recycling of general waste which still runs at ad hoc basis because there is no general waste policy. The Global Green Healthy Hospital initiative is suggested as having potential to provide technical support to Department of Health in reducing waste production, advocate for recycling and develop policies that promote green strategies.

Global green healthy hospital emphasizes proper separation of waste from the point of generation to reduce waste that goes for treatment. They recommend that if waste is properly segregated, non-infectious waste like general waste can be recycled and can be prevented from going to dumping sites. However, they note that for that to be successful there must be a policy for recycling general waste that will give uniform standards on how to recycle and provide reference on how to effectively manage recyclable general waste effectively.

Study findings shows that at each healthcare facility there is a GGHH trained officer who is responsible for managing healthcare waste. This study thus concludes that having a GGHH is a good idea as it focuses on reducing waste production, making use of treatment technologies which are environmentally friendly, and safe disposal of health care waste.

This study also conclude that Non-governmental organizations aid hospitals by ensuring that they take responsibility and accountability of their waste. This is so as some of their activities include assisting hospitals with proper segregation according to waste categories and ensuring that infectious waste does not end up affecting the environment

and harming people.

This also concludes that the department of health is currently constrained by issues of budget, which have led to vacant positions at a district level and in hospitals. The lack of budget goes a long way to hinder recycling initiatives. However, in some cases it is matter of prioritizing other issues by those who control budget.

## **7.2 Recommendations**

To ensure that waste is effectively managed from health facilities, it is suggested that each health facility should have an environmental health practitioner as a policy enforcer within the facility, who will do baseline assessment to identify where is the facility lacking in terms of managing waste and ensure that there are standard operating procedures for all waste management steps. The environmental health practitioner will also constantly monitor waste management practices and provide trainings for staff on a regular basis.

Interventions aimed at facilitating and supporting healthcare waste reduction are needed, most importantly there is a need for government to develop policies from national, provincial, and local level to guide sustainable strategies on HCWM. It is also suggested that consensus and effective communication among all stakeholders involved with health care waste management must be built for a better health care waste management to happen.

Researchers need to engage in ecological approaches which put emphasis on the additional importance of relations between the systems that a person interacts with.

The ecological systems theory assumes that, when a person or group is connected and engaged in a supportive environment, the functioning of that person or group also improves which for this study involves different stakeholders being involved in waste management as has also been noted by Mischo, (2014).

This macro-system level assisted in reviewing and providing an understanding of the international policies that regulate HCWM. The review of international policies is

necessary to determine how the policies are developed, who is responsible for the development of these policies and the contexts in which they were developed. Exploring international policies governing healthcare waste management is therefore critical in understanding the context and how such policies influence the development of policies within the South African context.

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## **APPENDICES**

### **Appendix 1: Introductory letter to the participants and consent form**



#### **INTRODUCTORY LETTER TO THE PARTICIPANTS**

Good morning/afternoon, my name is Sibongiseni Xulu. I am Psychology student at the University of KwaZulu-Natal, 4041, Pietermaritzburg, South Africa. I am conducting a study on green strategies for medical waste/health care waste in hospitals. The findings will assist policy makers in designing policies aimed at greening the economy in the healthcare sector. Dr Akintola Olagoke and Dr Lydia Hangulu are my supervisors. I would like to speak to you only if you agree to speak to me.

The discussion will take about 40 minutes to one hour. You will be asked about the green strategies that are there in the health care sector with regards to medical waste/health care waste and its management, the kinds of challenges that you perceive, causes of the challenges and the kinds of strategies that are used to deal with the challenges. I will need your permission to use audio-tape recorders to capture the discussion. All information that you give will be kept confidential and my supervisor's offices. Information will be used for research purposes only and raw data will be destroyed after five years. Also, we will not

use your actual name or designation in reporting the findings of the study but will use disguised names to make sure that no one links the information you will give us to you. You will not be given any monetary payments for participating in the study but your organisation, communities and the government will benefit from this study immensely.

Your participation in this study is voluntary and you have the right not to participate if you do not want to. If you agree to take part in the study, you may sign an informed consent form as an indication that you were not forced to participate in the study. Please note that you will not be at any disadvantage if you choose not to participate in the study. You may also refuse to answer particular questions if you don't feel comfortable answering them. You may also end the discussion at anytime if you feel uncomfortable with the interview. In case you want to withdraw information that is given after the interview, you can call my supervisor Dr Lydia Hangulu on 0733356091 or Email me on: [Hangulul@ukzn.ac.za](mailto:Hangulul@ukzn.ac.za)

Yours Sincerely,

Sibongiseni Xulu

#### **CONSENT FORM**

I have read the information about this study and I have understood the explanations of it given to me verbally. I have had my questions concerning the study answered and I understand what will be required of me if I take part in this study. I hereby agree to take part in this study.

Signature

Date

**Zulu version**

Mina, Sengifundile mayelana nokuquthwe inhlobo noma ngiyaqonda izincazelo zenhlobo njengoba ngazisiwe futhi ngachazelwa ngazo ngomlomo. Isiphenduliwe imibuzo yami ngalenhlobo, ngakho ngiyaqonda ukuthi yini ebhekeke kimina uma ngiba ingxenywe yalenhlobo.

Signature

Usuku:

## **Appendix 2: Interview guides**

### **INTERVIEW GUIDES FOR POLICY MAKERS FROM THE DEPARTMENT OF HEALTH, ENVIRONMENTAL AFFAIRS AND OTHER HEADS OF THE DEPARTMENT OR THOSE IN CHARGE OF FORMULATING HEALTHCARE WASTE MANAGEMENT POLICIES**

#### **WORK EXPERIENCE**

- How long have you worked in the organisation?
- What does your work entail?
- What is your role when it comes HCWM/medical waste?

#### **COLLABORATING PARTNERS**

- Which departments or institutions do you work with?
- Why do you work with these departments or institutions?
- When did you start working with these departments?
- How do you ensure that there is collaboration among these departments or institutions?
- What challenges do you face when working with these departments or institutions?
- What are the causes of the challenges with these departments or institutions?
- How do you solve these challenges?
- What kind of challenges do you face within your own department regarding issues with regards to medical waste?
- What causes these challenges?
- How do you solve these challenges?
- How best you think these challenges can be resolved?

#### **KNOWLEDGE ABOUT POLICES AND GREEN STRATEGIES**

- What are the names of the policies that are there so far for health care waste/medical waste management?
- What instigated/caused the development of these policies?
- What do they say about recycling of medical waste/HCW
- What do they say about using technologies that are good for the environment when it comes to treatment and disposal of medical waste/HCW
- In your own view, how adequate are the policies for HCWM/medical waste?
- What is making them adequate?
- What is making them inadequate?
- What could be improved with the policies regarding health care waste/medical waste?

#### **PROCESSES INVOLVED IN THE FORMULATION OF POLICIES FOR HCW/MW**

- What processes are involved in developing policies for HCWM/medical waste?
- In your own view, who or which department has more influence in the formulation of the policies for medical waste management? Why?
- How much influence do you have in developing these policies compared to other departments?
- Why do you have this kind of influence?
- What are the challenges that you face when developing policies for HCWM/medical waste?
- How do you deal with the challenges?

- How do you feel about how these challenges are dealt with?

**WHO ARE RESPONSIBLE FOR IMPLEMENTING THE POLICIES?**

- Which department or institutions are in-charge of implementing the policies for HCWM/medical waste?
- What processes are there to ensure that the policies are implemented?
- What challenges are there with regards to the implementation of these policies?
- What could be the cause of these challenges?
- How do you deal with these challenges?
- In your own opinion, what are the best ways of dealing with these challenges?

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**(ii) INTERVIEW GUIDE FOR CEOs AND MANAGERS OF HOSPITALS AND OTHER HEALTHCARE FACILITIES**

**WORK EXPERIENCE**

- How long have you worked in the organizations?
- What is your role when it comes HCWM/medical waste?
- What does your work entail?

**KNOWLEDGE ABOUT POLICIES AND INVOLVEMENT WITH THEIR FORMULATION**

- What policies do you use as a guide when it comes to health care waste/medical waste management in these health care facilities? (provide names)
- Who is responsible for developing these policies?
- How much influence do you have with the formulation of these policies?
- In your own opinion, what processes are involved in developing policies regarding HCWM/medical waste?
- What instigated/caused the development of these policies?

**GREEN STRATEGIES FOR HEALTH CARE WASTE/MEDICAL WASTE MANAGEMENT**

(a) Green procurement (hospital supplies)

- What plans have you put in place in this hospital for buying supplies that are recyclable?
- What caused the development of these plans for purchasing the supplies that are recyclable?
- Who is responsible for implementing these plans in this hospital?
- How do you ensure that these plans are implemented?
- What challenges do you face with their implementation?
- What challenges do you have with your suppliers?
- How do you deal with these challenges?
- In your opinion, how best can these challenges be addressed?

(b) Recycling of health care/medical waste

- What facilities do you have here in the hospital for recycling of healthcare waste/medical waste?
- List all waste that is recycled here in this hospital?
- Why do you or not have any?
- What made you to come up with the recycling facilities?
- Who supplies you with these facilities?
- What challenges do you have with the suppliers?
- Who else is responsible for making sure that medical waste is recycled within the hospital?

- What challenges do you face with the recycling facility?
- How do you deal with the challenges?
- In your opinion, how best can these challenges be addressed?
- (c) Segregation of health care/medical waste
  - How do you ensure that medical waste is properly segregated in this hospital?
  - What challenged do you face with regards to segregation of medical waste in this hospital?
  - What is the cause of these challenges?
  - How do you deal with the challenges?
  - In your opinion, how best can these challenges be addressed?
- (d) Storage of health care/medical waste facilities
  - What challenges do you face with regards to storage facilities for medical waste in this hospital?
  - What is the cause of these challenges?
  - How do you deal with the challenges?
  - In your opinion, how best can these challenges be addressed?
- (e) Transportation of health care waste
  - What transport facilities do you have within the hospital for transporting medical waste to the storage facilities?
  - Who is responsible for transporting medical waste within the hospital?
  - How do you ensure that medical waste is properly transported within the hospital?
  - What challenges do you face with transportation of medical waste in the hospital?
  - How do you deal with these challenges?
  - In your opinion, how best can these challenges be addressed?
  - Who is responsible for transporting medical waste outside the hospital?
  - What challenges do have with the transporters outside the hospital?
  - How do you deal with these challenges?
  - How best can these challenges be addressed?
- (f) Treatment of health care/medical waste
  - What treatment facilities do you have within the hospital?
  - How do these facilities work?
  - Who is responsible for ensuring that waste is properly treated within the hospital?
  - What challenges do you face with treatment of medical waste within the hospital?
  - What causes these challenges?
  - How do you deal with the challenges?
  - In your opinion, how best can these challenges be addressed?
  - Who is responsible for treatment of medical waste outside the hospital?
  - What challenges do face with the people incharge of treating the waste?
  - How do you deal with these challenges?
- (g) Disposal of health care/medical waste
  - Who is responsible disposing medical waste in your hospital?

- How do you ensure that medical waste is properly disposed of?
- What challenges do you face with the disposal of medical waste?
- What are the causes of these challenges?
- How do you deal with the challenges?
- In your opinion, how best can these challenges be addressed?

#### **TRAINING OF STAFF ABOUT MEDICAL WASTE MANAGEMENT**

- How do you ensure that staff are trained about medical waste management?
- How often is the training offered?
- What is involved in the training?
- How do you ensure that the staff implement what they are taught?
- What challenges do you have regarding training?
- How do you deal with these challenges?

#### **COLLABORATION WITH OTHER INSTITUTIONS OR DEPARTMENTS**

- Which other departments or institutions do you partner with regards to HCWM/medical waste?
- What is the role of these departments or institutions?
- What challenges do you face regarding your partnership with these institutions or departments?
- What could be the cause of these challenges?
- How do you deal with these challenges regarding your partnership?
- In your own opinion, how best can these challenges be dealt with?

## **QUESTIONS TO ASK WASTE MANAGEMENT CONTRACTORS**

### **WORK EXPERIENCE**

- How long have you worked in this company?
- What is your role when it comes HCWM/medical waste?
- What does your work entail?
- How long is your contract?
- What processes are involved in obtaining the tender?
- What challenges do you face with the tender process?
- How do you deal with these challenges?

### **KNOWLEDGE ABOUT POLICIES AND INVOLVEMENT WITH THEIR FORMULATION**

- What guidelines or rules do you follow while doing your work?
- What do these rules say about your work?
- Who is responsible for developing these rules?
- How much influence do you have in developing these rules?
- How do these rules assist you with your work?
- In what ways do the rules not assist you?
- What challenges do you have with the rules?
- What is the cause of these challenges?
- How do you deal with the challenges?

### **GREEN STRATEGIES FOR HEALTH CARE WASTE/MEDICAL WASTE MANAGEMENT**

#### **(h) Green procurement**

- What supplies do you have that are recyclable?
- Who is your supplier?
- Why did you decide to use products that are recyclable or not?
- What challenges do you have with your suppliers?
- How do you deal with the challenges?
- In your opinion, how best can these challenges be addressed?

#### **(i) Recycling of health care/medical waste**

- What facilities do you use for recycling medical waste?
- Where are these facilities located?
- Who operates these facilities?
- How do you feel about how these facilities are operated?
- What challenges do you face with these facilities?
- What causes these challenges?
- How do you deal with the challenges?
- In your opinion, how best can these challenges be addressed?

(j) Segregation of health care/medical waste

- How do you ensure that medical waste is properly segregated?
- What challenges do you face with regards to segregation of medical waste in general?
- What is the cause of these challenges?
- How do you deal with the challenges?
- In your opinion, how best can these challenges be addressed?

(k) Storage of health care/medical waste facilities

- What storage facilities do you have for medical waste management?
- What challenges do you face with regards to storage facilities for medical waste?
- What is the cause of these challenges?
- How do you deal with the challenges?
- In your opinion, how best can these challenges be addressed?

(l) Transportation of health care waste

- What transport facilities do you have for transporting medical waste?
- What challenges do you face with transportation of medical waste from the hospitals?
- How do you deal with these challenges?
- In your opinion, how best can these challenges be addressed?

(m) Treatment of health care/medical waste

- What treatment facilities do you have for medical waste?
- Where are they located?
- Who is responsible for operating these facilities?
- What challenges do you face with treatment facilities for medical waste in general?
- What causes these challenges?
- How do you deal with the challenges?
- In your opinion, how best can these challenges be addressed?

(n) Disposal of health care/medical waste

- Who is responsible for disposing medical?
- What disposal methods are there for medical waste?
- What challenges do you face with the disposal of medical waste?
- What are the causes of these challenges?
- How do you deal with the challenges?
- In your opinion, how best can these challenges be addressed?

## **TRAINING OF STAFF ABOUT MEDICAL WASTE MANAGEMENT**

- What kind of training is offered for medical waste management?
- How often is the training offered?
- What does the training entail?
- How easy is it to implement what is being taught?
- How hard is it to implement what is being taught?
- What challenges do you have regarding training?
- How do you deal with these challenges?

## **COLLABORATION WITH OTHER INSTITUTIONS OR DEPARTMENTS**

- Which other departments or institutions do you work with, with regards to HCWM/medical waste?
- What is the role of these departments?
- What challenges do you face regarding your partnership with these institutions or departments?
- What could be the cause of these challenges?
- How do you deal with these challenges regarding your partnership?
- In your own opinion, how best can these challenges be dealt with?

## **QUESTIONS TO ASK GROUNDWORK AND OTHER NGOs WHO HAVE INTEREST IN HCWM**

- What does your work entail?
- What is your role when it comes HCWM issues?
- Which departments or institutions do you work with?
- Why did you choose to work with these departments or institutions?
- What is the role of these departments or institutions?
- What kind of issues have you had regarding medical waste or HCWM?
- How have you been handling these issues?
- How much influence do you have when it comes to developing policies for medical waste/ HCWM?
- In your own view what processes are involved in developing policies for medical waste or HCWM?
- In your own view, how adequate are the policies for medical waste or HCWM?
- What is making the policies adequate or inadequate?
- How inadequate are the policies?
- What are the challenges do you face when advocating for proper medical waste or HCWM?
- How do you deal with these challenges?
- What can you recommend with regards to medical waste/HCWM?
- What is your comment on the health care waste that is illegally dumped or buried by waste handlers?

**Appendix 3: Approval from the research committee**

**Appendix 4: Approval letter from the district**



