



ASSESSING THE COMPLIANCE TO LEGISLATION PERTAINING TO MANAGEMENT AND DISPOSAL OF CONSTRUCTION AND DEMOLITION WASTE

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DECLARATION

I Olubanke Olubukola Olusanya, student number 1006180, hereby declare that this thesis, submitted for the MSc in Construction Project Management at the University of Witwatersrand, Johannesburg has not been presented to any other university or institution for any degree. All references are appropriately acknowledged.


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ABSTRACT

Construction and Demolition (C&D) waste generation is a universal problem and available landfill space is reducing as landfills reach capacity. Despite the huge effect of construction and demolition waste on the environment, there has been very little research on legislation around waste, and it is therefore increasingly important that compliance with legislation pertaining to management and disposal of construction and demolition waste be assessed.

This study explored departmental awareness of the Waste Act in the City of Johannesburg municipality and also in the utility Pikitup, and assessed how the Act has been able to reduce waste. Qualitative data collection techniques in the form of unstructured interviews were used to interview 4 persons in the City of Johannesburg legal department, and 3 persons in the Pikitup department.

The challenges and barriers the municipality faces due to the ineffectiveness of the relevant legislation were assessed to gain insight into difficulties with compliance. In addition, the study evaluated the effectiveness of the enforcement strategies that have been used. The results revealed that there is little or no awareness of the legislation so it is difficult for construction site workers to apply it effectively in their waste management activities. In addition, the results exposed a need for a review of the Waste Act as it applies to smaller construction firms and also renovation works, since it was found that it is impracticable for smaller companies to comply effectively with the legislation.

All in all, this research sheds more light on the legislation and its purpose, and also on the reasons why it has been quite difficult to achieve compliance with this legislation in the construction and demolition sector. The research will enable useful recommendations for the municipality and also potentially raise awareness of the importance of legislation within the construction community.

Key words:

Construction waste, Creation, Disposal, Legislation, Management,

DEDICATION

This research is dedicated to God Almighty, my source of life and wisdom, for enabling me to carry out all aspects of this research successfully, since without Him I can do nothing. It is also most gratefully dedicated to my awesome parents, Dr Sijibomi Boyejo Olusanya and Mrs Olusola Olusanya, for allowing God to use them as a support system financially, spiritually, and emotionally.

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LIST OF ACRONYMS

CBO	Community based organizations
CIOB	Chartered Institute of Building
COJ	City of Johannesburg
DEA	Department of Environmental Affairs
EHSA	Environmental Health & Safety Act
EIA	Environmental Impact Assessment
EMI	Environmental Management Inspectors
GWCS	General Waste Collection Standards
IP &WMP	Integrated pollution & waste management policy
IWMP	Integrated Waste Management Plan
JMPD	Johannesburg Metro Police Department
KPI	Key Performance Indicators
NEMA	National Environmental Management Act
NEMWA	National Environmental Management Waste Act
NGO	Non- Government Organization
OECD	Organization for Economic Co-operation and Development
WMO	Waste Management Officers
SWOT	Strength, Weakness, Opportunity, and Threat.

CHAPTER ONE: INTRODUCTION

1.0 INTRODUCTION

This chapter provides the background to this study. It explores waste management practices, associated challenges and existing legislation for the management of construction waste in South Africa. Furthermore, the chapter discusses the research problem, aim, research objectives, scope, and research questions. The proposed structure of the report is set out in the concluding section of this chapter.

1.1 BACKGROUND TO THE STUDY

Globally, the construction industry has been faced with many challenges. (Nagapan et al., 2012; Huabo et al., 2015). The quantum of waste generated on construction sites has continued to increase in recent times. Some of the reasons for this are: increased population, with ever greater demands for housing development and commercial buildings; design errors, which cause negative handling of materials; and inappropriate procurement methods (Yeheyis et al, 2013). This has in turn impacted on the time and effort of workers without adding much value to the client (Nagapan et al., 2012). In addition, several studies have examined the negative impact of construction and demolition waste on the environment (Nagapan et al., 2012; Rodriguez et al, 2015; Gangolells et al, 2014; Nahman and Godfrey, 2010). According to Nagapan et al, (2012), the construction waste generated in the European Union amounted to 859 million tonnes in 2008, while in Spain there was no reliable statistic for construction and demolition waste in the 2008 – 2015 Spanish waste plan. An estimate of 45 million tonnes of construction and demolition waste was given out in 2008 and 39.27 million tons in 2012 in Spain (Nagapan et al., 2012; Gangolells et al., 2014). Various measures were put in place to address the issues of construction and demolition waste in China (Wang et al., 2013),

including: the introduction of prefabricated structures; the use of precast concrete, considerations in architectural design; economic incentives; and investing in waste minimization activities (Badwin et al., 2009; Wand et al., 2013). A range of factors and strategies were explored in order to provide project managers and designers with information on how to address the issues of construction waste in their practice.

Nahman and Godfrey, (2010) opined that South Africa has had a history of incoordination in construction and demolition waste management and this has resulted in problems such as illegal dumping, a lack of sufficient programs and practices for recycling or minimizing waste, lack of legislation enforcement, and limited legislation related to construction and demolition waste in the first place.

The rapid population growth within Johannesburg is increasing the rate at which waste is being generated (CoJ IWM Plan, 2011) and thus putting huge pressure on the level of services the city can provide (CoJ IWM Plan, 2011; Zaman, 2014). This has brought about problems like “limited landfill space, a culture of littering and illegal dumping, lack of buy-in to waste minimization initiatives from communities and increasing costs of waste management and disposal” (CoJ IWM Plan, 2011). The CoJ IWM Plan (2011) also expanded on the reasons for some of the problems the city is facing, for example: the limited recovery of raw materials for reuse; the problems that can be caused by separation at source; lack of coordination and lack of awareness of recycling strategies in local areas; few or no legal facilitators and little or no enforcement of waste minimization and recycling principles. In addition, very few private firms participate in the waste minimization programmes (Yuan, 2011) and there are no concentrated programmes at schools and in communities. Instead of roaming the streets, becoming a drag on the economy or getting involved in crime, young people in the communities who are not in school could be made aware of the potential for diverting waste

from landfills for recycling. Creating job opportunities for them in this sphere would help empower them, reduce the crime rate and boost the economy (CoJ IWM Plan, 2011).

Another issue is that the relevant bylaws are not aligned with the current challenges experienced by the City of Johannesburg. Also there are no stringent measures in place for responding to non-compliance with the regulations, which enables nonchalant attitudes and behaviour among construction workers (CoJ IWM Plan, 2011). Furthermore, the information data base on the amount of waste generated is very inaccurate, since the available data are drawn only from the relatively few individuals that are willing to dispose of their waste appropriately to licensed waste disposal companies, while others opt for the services of unlicensed companies in order to reduce costs. Thus the genuine process of planning and executing programmes has been compromised (CoJ IWM Plan, 2011).

The construction industry has become increasingly aware that managing waste during the construction process is crucially important, given the high rate of growth and urbanization in the economy of today. While the industry has increased efforts to reduce waste, construction sites remain a major source of waste and pollution, impacting adversely on the environment. It is highly probable that construction waste will be passed on as a liability to future generations (National Waste Management Strategy, 2010). Gangolells et al. (2014) identified the various negative environmental impacts of construction waste as “soil alteration, resource consumption (i.e. land area), and water emissions”.

The National Waste Management Strategy was established as a result of the problem of waste in the environment and became a legislative requirement of the National Environmental Management Waste Act, 2008 (Act No. 59 of 2008), also referred to as the “Waste Act”. The Waste Act was established to give organization to the ways by which waste can be effectively classified in order to avoid problems associated with such aspects as recycling, the process of treatment of the waste, disposal, and also the time frames within which construction and

demolition waste should be managed. The duties of waste generators, transporters and managers of construction and demolition waste are clearly stated in the Act, but statistics have shown that the amount of waste generated still needs to be reduced. Thus the question lingers as to how effectively this legislation is implemented with regard to the management and disposal of construction and demolition waste. This concern has motivated the present study focused on “assessing compliance with legislation pertaining to management and disposal of construction and demolition waste”.

1.2 STATEMENT OF PROBLEM

The City of Johannesburg produces 1.4 million tons of waste of which 13% is waste from construction and demolitions (The city of Johannesburg, 2006; 2012 National Waste Information Baseline Report). Furthermore, the National Waste Management Strategy (2010) emphasized that *“the growth in waste volume is projected to rise to nearly 67 million cubic metres and rapid growth throughout the country is seriously outstripping the capacity of most cities to provide adequate waste services for their citizens”*. It further explained that *“over the next 50 years, South Africa’s population growth will be almost entirely concentrated in urban areas, and if adequate waste management policies and practices are not implemented, cities will be overwhelmed by their own [burgeoning amount of] waste, seriously affecting the quality of life of all citizens”*.

The National Waste Management Strategy (2010) stated that because of this anticipated increases in waste size and population, the health of the people is at stake as there could be an increase in disease, a resulting decrease in productivity and also a downturn in the economy. Also, a failure to address this waste would seriously sabotage global development goals (goal 11 & 12 of the sustainable development goals –SDGs- in particular) and harm the environment irreparably (United Nations [UN], 2015; United Nations Environmental

Programme [UNEP], 2015). Preventing this near drowning of whole population centres by waste requires the enactment of effective legislation that is well enforced in managing the waste produced, especially from events that are common to cities like constructions and demolitions. The legislation of a country plays a very crucial role in proper organization of the country and with the increasing negative effect of construction and demolition waste in urban South Africa, it is obvious that there is a lack of relevant legislations to minimize such wastes and existent legislations are not adequately effective. In investigating such a gap between legislation and observed waste situation, previous works like the city of Johannesburg Integrated Waste Management Plan (IWMP) have identified some challenges in managing construction and demolition wastes due to the absence of policies that encourages the separation of construction and demolition waste at source (on site) and also indicated that there are limited landfills to process such wastes. Pikitup (2010) noted several problems that affect waste minimization in South Africa, including: the lack of an effective, workable waste management plan; the increasing cost of waste management and disposal; and poor knowledge of the legislation around effective waste management. But there has not been a comprehensive study focused on the city of Johannesburg to investigate the role of effective legislation in minimization of waste. As such, this study fills that gap by assessing the compliance with legislation pertaining to the management and disposal of construction and demolition waste practice in Johannesburg. All in all, there is a crucial need to understand the enforcement of current legislation on management and disposal of waste, because this process focuses awareness on the importance and effectiveness of the legislation itself.

1.3 RESEARCH QUESTIONS

1. What existing legislations impact upon waste minimization?
2. To what extent are the existing waste management legislations implemented?

3. How effective are those legislations in optimizing waste management practices?
4. What are the barriers to enforcement of Construction and demolition waste management practices enshrined in the legislations?

1.4 AIM OF THE STUDY

The main aim of the study is to assess compliance with legislation pertaining to the management and disposal of construction and demolition waste.

1.5 RESEARCH OBJECTIVES

With the increasing problems of waste in the economy the consequences of ignoring these waste issues are increasing and this research will look at some important factors that can help the minimization of waste.

The objectives of this study are to:

- Identify the relevant legislation pertaining to management and disposal of construction and demolition waste.
- Assess the effectiveness of the legislation on management and disposal of construction and demolition waste on construction sites.
- Assess the barriers to enforcement of waste management practices as defined in the legislation on management and disposal of construction and demolition waste.

1.6 RESEARCH SCOPE

Johannesburg is a rapidly developing South African city where the many construction works in progress are increasing the waste generated from sites and thus causing problems for the environment. The South African government has developed waste management strategies but have yet to give significant focus to construction and demolition waste. This study considers

the ways in which construction and demolition waste can be minimized. The findings will assist the construction industry to understand the importance of legislation and how it can be effectively implemented and monitored.

1.6.1 Delineation

This study focuses on assessing compliance with legislation pertaining to management and disposal of construction and demolition waste. It assesses the enforcement strategies that have been put in place by the City of Johannesburg municipality and evaluates the barriers faced by the City. The Pikitup organization was involved in the research process as they are responsible for handling the generated waste. Similarly, the waste management legal department in the City of Johannesburg were involved because it is their responsibility to enforce the legislation and ensure that all waste management practices are aligned with it.

The key waste legislation evaluated is:

- National Environmental Management: Waste ACT, 2008 (ACT NO.59 OF 2008) (Waste classification and management regulations). This legislation deals with construction and demolition waste generation on site, and also the measures by which this waste must be handled on site.

1.6.2 Assumptions

Sorting of waste at source helps to increase the percentage of recovery of waste materials for reuse and recycling.

According to the National Waste Management Strategy (2010) “Separation at source is an important means to both improve the quantity of recirculates, and reduce waste sent to landfill”. Separation at source will also result in a better quality of recirculates in terms of lower contamination levels. The government intends to pilot measures to implement

separation at source over the next five years in the paper and packing industry through the implementation of the Industry Waste Management Plan, with a view to rolling out a successful system country-wide (National Waste Management Plan 2010). This process will have little impact on municipal waste collection capacity requirements, whilst meeting recycling objectives. There will be a higher volume of recycled products if waste is separated at source, and in order to ensure that demand meets supply, measures will have to be applied to stimulate the market for recycled product. Markets could be developed by industries for recyclable material with the support of the government (National Waste Management Strategy 2010).

Enforcement of legislation can reduce waste creation.

An example of where legislation has had a positive impact in the reduction of waste is Ireland. The rapid growth in the economy in Ireland brought about a decision to create the Environmental Protection Agency and also the Office of Environmental Enforcement as an entity tasked to look into the problems waste had caused in the environment, such as illegal dumping and disposal of the wrong type of waste at the landfill. The Office of Environmental Enforcement established an enforcement network through collaboration with a number of inter- agency groups and other networks in order to attend to the economic problems and also to the rise in the landfill levy which had increased the illegal dumping of waste in the environment, as well as the limited availability of landfill areas due to excess waste (Gottsche 2012). Penalties were put in place to shock people into correct, compliant behaviour. For example, section 13 (2): “a person convicted of an offence under sub-regulation (1)(a) is liable to a fine not exceeding R10 million or to imprisonment for a period not exceeding 10 years, or to both such fine or such imprisonment” and also section 13(3): “a person convicted of an offence under sub-regulation (1)(b) is liable to a fine of 20,000 or to imprisonment for a period not exceeding 1 year or to both a fine and such imprisonment” (National

Environmental management: waste ACT, 2008 (ACT NO.59 OF 2008)). It was assumed that if these penalties were not enforced as stated, there would be an increase in the nonchalant attitude and behaviour of the waste generators.

Adherence to the legislation and implementing a waste management strategy can contribute to waste reduction and environmental sustainability.

The National Environmental Management Act (2010), described as the Waste Act, interprets and describes the purpose of the regulations which are reviewed every five (5) years. The regulations give a broad framework of the various waste management activities and principles as well as the procedures put in place to dispose of waste properly in the landfills. The regulations also establish the time frames for various actions that should be carried out, from the waste generation stage to the disposal stage. Furthermore, they provide a basis for other environmental legislation. The environment and the people inhabiting it are both taken into consideration as the rights and protection of the people must be respected and the waste must not be harmful to the welfare of the environment (National Environmental Management Act, 2011).

1.7 RESEARCH METHODOLOGY

In order to achieve the research objectives and also answer the research questions appropriately the study adopted a qualitative approach. Members of the City of Johannesburg legal department, which stands as the enforcer of legislation, and of the Pikitup organization as the implementers of the legislation, were deemed the respondents necessary for this research. This selection was made from the understanding that these respondents would have a working idea of the legislation and the processes involved and would also be conversant with legislation on managing waste appropriately. Primary and secondary data were obtained in order to address all the issues. The primary data were obtained by using interviews within

the framework of a qualitative approach and the secondary data were obtained by perusing documents from the legal department and also the Pikitup department. The data were analysed using a narrative method.

1.8 LIMITATIONS

Limitations are obstacles that hinder or limit findings.

The following were limitations of this research:

- Due to time constraints the research was limited to Johannesburg and thus the results cannot readily be generalized to the rest of South Africa.
- This research was limited to the Waste Management Legal Department in the City of Johannesburg Municipality and the Pikitup organization.
- A limited number of published journals deal with assessment of the relevant legislation or policies.

1.9 ETHICAL CONSIDERATIONS

Ethics are behavioural standards that guide individuals on how to conduct themselves when (for example) collecting data from respondents. The researcher needs to ensure that the respondents are not deprived of rights such as the following: the respondents have the right to accept or decline the research; they must not be forced to provide any information against their will; they must be safe from harm; and they have the right to remain anonymous (Saunders et al 2012: Babbie, 2013).

The ethical issues identified by Mitchell and Jolley (2010) guided the researcher throughout this study. Each respondent was given a consent letter which offered a brief explanation of the research, and ethical issues such as getting consent from the respondent, and respondents' rights to privacy and to honesty on the part of the researcher were taken very seriously.

Respondents were free to stop the interview at any time, or to turn down any request related to their involvement in the study, since they were not bound by any law to involve themselves. Furthermore, interview questions were formulated in an ethical manner taking into consideration all the necessary issues of honesty, right to privacy, validity and reliability.

1.10 RATIONALE AND SIGNIFICANCE OF STUDY.

Following from the City of Johannesburg integrated waste management plan (2011), a number of challenges are identified in this document. These challenges include: illegal dumping of construction and demolition waste; insufficient propagation of the programmes for recycling this waste; lack of enforcement of legislation; outdated by-laws; limited landfill space; and also inaccurate information data based on the amount of waste generated. Furthermore, Godfrey and Nahman (2010) confirm the history of lack of organization in construction and demolition waste management in South Africa which has brought about the issues identified above.

With this observation in view, it can be generally acknowledged that there are ongoing problems with waste. This research identifies the construction waste that is generated on site, explores current waste management practices, identifies problems associated with these practices and proffers solutions for managing waste. The legislation that is already in place is evaluated in order to determine how it can be used to create practicable waste management practices on site. By increasing the body of knowledge around waste management, this study will thus help to create awareness of the importance of the legislation and the positive impact that enforcement of the legislation will have on the environment and economy at large.

1.11 STRUCTURE OF THE REPORT

This research report contains five (5) chapters as follows

Chapter one: Introduction

This chapter gives a brief introduction and background to the research and explains the purpose of the research.

Chapter Two: Literature Review

This section provides a review of relevant literature from reliable authors and sources which address the subject matter of the study and exposes the gaps in current research.

Chapter Three: Methodology

This chapter describes the research design that was appropriate for answering the research question and addressing the research objectives. It describes the research approaches and methods of data collection followed in the study, considering questionnaire structure and discussing the population and the sample size best suited for the survey.

Chapter Four: Findings and Data Analysis

This chapter discusses the findings and offers interpretation and analysis of the findings in the light of the research methodology used.

Chapter Five: Conclusion

This chapter offers a summary of the findings, addresses the research questions and objectives in the light of the findings and considers the contribution the study makes to the existing body of knowledge. Furthermore the chapter explores the limitations of the research and offers recommendations for further studies.

Chapter one has shown that the problem exists in the management of construction and demolition wastes from the construction industry sites, and it requires urgent attention.

Literature reviewed has proven that implementation of legislation and policies on waste management remain a global challenge. The next chapter examines policies and legislation on construction and demolition waste across the world and in South Africa

CHAPTER TWO: LITERATURE REVIEW

2.0 INTRODUCTION

This literature review follows the form of a ‘narrative’ or ‘traditional’ literature review in that it summarizes a large volume of literature from previous studies and also draws conclusions on the subject area that has been explored (Cronin et al 2008).

The review begins by critically reviewing previous definitions of waste, and exploring the generation of construction waste and its social, economic and environmental impacts. It also provides a critical review of the development of various bodies of legislation and/or policies on waste and waste disposal, in both global and national contexts, and the waste hierarchy that has developed as a result of the problems of waste creation is also discussed. A conceptual framework/model is drawn to give direction and focus to the study. All this will be done by first gaining an understanding of the different legislation put in place for proper disposal of generated waste and also see if such legislation is being enforced.

2.1 METHODOLOGY OF LITERATURE REVIEW

To gain in-depth knowledge of research literature around waste generations and legislation, the method used in this study was to find secondary data relevant to waste management practices in different contexts, exploring on the one hand how construction and demolition waste were being generated and the general impact of this waste according to three (3) factors (that is, economic, social and environmental aspects); and on the other hand examining various bodies of waste legislation, both global and national. This was achieved by developing four key words as a guide for the research. The key words include “*Construction waste*”, “*demolition waste*”, “*global legislation*”, “*national legislation*”.

This approach helped to focus the study. In addition, inclusion and exclusion criteria were used and not all the data collection involved using the four key words search strategy. Several other aspects were taken into consideration: firstly, the language restriction - all the secondary data had to be in English. Secondly, the sources used had to be recent and within the time span of five years (i.e. 2010 to 2015). Thirdly, the search engines used had to be geared to academic research. The research problem was investigated using the following sources:

- Academic Journals
- Conference papers
- Books written by key/expert authors
- Government and organizational reports
- Theses.

The data was obtained from various search engines in order to gain a relatively objective picture of what most authors perceive as a problem in previous studies of waste management. Furthermore, it was ensured that all journals used were up to date and had relatively sound research methodology. Most of the journals were found from the Google scholar, Sage journals, Emerald, EBSCOHOST, Elsevier and Taylor and Francis databases. A small proportion of the study focused on material from conference papers because much of the literature in conference proceedings remains unpublished or rigorously peer-reviewed. However, this focus did help with obtaining the latest research in the field in terms of waste management. Again, the study made minimal use of books. Books assist the researcher in gaining a general or theoretical understanding of the various authors' findings. However, the disadvantage of using books is that they may be out of date. Corporate reports were looked at in order to get an understanding of what is trending in the industry in terms of waste management practices; this strategy has increased the body of knowledge to a great extent.

There is a limited amount of published data that assesses compliance with legislation. Considering that waste has been a source of problems in many economies and is increasing due to the rise in population, there is a need to understand what legislation says about this waste and whether it has been able to control the creation and subsequent handling of waste appropriately.

2.2 DEFINITIONS OF WASTE

Construction waste has been defined as *“Building debris, rubble, earth, concrete, steel, timber, and mixed site clearance materials, arising from various construction activities including land excavation or formation, civil and building construction, site clearance, demolition activities, roadwork, and building renovation”* (Shen et al, 2004).

The Waste Act (2008) introduced a definition of waste which has major implications for those activities that have traditionally not been treated or regarded as waste-related. Importantly for industry, waste products and waste-related activities that fall outside the definition of waste are able to avoid the provisions of the Act.

The Waste Act defines waste as *“any substance, whether or not that substance can be reduced, re-used, recycled and recovered, that is surplus, unwanted, rejected, discarded, abandoned or disposed of, which the generator has no further use of for the purposes of production, that must be treated or disposed of, or that is identified as a waste by the Minister by notice in the Gazette, and includes waste generated by the mining, medical or other sector* (National Waste Management Strategies, 2010).

Furthermore, waste can be defined as *“materials that are not prime products (that is products produced for the market) for which the generator has no further use in terms of his/her own*

purposes of production, transformation or consumption, and of which he/she wants to dispose” (OECD/Eurostat, 2005).The Basel Convention, (1992),&EAP, (2002) “ defined waste as substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law”.

The Organisation for Economic Co-operation and Development (OECD) state that; *“A waste ceases to be a waste when a recovery or another comparable process eliminates or sufficiently diminishes the threat posed to the environment by the original material (waste) and yields a material of self-sufficient beneficial use” (OECD, 1998).*

Construction waste, which is classified under general waste, and is defined as *“waste, excluding hazardous waste, produced during the construction, alteration, repair or demolition of any structure, and includes rubble, earth, rock and wood displaced during that construction, alteration, repair or demolition” (DEA 2012).* Also Zhang et al (2012) defined construction waste as anything generated as a result of construction activity and then abandoned, regardless of whether it has been processed or stock piled. For example, surplus materials from site clearance, excavation, construction refurbishment, renovation, demolition and road works.

Nagapan et al. (2012), further defined construction waste as *“any material by-product of human and industrial activity that has no residual value.”* These authors also classified construction waste into two groups, physical and non- physical waste.

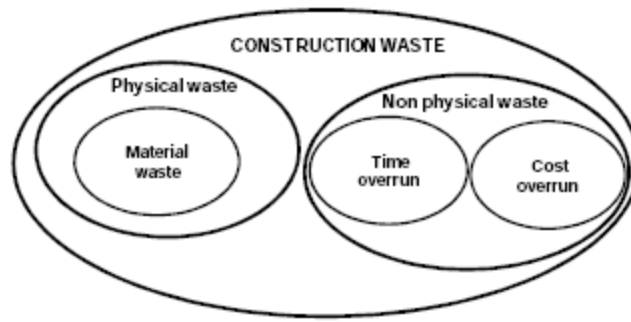


Figure 2.1 Classification of Construction Waste. (Nagapan et al., (2012))

Physical construction waste: this is waste material arising from construction, renovation works, and demolition activities such as land excavation and land formation, civil and building construction, site clearance, road works and building renovation.

Non-physical waste: this also arises from the construction process, but in the form of time and cost overruns. Researchers have noted that waste should not be seen only from the physical perspective but also the non- physical, such as waiting time and delays. These forms of waste can be seen when there is inefficiency as a result of inadequate equipment, materials, labour and money. Furthermore, waste can be experienced from overproduction of materials, waiting time, poor material handling, inventories and unnecessary movement of workers. These forms of waste are often disregarded. (Nagapan et al., 2012).

Construction waste is waste generated from newly constructed buildings and therefore takes the form of either newly recycled products or freshly manufactured products. Demolition waste, on the other hand, accounts for more than 10 times the waste generated from construction and consists of materials that have been mixed together. Demolition waste might come from a building that has undergone some painting and use of adhesives, and has been exposed to dirt, as in waste generated from renovation works, and also waste generated by the demolition of road and bridges. Furthermore, separation of materials from demolition waste can be very difficult (Huabo et al., 2015).

Yuan et al (2011) affirm that construction/ demolition waste is waste generated during construction work on site or demolition processes on site. Construction and demolition waste accounts for the largest percentage of waste overall, by now being eight (8) times larger than municipal solid waste. According to Poon et al. (2001), these forms of waste can be categorized into five (5) groups: roadwork material, excavated soil, demolition waste, site clearance waste and renovation waste.

Construction and demolition waste are waste such as concrete, wood, metals, plaster board, cardboard, plastics asphalt, and mixed site debris such as soil and rock. Studies have been done on how these wastes affect the environment, economy and society.

This research will use the definition supplied by Zhang et al., (2012) who stated that waste can be classified into two types: inert waste materials, “soil or mud, concrete, reinforced concrete, asphalt, brick or sand, cement plaster or mortar aggregate, and rock or rubbles” (Zhang et al., 2012). The first type of construction waste contains no more than 20% by volume, or 30% by weight, of inert materials. The second type of waste consists of more than 20% by volume, or 30% by weight, of inert material.

2.3 GENERATION OF CONSTRUCTION WASTE

Problems associated with construction and demolition waste have increased in the past decade due to waste generation that has been on the rise and is due in turn to the increase in population which has raised the number of buildings being constructed (Calvo et al., 2014). The hazardous nature of this waste has not been the only reason for environmental problems; lack of proper waste treatment and disposal at landfills are also responsible (Calvo et al., 2014).

Nagapan et al., (2013) conducted research on construction sites and found that construction waste was mainly timber, metal, concrete, mortar, packaging waste and bricks. Construction

waste is made up of solid waste which is *inert waste*: this is rejected waste that does not react to biological, chemical, physical or radiological transformations and does not decompose. Examples of inert waste are sand, bricks, blocks, steel, concrete debris, and tiles (Nagapan et al., 2012 and Yuan, 2013). *Non-inert waste* is waste that decomposes and undergoes chemical, biological or physical transformations. Examples of non-inert waste are paper, plastic, bamboo, glass, wood, vegetation and other organic materials (Nagapan et al., 2012 and Yuan, 2013). From Yuan's viewpoint these inert waste materials can be disposed of at public filling areas so that the land can return to its previous state. Furthermore, observations showed that timber waste was the largest form of waste generated from the site; next were bricks, packaging waste and concrete. Yuan (2012) opined that 25% of virgin wood and 40% of raw stone, gravel and sand are used by the construction sector globally every year, while 40% of materials are also consumed by the construction industry.

Many researchers have come up with causes of waste on construction sites, including the following: poor attitudes to work; poor supervision; lack of an effective waste management plan; mistakes in estimation of work; poor quality of materials; mishandling of materials; and poor material storage (Nagapan, 2013; Nagapan et al., 2012; Yunpeng, 2011; Liatas, 2011). Nagapan et al. (2012) also pointed out that some other factors such as design, operational, procurement and material handling activities caused generation of waste, including time and effort waste that in turn resulted in loss of materials and delay in project and work delivery.

Research is therefore needed on ways of reducing waste at project level, and previous studies show that there are some variables that allow or inhibit waste generation: these include the design stage, investment in waste management, government regulation, space constraints on site, construction technology and also the waste management culture in the organisation. Making changes in design when construction is already ongoing has been seen to be a large generator of waste. Up to 33 per cent of construction waste can be related to the project

design (Osmani et al., 2008). Studies carried out by Esin and Cosgun (2007) and Jaillon et al. (2009) have shown that waste production can reduce to a large extent if low waste construction techniques such as off-site fabrication and modularization can be implemented.

These problems with waste and proper disposal have brought about the creation of the National Waste Management Strategy. The strategy is a legislative requirement of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), hence referred to as the 'Waste Act'. This legislation was put in place to dictate how waste can be managed or properly disposed of. The National Waste Management Strategy is not aimed at completely eradicating waste, which would not have been feasible in terms of the waste hierarchy. Rather, it aimed at "eliminating the use of raw materials, ensuring sustainable product design, resource efficiency and waste prevention", emphasizing the reuse of products and recycling to gain value. The problem of waste management is universal and cannot be approached by one person or a single institution, therefore the National Waste Management Strategy cannot on its own hope to achieve its vision without the input of a wide range of stakeholders in South Africa.

2.4 SOCIAL, ECONOMIC AND ENVIRONMENTAL IMPACT OF CONSTRUCTION AND DEMOLITION WASTE.

There are economic, environmental and social impacts of construction and demolition waste on any economy (Ye, 2012).

2.4.1 Economic Perspective: The impact of the economic influence on the environment or society includes the cost of collection, separation and sorting of the waste; equipment purchase costs; economic benefits from management of construction waste; landfills costs, profits derived from recycled waste (Ye et al., 2012; Yuan. 2013).

2.4.2 Environmental impacts include: loss of natural environment when virgin land is used for new landfills or there are extensions or enlargement of already created landfills; raw material extraction increased for new construction products; poor quality of air from demolition activities that cause an increase in dust and noise levels; and waste water from landfill items entering into soil and groundwater (Ye et al., 2012). Furthermore, Gangolells et al. (2014) also identified environmental problems arising from construction and demolition waste materials as: “resource consumption, local issues, transport issues, effects on biodiversity, incidents, accidents and potential emergency situations, and waste generation”(Gangolells et al., 2014).

2.4.3 Social impacts include: firstly, congestion on confined sites, which is generally not given due attention and affects the performance of workers on site mentally and healthwise. Some of these sites do not have storage facilities for materials or equipment (John et al., 2012), which could create accidents on site as the equipment is left unprotected in the working areas, and workers become impatient towards their duties due to the choked environment. Other social impacts of construction and demolition waste are frequent legislative changes (that is, when legislation is changed after a very short period of time). Sometimes implementation processes have not been fully executed when new legislation comes on board. This could cause disorganization of the whole site management process (Yuan, 2013). On the other hand, a good approach to waste can also impact positively on society. This includes increased job opportunities and/or training opportunities, the reshaping of the local built environments; and community involvement (Ye et al., 2012).

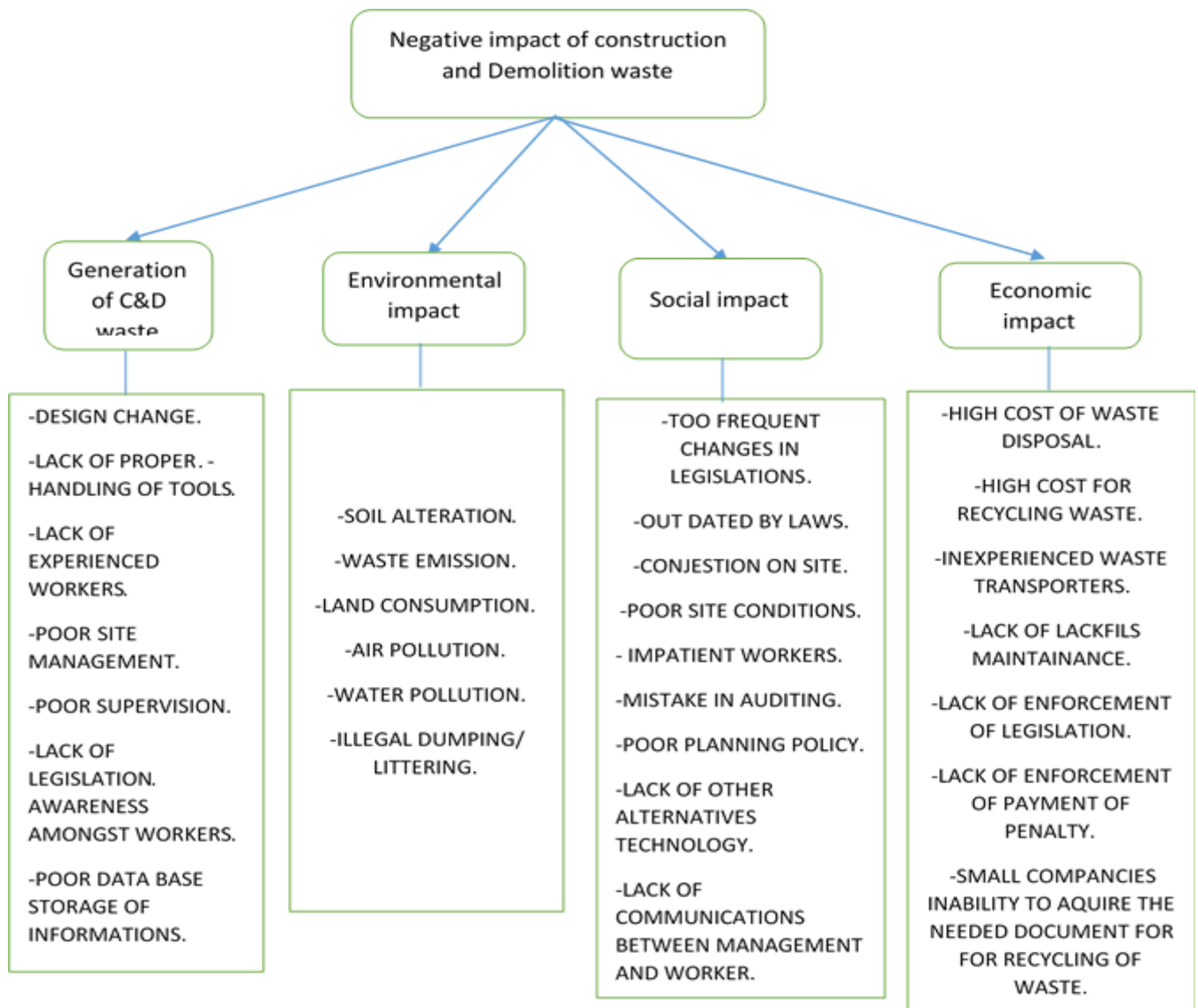


Figure 2.2: A framework diagram showing the negative impact of construction and demolition waste (Yuan., 2013)

There has been much research on current waste management, and researchers have come up with many ways of implementing waste management practices, but a lot of these practices are applied after waste has been generated (Udawatta, 2015), while some research is focused on minimizing waste and prolonging the life cycle of the landfill. However, much waste can be avoided if workers and stakeholder on site change their perspectives towards waste (Udawatta, 2015). The CIOB (2012) discussion group noted that a site waste management plan is an essential tool which helps businesses make records of produced and actual

resources used and also waste generated on the construction site. The involvement of every worker in the construction project is very important because each must have a role to play in order to properly implement the site waste management plan. Also the enforcement of legislation is very important as it offers a good guide to how waste can be effectively minimized without disturbing the environment. The National Environmental Management Act (NEMA) states that: *the State must respect, protect, promote and fulfil the social, economic and environmental rights of everyone and strive to meet the basic needs of previously disadvantaged communities; inequality in the distribution of wealth and resources, and the resultant poverty, are among the important causes as well as the results of environmentally harmful practices.*

It is important to understand both the global legislation and the local legislation which offer guiding principles for effective waste management strategy.

2.5 CONSTRUCTION AND DEMOLITION WASTE MINIMIZATION IN THE GLOBAL CONTEXT

The 1960s saw a massive increase in waste dumping worldwide, in a situation where environmental waste could generally be dumped on empty fields without any caution or control (UN Habitat, 2010). This meant that waste could be present in the air through bush burning and evaporation of chemicals and also in water through water pollution affecting natural water flowing from rivers or streams (Medina, 2002). Due to lack of knowledge, little or no regard was paid to the waste issue and the resulting build-up of waste began to affect the health of children, causing sicknesses and disease. It therefore became necessary to control the rate at which waste was building up and modern states began to seek and find ways to reduce the disposal of waste by creating means of minimizing it. This development brought about the standards that help control the rate of pollution created by waste. Gradually, different types of waste began to be recognized and measures were created for dumping of

this waste (UN Habitat, 2010). Countries with high income were able to create standards for waste disposed to landfills and could move on to address other aspects of waste minimization, but low income countries are still struggling to manage illegal dumping of waste across their cities. When landfills are properly controlled it improves a country's state of health and environment. In 1963 the United Kingdom did an exploratory investigation into new ways to frame tendering documents in order to control and minimize waste (Ndiokubwayo & Haupt, 2009: 2). Various studies in many parts of the world have by now contributed to ensuring waste is minimized.

In the European context, Saez et al. (2015) aimed at quantifying the increase or decrease in waste being generated in residential construction. The behaviour of construction workers on site was assessed using social cognitive theory, in order to determine their attitude towards waste. The outcome of that study indicated that workers and stakeholders on site were not sufficiently concerned about waste, which rendered the waste-minimization strategies ineffective. The study by Gottsche (2012) aimed at implementing a site waste management plan, using medium sized building contractors in Ireland as a case study. The conclusion of the research showed that the level of increased waste on landfills is a serious cause for concern as construction activities consume large amount of resources and construction activities have adverse effects on sustainable development. The study conducted in Spain (Saez et al., 2013) discusses the dynamic model for construction and demolition waste management, acknowledging the increase in construction and demolition waste activities which has led to an increase in construction and demolition waste. This research also identified that the problems of landfill spaces getting filled up has been causing problems in the environment. The study further enlarges understanding of the socioeconomic implications of waste management and the advantages of policies on recycled aggregates. Liatsas (2014) drew a conceptual model of analytical expression which can be used to quantify the amount of

waste generated, where the amount of waste generated is so high that there are difficulties in quantifying it accurately.

There are many Asian studies on waste management, including that of Poon et al. (2010) on reducing building waste at construction sites in Hong Kong. This research was able to identify that waste can be reduced from the design stage of a project, although designers do not generally attend to the issue of waste generation. Yuan (2013) addressed the key indicators for assessing the effectiveness of waste management in construction, thus helping to underline the importance of waste management policies and plans.

In China, Wang et al. (2014) looked at the critical factors in effective construction waste minimization at the design stage and found that many factors can influence effective construction waste minimization design, while also indicating that there are few studies on waste minimization at the design stage of construction. Zhang et al. (2012) noted the environmental impact of construction waste as a major problem and indicated that there are various low waste technologies available for implementation in developing construction projects across different stages. Another Chinese study made a SWOT analysis, using an explorative and qualitative research methodology to examine the problems of waste. It identified the need for the construction industry to analyse waste issues, and helped stakeholders to clarify their understanding of both the internal and external conditions of waste management in construction (Yuan, 2013). A Korean study discussed identifying and assessing factors which improve waste management performance for building construction projects (Cha et al., 2009). This researcher undertook a pilot study using quantitative research methods based on a questionnaire survey. The pilot test obtained findings on poor waste management performance in current practice using four (4) different perspectives: manpower, material, method and management, thus clarifying issues faced by project practitioners in finding a way to prevent pollution and waste.

In the study conducted in Australia by McDonald and Smithers (2010), a case study method was used to discuss implementation of a waste management plan during the construction phase of a project, on the understanding that if construction waste is reduced, then other waste streams will reduce, and showing that contractors have a major role to play during the construction phase in managing waste effectively.

Another study from Australia by Lehmann (2011) focused on optimizing urban material flows and waste streams in urban development through the principle of ‘zero waste’ and sustainable consumption. The research found that problems with mass consumption of resources cause global warming, material depletion and enormous waste generation. “The findings of the research is that embedding zero-waste requires strong industry leadership, new policies and effective education curricula, as well as raising awareness (through research and education) and refocusing research agendas to bring about attitudinal change and the reduction of wasteful consumption”(Lehmann, 2011).

Some African studies were conducted in Nigeria and Ghana. The Ghanaian study looked at awareness of sources of construction waste and local strategies used in minimizing it (Adjei-kumi & Zoya Kpamma, 2011). The study in Nigeria found that the majority of construction companies used the waste plan only at the tender stage but few firms considered using it at the pre-tender stage. When implemented in the construction phase the waste management plan produced more effective performance than in projects where problems with equipment, labour and time generated waste. Nahman’s (2010) study investigated “Economic instruments for solid waste management in South Africa: Opportunities and constraints”, identifying the opportunities and constraints associated with implementing economic instruments in South Africa in the light of concerns at the lack of monitoring of illegal dumping and also lack of enforcement capacity at municipal level. Structured and semi-structured interviews were used

and almost all respondents opined that economic instruments should be implemented to reduce landfill waste and recycle it for reuse. Matete (2008) also looked at ‘zero waste’ and his findings showed that this approach would be beneficial to the environment and save on landfill space while also improving the economy.

In conclusion, the findings of most of these studies, while specific to particular countries or cities, show that there are still waste problems all over the world. At the same time, only one study focused squarely on policy, which thus emerges as a gap, indicating that in further studies such as the present one, it will be important to propose the legislative route.

2.6 WASTE LEGISLATION IN THE EUROPEAN CONTEXT

Construction and demolition waste has been a huge contributor to environmental problems in most developed countries. According to the European Union, about 900 million tonnes of construction waste are generated every year, which has a huge impact on the environment and contributes to pollution and greenhouse gas emissions which also in turn contribute to climate change, while considerable loss of materials also occurs. This is caused by the rapid rise in access to hi-technology products which include tough, dangerous materials, plastics and precious metals (European Union, 2010). Furthermore, this alarming increase in waste is also connected to the high consumption rate of short life-span products. Much modern equipment and products are disposable within a short period of time (European Union, 2010). The challenges posed by waste also include the large amount of hazardous waste generated; therefore the European Union is seeking to ensure that waste materials that will be hazardous to the environment are reduced and the use of certain chemicals is banned (European Union, 2010).

2.6.1 European community strategy for waste management 1989

The first policy on waste set out by the European Commission to the European Community Strategy for Waste Management of 1989 (SEC (89) 934 Final 1989) is a document that helps to give major direction to the European waste policy.

The waste hierarchy concept was first developed by the European Union Waste Directive in 1975 and the European Commission's Community Strategy for Waste Management in 1989. The waste hierarchy puts prevention as the highest priority, with reduction following prevention, after which reuse and recycling follow and, finally, disposal. The main standpoint of the hierarchy is to get the fullest, most effective use of all parts of a product and then generate the minimum amount of waste possible.

2.6.2 Council Directive 91/156/EEC Amending Directive 75/442/EEC on Waste.

This document is aimed at encouraging and making sense of processes for reusing and recycling raw materials, with the following specific objectives: reducing the amount of waste produced; ensuring that such waste is not harmful to the environment; and recycling waste properly to enable recovery of some minor raw products.

2.6.3 Waste framework directive 2006/98/2008 EC

In 2008 a review of the waste framework directive reversed the directives of 2006, directive 75/439/EEC and 91/689/EEC with regard to hazardous waste and oil. The reviewed document aimed at providing a waste prevention concept and definition.

In March, 2011 the waste framework directive 2008 was entered into Irish law. Concepts and definitions relating to managing waste were adopted from the document: for example, definitions of *waste*, *recycling*, and *recovery*. It explains what can be termed *waste* on the one

hand and *secondary raw product* on the other, as well as how to distinguish between *by-products* and *wastes*.

2.6.7 International review of Waste Management Policy 2009

This document discusses the recovery of construction and demolition waste as reported by the Environmental Protection Agency at 72 per cent, with a clear difference between recovery of soil and stones (81 per cent) and that of other materials (44 per cent). Recommendation 6 of the report outlines the target rates for construction and demolition waste. These are: 2010 - 75%, 2012- 80%, 2014- 85%, 2016- 90%.

The site waste management plan will be mandatory within the parameters set out in the Planning and Development Act 2000; recommendation 7 of the report states also that the plan should pursue the following target: 80% in 2011, 85% in 2012, 90% in 2014, and 92% in 2016. (DoEHLG, 2009).

The European legislation has been obliged to look into the enforcement of waste legislation because of the high rate of the landfill levy and also the negative effect of waste on the economy. Companies could be tempted to dispose of their waste illegally to save the cost of the landfill levy and, similarly, illegal waste operators could accept waste at a cheaper rate and dump it illegally. In such cases, the environment is put at risk (Gottsche, 2012).

2.7 WASTE LEGISLATION IN SOUTH AFRICA.

The problems of construction and demolition waste have increased in the past decade. With the rise in population, building construction has increased and higher levels of waste generation have resulted (Calvo et al., 2014). Environmental problems have followed, because not only is the waste hazardous in itself but there is also a lack of proper waste treatment and disposal at landfills (Calvo et al., 2014). These problems have led to the creation of the

national waste management strategy. The strategy was formed as a requirement of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), later known as the 'Waste Act'. This legislation was put in place to dictate the manner in which waste can be managed or properly disposed of. The National Waste Management Strategies are not aimed at completely eradicating waste (which would not have been feasible by means of the waste hierarchy), but rather “eliminating the use of raw materials, ensuring sustainable product design, resource efficiency and waste prevention”, and thus emphasizing reuse and recycling to gain value from products. Further, the problem of waste management is universal and cannot be approached by one person or just a single institution, therefore the National Waste Management Strategy cannot on its own hope to achieve its vision without the input of a wide range of stakeholders in South Africa.

The National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) is reviewed every five years, and all requirements and actions provided for in the Act are to be strictly followed through the five year period as and when they fall due. The Acts interpret and explain the purpose of the regulations. According to the Waste Act 2013 section 2(1) some purposes are to

- (a) “regulate the classification and management of waste in a manner which supports and implements the provisions of the Acts” (National Waste Management Strategy, 2010).
- (b) provide methods and directions for identifying waste management activities that have no need for a waste management licence.
- (c) specify the appropriate methods and requirement for proper disposal of waste to landfills
- (d) provide timeframes for proper and efficient management of some types of waste
- (e) specify the duties of generators of waste, transporters of waste and landfill site managers with regard to proper disposal.

All these purposes are geared to help manage waste effectively, ensuring that the environment is free from harmful objects that could affect the health of individuals around the environment.

2.7.1 How the regulations are applied

According to section 3(1) (2) and (3): All provinces in the Republic of South Africa must follow the regulations: that is, all generators of waste, transporters of waste, landfill site waste managers, etc. These sections include specific instructions on how to apply the legislation, including the allotted responsibilities of everyone involved. However, the legislation deals only with those having anything to do with waste from project start to finish. This regulation is not applicable to other waste generators such as the domestic waste collected by a municipality. (Waste Management Act, 2013).

2.7.2 The framework for legislation

Outlined here are the major pieces of legislation and policies for both national and provincial levels of the City of Johannesburg while the existing legislative framework is also outlined in conjunction.

2.7.2.1 The national legislation

This includes:

_ “The Constitution of the Republic of South Africa (Act 108 of 1996), which sets out the environmental mandate as well the different roles and responsibilities of the different spheres of government”(Integrated Waste Management Plan, 2011).

_ “The National Environmental Management Act (NEMA), Act 107 of 1998 is a framework legislation which covers the broad environmental management principles. It forms the basis for all other subsidiary environmental legislation” (Integrated Waste Management Plan, 2011).

_ “The National Environmental Management: Waste Act (NEMWA), 2008 is a subsidiary act of the NEMA, which regulates the management of all waste within South Africa as well as defines the different roles and responsibilities of the different spheres of government while implementing this mandate” (Integrated Waste Management Plan, 2011).

_ “The National Health Act, (Act 61 of 2003) includes waste management as one of the functions of an Environmental Health Officer in terms of its explanation of ‘municipal health services’” (Integrated Waste Management Plan, 2011).

_ “The Municipal Structures Act (Act 117 of 1998) delineates powers and functions of different categories of municipalities. In terms of this Act, district municipalities have powers and functions relating to the integrated, sustainable and equitable social and economic development of the district” (Integrated Waste Management Plan, 2011). Further: “This role should be performed by ensuring integrated development planning for the district as a whole, building the capacity of local municipalities to perform their functions, exercising local municipal powers where capacity is lacking, and promoting the equitable distribution of resources between the local municipalities in its area” (Integrated Waste Management Plan, 2011).

_ “The Municipal Systems Act (Act 32 of 2000) defines the alternative approaches that may be employed in delivering municipal services and the processes to be followed when such alternatives are considered” (Integrated Waste Management Plan, 2011). The Systems Act has some emphasis on managing and achieving services delivery through both internal and external integrated planning and performance monitoring. The Act encourages communities to be involved in strategic decisions that will enable them to enjoy good service delivery.

2.7.2.2 Constitution and Legal Framework

The National Environmental Management: Waste Act 2008 (Act No. 59 of 2008), reviewed the law regulating waste management, ensuring that the legislative framework included and

integrated all the steps in the waste hierarchy. This helped to build on the environmental legislation in place since 1994. The environmental regulations and policy in South Africa were first constituted in 1996 (Acts 108 of 1996: the Constitution of the Republic of South Africa). Section 24 of chapter 2 of the Bill of Rights gives every South African or occupant the right to live in a secured environment, free of anything that is harmful to their health or well-being. These environmental rights underpin the environmental policy (the White Papers on Environmental Management and Integrated Pollution and Waste Management) and the law (principally the National Water Act; the National Environmental Management Act (NEMA) (National Waste Management Strategy, 2010). The National Environmental Management Act states that *“the State must respect, protect, promote and fulfil the social, economic and environmental rights of everyone and strive to meet the basic needs of previously disadvantaged communities; inequality in the distribution of wealth and resources, and the resultant poverty, are among the important causes as well as the results of environmentally harmful practices”*.

The waste hierarchy was put together by the White Paper on Environmental Management in South African environmental policy, which was accepted and legalized in National Environmental Management Act (National Waste Management Strategy, 2011). The waste hierarchy is a step by step approach to integrated waste management, that addresses “waste avoidance, reduction, re-use, recycling, recovery, treatment safe and disposal of waste as a last resort”(National Waste Management Strategy,2010:9) .

Some added guiding principles were introduced into South African environmental legislation by the National Environmental Management Act (2008), which includes “the life-cycle approach to waste management, producer responsibility, the precautionary principle and the polluter pays principle” (National Waste Management Strategy, 2010). Individuals are

required also to ensure that their surroundings are protected, and should also take it as their duty to ensure prevention of pollution and degradation, since the National Environmental Management Act will penalize any individual who causes pollution (National Waste Management Strategy, 2010). Implementation of the waste hierarchy must be taken seriously in order to protect the environment and public health, as “The Waste Act is echoing the duty of care provision by obliging holders of waste to take reasonable measures to implement the waste hierarchy whilst protecting the environment and public health” (National Waste Management Act, 2010).

According to Chapter five (5) of the National Environmental Management Act, applications of the environmental management tools are promoted to ensure their integration in the environmental management activities and also these help to “provide instruments for co-ordination and co-operation for integrated waste management” (National Waste Management Act, 2010). The Waste Act is highly important in the legal and policy framework in that it helps both in managing the waste sector and in regulating waste activities, between the three (3) spheres of government, the Act is based on the Constitutional assignment of legislative and executive powers (National Waste Management Act, 2010).

“The Constitution assigns concurrent legislative competence to national and provincial government in respect of the *environment* and *pollution control* (section 146 of the Constitution) and exclusive provincial legislative competence to the local government matters of *cleansing and refuse removal, refuse dumps* and *solid waste disposal*...The Constitution allows national legislation to provide for national norms and standards relating to these matters where national uniformity is required to deal effectively with an issue” (National Waste Management Act, 2010).

The foundation of the regulatory system that is established in terms of the Waste Act is the development of norms and standards, which must accord with the regulatory system; also, other ancillary matters may be developed in the process, so that norms and standards need to bear in mind some important sectoral legislation such as the national Environmental Management Act. Examples of such legislation are “Air Quality Act (No. 39 of 2004) and the Health Act, 2004 (No. 61 of 2003)”.

Provinces and municipalities have permission to develop standards provided they are not in conflict with national standards. The Waste Act establishes cooperative governance mechanisms for dealing with matters such as waste planning, appointment of waste management officers and performance reporting (National Waste Management Acts, 2010).

“National and provincial government departments are also constitutionally obliged to support municipalities in the execution of their functions” (National Waste Management Acts, 2010).

The Waste Act thus needs to be read together with the other bodies of legislation that regulate local government such as the Municipal Finance Management Act, 2003 and the Municipal Systems Act, 2000, which help in creating the framework for planning, budget control, delivery of effective service and reporting at the local government level due to the importance of municipal waste services (National Waste Management Acts, 2010). “There are some important overlapping provisions regarding waste services. For example, section 94(e) (ii) of the Municipal Systems Act allows the Minister to make regulations or issue guidelines for incentives and penalties to encourage the recycling of waste” (National Waste Management Acts, 2010). According to section 74(1) (h) of the Municipal Systems Act, “a municipal council must adopt and implement a policy on the levying of fees for municipal services provided by the municipality itself or by way of service delivery agreements”. The efficient usage of resources and the recycling of waste products is encouraged by the policy and other

environmental objectives. By-laws may be created to help municipalities provide for removal of waste in their areas.

It is essential to read the Waste Act in conjunction with other sectoral legislation. For example, “the Minerals and Petroleum Development Resources Act, 2002 section 39(3) (iii) states that Environmental Management Plans must comply with any prescribed waste standard or management standards or practices”. There are limitations to the application of the Waste Act – the Act is not applicable to: “radioactive waste, residue deposits and residue stockpiles, the disposal of explosives, nor the disposal of animal carcasses which are all regulated by their own sectoral legislation”.

Some amendments of the regulations have been issued by NEMA and this has enabled provision of a complete regulatory framework which can help the Environmental Impact Assessments (EIAs) perform well. Environmental Management Inspectors (EMIs) are also designated and appointed in terms of NEMA, and all these provisions together form the backbone of the compliance and enforcement system that is required to support implementation of the Waste Act. The designation of Waste Management Officers (WMOs) is stipulated in the Waste Act where an officer can be designated at a national, provincial and municipal level to be responsible for coordinating matters pertaining to waste management in the various tiers of government.

Some guidelines have been put in place and gazetted by the Department of Environmental affairs to enable both the industrial sector and the government sector to understand and interpret the application of the regulations.

2.7.2.4 National standards and regulations

_ The National Environmental Management, Waste Act (Act No. 59 of 2008) states that there are required standards to “give effect to the right to an environment that is not harmful to health and well-being of the people”.

_ “The Waste Information Regulations (Notice 430 of 2009) give effect to section 60 of NEMWA and regulate the procedure and criteria for the submission and processing of applications to register on the national Waste Information System (WIS)” (Integrated Waste Management Plan for the City of Johannesburg, 2011).

2.7.2.5 National policies and strategies

The Integrated Pollution and Waste Management Policy (IP&WM): there has been some historic fragmentation on the environmental legislation regarding pollution. The IP&WM Policy must ensure integration of pollution control. This policy was part of the building blocks in the development of NEMWA.

_ “National Waste Management Summit: Polokwane Declaration: This declaration was adopted in 2001, and states optimistically that the goal is to reduce waste generation and disposal by 50% and 25% respectively by 2012 and to develop a zero waste strategy by the year 2022” (Integrated Waste Management Plan 2011).

_ “National Waste Management Strategy: The strategy is binding on all organs of state in all spheres of government and will be reviewed every five years. The targets as currently set in this strategy for the year 2015 are used as a bench mark for the targets set in this plan” (Integrated Waste Management Plan, 2011).

_ “National Cleaner Production Strategy: The National Cleaner Production Strategy has been formulated as a result of the Johannesburg Plan of Implementation for Sustainable Consumption and Production document”(Integrated Waste Management Plan, 2011). There was a strong emphasis in this strategy on minimizing waste, re-using waste and recycling

waste, especially within industry, and it is focused on preventive measures of creating waste rather than ‘end of pipe’ treatment (Integrated Waste Management Plan, 2011).

_ “Development of a core set of Environmental Performance Indicators: The purpose of the indicators is to provide Municipalities with a voluntary ‘toolkit’ to assess their performance in terms of the environment. Indicators of importance to this task include: waste generation rates, waste reduction, and waste services related issues” (Integrated Waste Management Plan, 2011).

_ Local Government Turnaround Strategy: The Department of Cooperative Governance and Traditional Affairs identified worrying trends undermining local government service delivery. In order to renew the vision of developmental local government, a turnaround strategy was devised to facilitate differentiated and targeted support to local government.

2.7.2.6 Provincial Legislation

It is the responsibility of each province to guide and direct this legislation appropriately.

_ “Gauteng Provincial Integrated Waste Management Policy: The Gauteng Provincial Guide has developed an appropriate legislative regime to support and enable the Gauteng IWM Policy, and to foster consistency between national, provincial and local waste management requirements, to foster capacity building and filling of gaps in existing waste management regulations and requirements. Key issues addressed in this policy include waste reduction and minimisation, recovery and recycling, collection and transportation, processing, treatment, disposal and Waste information” (Integrated Waste Management Plan, 2011).

_ “First Generation Integrated Hazardous Waste Management Plan for Gauteng: Factors that hinder Integrated Waste Management in the Gauteng province include lack of the following: proper coordination of recycling activities, separation at source including for hazardous waste, testing and analysis facilities, incentives and insufficient waste volumes and economy of

scale” (Integrated Waste Management Plan, 2011). There have been limited treatment facilities, capacity and access to the existing facilities.

Gauteng Provincial Standards and Regulation: the important documents relevant to this task are the “General Waste Collection Standards and Waste Information Regulations that the provincial government set in 2007 and 2004 respectively” (Integrated Waste Management Plan, 2011).

_ Gauteng General Waste Collection Standards: The General Waste Collection Standards (GWCS) have been developed to ensure the provision of consistent, uniform waste collection and cleaning services which are equitable, appropriate, environmentally and socially acceptable, to the communities in Gauteng.

_Waste information Regulations: The Gauteng Provincial Government promoted awareness of the Waste Information Regulations in 2004. This helped to guide the development of a Provincial Waste Information System. The Waste Information System is intended to be strictly adhered to, and also information on waste must be available to the public (Integrated Waste Management Plan, 2011).

2.7.2.7 Local level legislation

Waste by-laws: The existing City of Johannesburg waste by-laws are being revised currently. There should be a revision of the by-laws in order for the Constitution, principles of NEMA, and NEMWA to be effective. The by-laws must be clear and specific and must reflect the waste hierarchy very clearly, covering all aspects of waste management.

There are advantages to implementation of waste management strategies by municipalities, including job creation opportunities and economic improvement. The estimated total expenditure of the waste management sector is approximately R10 billion per annum. The collection and disposal of waste contributes to job creation and GDP, which can be expanded

further. An effective solid waste management strategy can contribute greatly to “environmental sustainability, economic development and poverty alleviation” (Integrated Waste Management Plan, 2011).

The Environmental Management Plan (2008) introduced some guidelines for integrated management for construction waste at local level. These guidelines support the following activities: the waste assessment, the waste plan, waste treatment, recycling, separation of materials; recycling and waste minimization; , on- site management; storage of building waste; auditing and control, transportation and disposal of waste..

1. The Waste Assessment: This allows a fuller understanding of the type and volume of waste generated per time in order to enable sound construction practice incorporating good measurement and analysis. These are now explained subsequently.

2. Waste Plan: A waste plan is necessary for the organization and effectiveness of the waste flow on site. The waste plan should be able to tackle problems of large volume waste disposal, alert to ways by which it can be reduced and also ways to reduce the cost of managing the waste, bearing in mind the environmental standards that must not be altered. The plan must recommend the recovery, re-use and recycling of waste. Construction waste management deals with reduction of waste going to the landfill site. Recycling is the best way to reduce waste. There are several opportunities that can be gleaned from construction waste: 80% of this waste is recyclable, for example, wood, concrete, bricks, metals, glass paint and so on. (Environmental Management Plan, 2008). The popular three basic steps to managing construction waste are *reduce*, *reuse* and *recycle*. *Reduce* can be construed as preventing waste through efficient and effective usage of materials, and this can be achieved through training, that is by developing the awareness and efficiency of workers handling these materials. *Reuse* means using materials that have already been used (not necessarily on the

same construction site) rather than discarding them. These materials could also be sold out or giving out to someone who needs them.

3. Waste Treatment: section 7(1) of the Act states that “waste must not be mixed or treated where this would (a) reduce the potential for re-use, recycling or recovery; or (b) result in treatment that is not controlled and not permanent”(Environmental Management Plan, 2008). Section 7(2) states that “notwithstanding Regulations 6(2) and 7(1), waste may be blended or pre-treated to (a) enable potential for re-use, recycling, recovery or treatment or (b) reduce the risk associated with the management of the waste” (Environmental Management Plan, 2008).

4. Recycling: This is converting a material into something else that could be used for another purpose and can be implemented by first separating the materials that can be recycled from the ones that cannot be recycled, and training workers to practice the on-site sorting of waste. Recyclable materials are, for example, “papers, cardboard, wood, metals, plastics, glass, paints, stains, solvents and sealants, oil” (Environmental Management Plan, 2008).

5. Separation of materials: On- site separation is a very effective means of separating waste materials appropriately according to their individual types; it is also a very easy method of separating construction waste because if wastes are disposed on the landfill site, it becomes very difficult to segregate the useful recyclable waste from the unusable. For this separation to be achieved containers should be placed in strategic locations on site and tagged appropriately. The containers should also be closely monitored to avoid employees are not carried away when disposing there waste. Caution should also be exercised with wastes that should not be exposed to rain, also according to clause 6 sub clause 2 of the National Environmental Management, Waste Act, 2008, “Waste must not be diluted solely to reduce the concentration of its constituents for the purposes of classification in terms of Regulation 4(2), or assessment of waste in accordance with the Norms and Standards for Assessment of

Waste for Landfill Disposal set in terms of section 7(1) of the Act”(Environmental Management Plan, 2008).

6. Recycling and waste minimization: Guidelines must be adhered to, to ensure minimization of material waste.

Wood: the design must be fitted to the material as accurately as possible in order to avoid off-cuts, and wood must be stored on level block and covered to reduce warping or twisting which may cause it to be treated as waste (Environmental Management Plan, 2008).

Metal: recycled metals should be separated accordingly, “metals like copper, piping, wire aluminium, iron and steel, nails and fasteners, galvanized roofing” (Environmental management plan, 2008).

Cardboard, paper and plastic: there should be less packaging materials and supplies, and if there is packaging it must be done properly to avoid damage and waste. The use of recyclable packaging should be advised and cardboards should be kept in a dry place to prevent them from getting destroyed (Environmental Management Plan, 2008).

Plastic: there are over 60 different types of plastic resins, divided into different categories. The plastic federation of South Africa have adopted a coding system for all categories of plastics to ensure easy sorting of material for recycling (Environmental Management Plan, 2008).

The coding systems are itemized in the table below.

Table 2.1: Plastic Coding system

ID NUMBER	PLASTIC RESIN TYPE
1.	PET (polyethylene terephthalate)
2.	HDPE (high-density polyethylene)
3.	PVC (polyvinyl chloride) or V (Vinyl)

4.	LDPE (low-density polyethylene)
5.	PP (polypropylene)
6.	PS (polystyrene)
7.	Other (laminates, etc.)

Source : Environmental Management plan, 2008.

7. On-site management: There should be good supervision of the waste management programme on site, and also regular check-ups on the organization of the on-site programmes and effective operation of these practices.

8. Storage of building waste: Section 6(2) of the Act requires that the waste must be well stored in clearly marked receptacles having the identity of the person in charge; also the receptacle must have reflectors fitted on it outlining the front and the back and should be covered at all times to avoid an unpleasant smelling and unhealthy environment.

Section 6(2) of the Waste Act states “Waste must not be diluted solely to reduce the concentration of its constituents for the purposes of classification in terms of Regulations 4(2), or assessment of the waste in accordance with the norms and standards for assessment of waste for landfill disposal set in terms of section 7(1) of the Act”. Section 6(5) of the Act states that “The waste management must not store waste for more than eighteen (18) months from the date of receipt from the waste generator” (Environmental Waste Management Plan, 2008).

9. Auditing and control: A successful waste plan should have some criteria or measures put in places such as the waste volume, cost of disposal, cost recovered from recycling etc. There must also be records of every event carried out on site. Examples of these are education and training sessions, educational needs surveys, also trends and benchmarks established for goal

setting and standards. All of these give accounts of progress or the success of a plan. As well as continuous adequate record keeping and control, the waste plan must be improved or adjusted either annually or every five years, depending on when required (Environmental Waste Management Plan, 2008).

10. Transportation and Disposal of Waste

(a) Transportation of waste

Section 22(1) states that no person is permitted to operate a vehicle conveying waste on public roads unless the vehicle is big enough to transport construction waste, also the vehicle must be maintained and be in perfect roadworthy condition, and when transporting material the vehicle must be well covered with a tarpaulin in order to prevent spillage on the road (Waste Management By-laws for the City of Johannesburg Metropolitan Municipality 2011).

(b) Disposal of waste:

According to the Waste Management By-laws for the City of Johannesburg Metropolitan Municipality 2011:

- (1) (a) Generated waste from municipalities must be disposed of with permission from the council.
- (b) The provisions of section 12(2) and other regulating laws for disposal of waste must be complied with by the licensee during disposal of waste.
- (2) There should be no burning of waste in public or private places for disposal purposes.
- (3) Incinerating of waste is prohibited anywhere else except in an incinerator.
- (4) Incineration of waste must be done only in an incinerator where the necessary permission is given or as assigned by the Council.
- (5) All disposal of waste at any disposal site, and all conditions imposed by the National Department of Water Affairs and Forestry are subject to condition by the council,

including hours of opening and closing, the nature of the waste to be disposed of, the position in which the waste will be placed and any other necessary matter, for the Council to ensure that the environment is sound and waste is properly managed.

(6) Every person entering the waste disposal facility must comply with the laws given, must enter through the right access point, and must receive instruction on all movement in the waste disposal facility.

(7) Liquors or intoxicating or narcotic substance are not allowed in a waste disposal facility; entrance into the waste facility is not allowed except on instruction by the person in charge or the Council.

As required in the Waste Act (No59 of 2008), the municipalities in South Africa must report their waste management practices and any information concerning waste must be reported to the National Waste Information System (NWIS) which should also have data on the “quantity and type or classification of waste generated, stored, transported, treated, transformed, reduced, re-used, recycled, recovered and disposed of” (Department of Environmental Affairs, 2012).

“The third national baseline (n.d) study reported that South Africa generated approximately 108 million tonnes of waste in 2011 with 98 million tonnes of that waste ending up in the landfill site (DEA, 2012). 59 million tonnes (55%) of the total waste is general waste, 48 million tonnes (44%) is currently unclassified, and about 1million tonnes (1%) is hazardous waste, while about 10% of the total waste was recycled in 2011” (Department of Environmental Affairs, 2012).

Table 2.2: The five broad categories of municipal solid waste

Biodegradable waste	Food and kitchen waste and green waste and paper, etc.
Recyclable Materials	Paper, glass, bottles, cans, metals, plastic, etc.
Inert waste	Construction and demolition waste, dirt, rocks, debris, etc.
Composite Waste	Waste clothing, polystyrene, waste plastics including toys, etc.
Domestic hazardous waste and toxic waste	Medication, paints, chemicals, light bulbs, fluorescent tubes, spray cans, fertilizer and pesticide containers, batteries, shoe polish, etc.

Source: (SAWIS 2014)

Four types of waste dominate the total general waste stream: non-recyclable municipal waste (35%), construction and demolition (C&D) waste (20%), organic waste (13%), and metals (13%) (DEA, 2012).

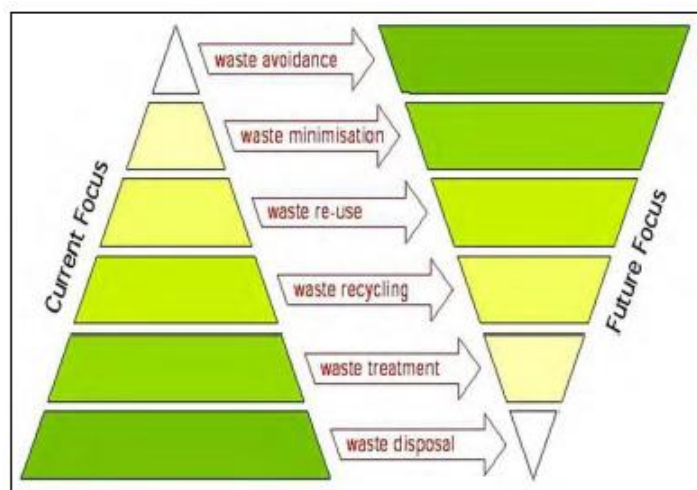
The DEA (2010) defined the waste hierarchy as a “systematic and hierarchical approach to integrated waste management, addressing in turn waste avoidance, reduction, reuse, recycling, recovery, treatment, and safe disposal of waste as a last resort”.

There are 5 waste management hierarchies:

- i) Waste prevention (reducing the waste).
- ii) Minimization
- iii) Re-use
- iv) recycling
- v) Disposal.

This hierarchy can be presented graphically as follows:

Figure: 2.3 Paradigm shift in the Waste Management hierarchy.



Source: Langeberg LM IWMP, 2011.

2.8 BACKGROUND TO EMPIRICAL QUESTION

1. What are the legislation/ policy's surrounding waste management practices?

The National Environmental Management: Waste Act 2008 (Act No. 59 of 2008) reviewed the law regulating waste management, ensuring the integration of a legislative framework which includes all the steps in the waste hierarchy. These helped to build on the previous environmental legislation which has been in place since 1974. The environmental regulation and policy in South Africa is based firstly in the constitution of 1996 (Acts 108 of 1996) called the Constitution of the Republic of South Africa. Section 24 of chapter 2 of the Bill of Rights gives every South African or occupant the right to live in a secured environment, free of anything that is harmful to their health or well-being. These environmental rights support the environmental policy (the white Papers on Environmental Management and Integrated Pollution and Waste Management) and also the Law (principally the National Waste Act and the National Environmental Management Act (NEMA)). NEMA states that: *the State must respect, protect, promote and fulfil the social, economic and environmental rights of everyone and strive to meet the basic needs of previously disadvantaged communities; inequality in the*

distribution of wealth and resources, and the resultant poverty, are among the important causes as well as the results of environmentally harmful practices.

The City of Johannesburg Metropolitan Municipality waste management by-laws introduced some guidelines for the laws guiding building waste. These guidelines are: generation of building waste storage, collection and disposal of building waste.

2.9 CONCLUSION

From the literature reviewed, it can be seen that minimal attention has been given to construction and demolition waste management because there is limited legislation dealing with construction and demolition waste. Across the world it was discovered that legislation and policies concerning management of Construction and Demolition waste are made available by various countries but full implementation has been a major challenge on construction sites.

In the South African context the Department of Environmental Affairs opted that the legislation has not been fully implemented because there is little knowledge of it, which has some negative impact on the generation of waste. Understanding the relevant Acts and also enforcing them on all site activities at every stage of work would impact positively on the environment and also reduce waste going into the landfills, thereby creating a healthy and sound environment that is conducive to human activities.

For the purpose of this study not all the legislation analysed above will be evaluated. It is important to know that particular measures exist and what they stand for. But for this study the National Environmental Management: Waste ACT, 2008 will be evaluated. This is because it specifically states the regulations as regards construction and demolition waste.

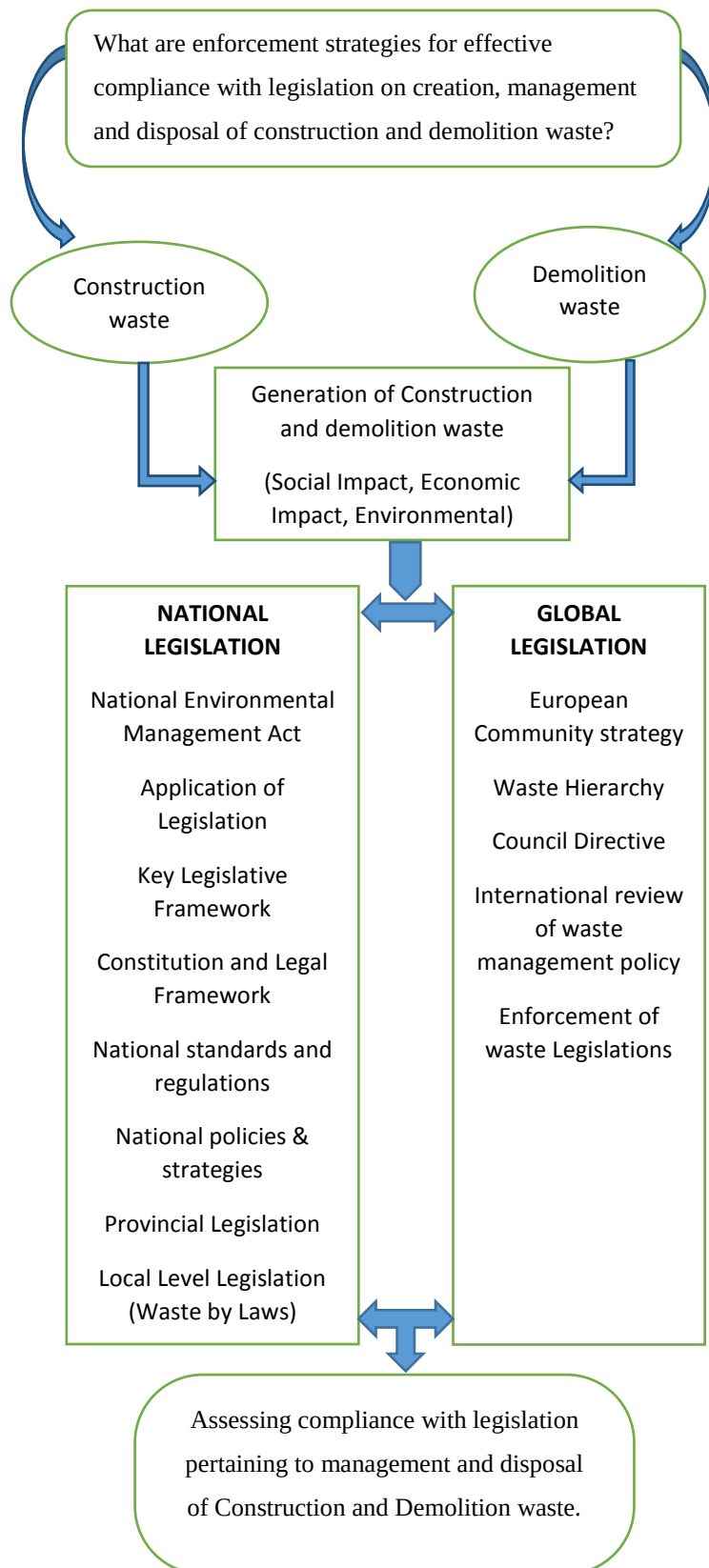
2.10. Conceptual framework

Assessing compliance to waste legislation in Johannesburg requires a study framework that takes into considerations the full legislative context under which waste is managed in the city. A grasp of the context begins from asking a critical question to identify enforcement strategies for effective compliance with legislation on creation, management and disposal of construction and demolition waste. Such strategies will depend on what the social, economic and environmental impact of the waste being generated. A low impact on those three fronts mean strategies in place might be more local, less prioritised and not focused on being very visible. However, high impact will demand a more robust approach that derives from efforts at global, national and local levels, as well as a more considered mechanism to enhance effectiveness. It is the compliance to the legislative strategies that are enshrined in such efforts that will then be interrogated to achieve the objectives of this study.

The thinking outlined above, that underlies this study, means that an integrated research methodology that encompasses a multi-level review of laws and obligations, as well as a thorough analysis of the social, economic and environmental impact of construction and demolition waste generation in Johannesburg is required to answer the study questions. The research methodology used for this study was based on this rationale. A literature review was used to peruse the levels of legislations to identify and review the existing waste minimization structures. The literature review also analysed the social, economic and environmental consequences of construction and demolition wastes within the urban context of Johannesburg. Interviews with key informants in the City of Johannesburg Municipality and Pikitup utility were used to assess compliance to legislative obligations and rules. The interviews were analysed to interpret the positions of the respondents and their views as to the effectiveness of the legislations and the barriers to effectiveness.

This chapter has given reviews based on legislation and policies on how construction and demolition waste can be managed, the next chapter looks at the best research method to achieve the objectives and aim of the study.

Figure 2.4 Conceptual framework for this study.



WASTE MANAGEMENT CONCEPTUAL FRAMEWORK

CHAPTER THREE: RESEARCH METHODOLOGY

3.0 INTRODUCTION

This chapter outlines the research design that was implemented for data collection and analysis so as best to carry out the research, answer the research questions and achieve the research objectives.

There is a need to understand the enforcement strategies and also the effectiveness of the legislation on construction and demolition waste. It was necessary to assess the level of compliance with legislation from the legal department of the City of Johannesburg; the enforcement strategies, and also the barriers to proper compliance with the legislation. The legal department of the City of Johannesburg Municipality and the Pikitup organization were the targeted respondents. This was because the legal department are the enforcers of the legislation and the Pikitup organization are tasked with the collection, classification, treating and disposal of construction and demolition waste which makes them the implementers of the legislation.

A qualitative research approach was used in this research for answering the research question and objectives, using structured interview questions. The “research onion” proposed by Saunders et al, (2012) was used to describe the stages of the research philosophy and approaches used to provide clarity on the research questions and objectives identified in Chapter One. This was followed by analysing each of the layers which helped to give a sound direction on how data was to be collected and also the method to be adopted. Each layer of the ‘onion’ is discussed below, explaining the philosophy, approach, strategy, choice, time horizon, techniques and procedures adopted. This discussion explains why the method adopted was suitable for the research.

The specific ethics or standards of behaviour that guided the researcher's conduct in consideration of the rights of those who became the subjects of the work or were affected by it, are also described (Saunders et al., 2012:226).

3.1 RESEARCH DESIGN

The research onion has been used by many researchers and considered helpful for their research, which prompted its use for this research. The research onion explains the research design which encompasses the philosophies, approaches, strategies, choices, time horizons, also techniques and procedures used in formulating the research design. In this study, the research design used is that of an explanatory study. This allowed the researcher a better understanding of how to assess compliance with legislation pertaining to management and disposal of construction and demolition waste. Also, the researcher was enabled to understand why the problems as stated in the City of Johannesburg integrated waste management plan still persist. This research design is used because it helped to expose and give deep insight into the topic considered (Saunders *et al.*, 2009: Alfred et al., 2013).

3.2 RESEARCH PHILOSOPHY AND APPROACH SUBSTANTIATED (STRATEGIC CHOICES)

The research philosophy helps identify what research design and approach is best suited for a study. Saunders et al (2012) considered that the philosophies adopted in any research influence the views of what is acceptable knowledge. A researcher who is concerned with facts will think and act different from one concerned with attitudes or feelings of people. As strategies and methods differ so also do views and perspectives (Saunders et al 2012).

3.2.1 ONTOLOGY: According to Saunders et al, (2012: 130) Ontology is “concerned with the nature of reality”. Ontology deals with questions about how the world operates and

implies commitment to some views of how the world is seen by an individual (Bhattacheryee, 2012). Two aspects of ontology are objectivism and subjectivism (Saunders et al, 2012).

3.2.1.1 OBJECTIVISM: This is concerned with “the position that social entities exist in reality external to and independent of social actors” (Saunders et al, 2012: 131).

3.2.1.2 SUBJECTIVISM: This is of the notion that “social phenomena are created from the perceptions and consequent actions of social actors” (Saunders et al, 2012: 132). This ontological aspect of the research focused on subjectivism because the research was not an independent study but was limited to the perception of the participants in it.

These philosophical standpoints deal with the theory of human knowledge and the gathering of knowledge which also fall into three subsections namely Positivism, Realism and Interpretivism.

3.2.2.1 The positivist approach: deals with observations on the reality, regularity and causal relationship of data to create a general viewpoint of a subject matter (Bhattacheryee, 2012). The use of existing theory to develop hypotheses is important.

3.2.2.2 The realist approach: this philosophical position holds “that objects have an existence independent of the human mind” i.e. “reality is quite independent of the mind” which is opposed to idealism in which “the theory that only the mind and its contents exist (Saunders et al 2012). It is similar to the positivist approach in that the assumption has to do with the data collected and understanding of the data.

3.2.2.3 The interpretivist approach deals with interaction with/between humans rather than non-living things. The researcher has to “adopt an empathetic stand” which implies participating with the social world in order to understand it from the participants’ point of view (Saunders et al., 2012). This research adopted the interpretivist approach as it was helpful for understanding the respondents’ standpoints. This formed the basis of the research

findings in answer to the question “What are the enforcement strategies for effective compliance to legislation on management and disposal of construction and demolition waste?” No specific philosophy could be identified with this research question therefore the interpretive approach was used.

3.2.3 Pragmatism: Pragmatism deals with multiple methods in one study on the assumption that the world can be described in various dimensions and that a single view point is not enough to model its entirety. Pragmatism does not demand that multiple methods must be used at all times but requires “a method or methods that enables credible, reliable and relevant data that advance the research” (Saunders et al, 2012:130).

In all this approach, the interpretivist approach was best suited for the research because it has to do with interacting with the respondent and putting into consideration their stand point on the subject matter. The positivist approach cannot be considered because it is expected to work with the researcher’s point of view it does not give an independent thinking of what the respondent has in mind while the pragmatic approach deals with multiple methods and the study deals only with a single method.

3.3 RESEARCH APPROACH

“Research approach is the plans and procedures for research that spans the steps from broad assumptions to detailed methods of data collection, analysis and interpretation” (Creswell, 2008: 3). Two approaches help in understanding the theories used in a research study and in raising questions about the design that could be used for the research, these being deductive and inductive reasoning (Saunders et al., 2012). Deductive reasoning is involved with developing theory that will be tested in the period of the research: “it also occurs when the conclusion is derived logically from a set of premises, the conclusion being true when all the premises are true” (Saunders et al., 2012:143). On the other hand, inductive reasoning affirms

that “there is a gap in the logic argument between the conclusion and the premises observed, the conclusion being ‘judged’ to be supported by the observations made” (Saunders et al., 2012:143). A third form of reasoning, namely abductive reasoning “begins with a ‘surprising fact’ being observed” (Saunders et al., 2012: 144).

3.3.1 Deduction (Quantitative Research Design)

Deduction is also known as the quantitative method when it deals with testing of theories subjected to a series of propositions and the variables involved can be measured using models or instruction, numbered data that are collected and can be analysed using statistical process. According to Saunders et al., (2012) “It is the dominant research approach where laws are a basis of explanation, allow the anticipation of phenomena, predict their occurrence and therefore permit them to be controlled” (Saunders et al. 2012).

3.3.1.1 Characteristics of Quantitative Research

According to Saunders et al. (2012) “Quantitative research examines relationships between variables, which are measured numerically and analysed with a range of statistical techniques” (Saunders et al., 2012:162). Questions must be as clear as possible, and for clear understanding the method usually uses probability sampling techniques and the research does not have any influence on the respondent (Saunders et al., 2012).

3.3.1.2 Quantitative Research Strategy

This is usually associated with experimental and survey research strategies, and usually conducted with the use of questionnaires or structured interviews and observation (Saunders et al., 2012).

3.3.2 Induction

This type of qualitative research often involves interviewing individuals to get in-depth views of a study. The nature of the problem will be understood, the result of the analysis is the

formation of theory expressed as a conceptual framework (Saunders et al., 2012). It involves interpreting interviews and analysing the data collected (Naoum, 2013). The structure of the report is based on data collection, its analysis and interpretation. This type of research is relatively flexible in nature.

As earlier stated, this study utilized the qualitative method approach (induction) to gain a better view of the research problems. That approach was chosen to gain a clearer understanding of the effectiveness of legislation in optimizing waste management practices. The inductive approach was essential for this research as there was a need to identify the problems and also assess whether the enforcement strategies put in place were sufficiently effective to solve the problems. Structured interviews were designed to fulfil the purpose of the research question. The questions were designed for simplicity. The research method had to allow for validation of qualitative data, to protect the researcher from bias while allowing for clarity in data interpretation for reporting (Creswell, 2008).

3.3.2.1 Qualitative Research Characteristics

When data is obtained through interviews and is not in a standard format, the researcher has the opportunity for one-on-one interaction with respondents, thus building rapport. The research needs to be sensitive to the respondents' feelings; so if a respondent is not coming out with clear answers, the researcher can reschedule (Saunders et al, 2012).

3.3.2.2 Qualitative Research Strategy

This research used phenomenological research strategy in seeking to understand the past experiences or the trend in how legislation has helped waste minimization. Phenomenological research makes enquires about human experiences; it helps participants air their views on a particular subject matter. It involves studying a small number of respondents and at this stage

the researcher withdraws his or her own experiences or thoughts and is fully attentive to the respondents (Creswell, 2009).

3.3.3 Abduction (Mixed/ Multiple Method)

Abduction is a type of research approach that moves between quantitative and qualitative or combines both the inductive and deductive research methods (Saunders et al., 2012). It begins with “observation of a surprising fact, then works out a plausible theory of how this could have occurred” (Saunders et al., 2012:147). The abduction research approach is used when there is enough time. It can’t be fully exercised in a short period of time.

3.3.3.1 Characteristics of Multiple Research Method.

This method of research design deals with using more than one data collection technique and may involve both quantitative and qualitative research, for example one may conduct a questionnaire survey and also an interview. There are different ways of combining the data, which range from simple, convergent forms to complex, fully integrated forms.

3.3.3.2 Mixed Method Research Strategies

The strategies embedded in this type of research are concurrent triangulation design, concurrent embedded design, sequential explanatory design, sequential exploratory design and sequential, multi-phase design. The mixed approach has six major design strategies, which are: the convergent parallel design, the explanatory sequential design, the exploratory sequential design, the embedded design, the transformative design and the multiphase design (Clarke and Creswell, 2011).

3.4 METHODOLOGICAL CHOICE

According to Saunders, design methods may be classified as qualitative, quantitative and mixed methods. Saunders et al. (2012:161) confirmed that “one way of distinguishing

quantitative research from qualitative research is between numeric data (use of numbers) and non-numeric data (use of words, figures, video clip etc.)”. Quantitative data collection involves using questionnaires while qualitative data collection method involves using interview technique. The present study used an interpretivist philosophy to help researcher get a deeper understanding of the respondents views on a subject matter which led to interviews using recorders (words) (Saunders et al., 2012).

3.4.1 Qualitative Research Philosophy

This philosophy, also called the qualitative research which involves interpretivist approach. A qualitative researcher, according to Saunders et al(2012), ‘needs to make sense of the subjective and socially constructed meanings expressed about the phenomenon being studied’.

Data collected in the Qualitative research is non- standardised form this is to ensure that the questions and procedures during the research process may alter and emerge making it interactive and participatory from majorly the respondent. The researchers views are no the major consideration in this research method, the respondent is free to air their views to the depth of their knowledge about the subject matter. This helps to form the basis for the next phase of research findings.

3.5 RESEARCH TECHNIQUES

Interviews were used for the qualitative data collection. The interviews were analysed to interpret the positions of the respondents (Alfred et al, 2013). The two potential participants considered for the study were the waste management legal department in the City of Johannesburg municipality and the Pikitup Company. Data were collected using structured interviews for the waste management legal department while data collection from the Pikitup organization used a face-to-face method.

3.6 POPULATION

The population for this study were the individuals in the legal Department of the City of Johannesburg and the Pikitup organization. Naturally the City of Johannesburg Municipality has many staff in different departments affected by construction, requiring streamlining respondents to only the legal department of the City of Johannesburg and the Pikitup organization. These were chosen because the legal department are the enforcers of legislation while the Pikitup organization are its implementers, a role which involves collecting, classifying, treating and proper disposal of the construction and demolition waste. It would have been impossible to collect data from all staff within the time frame available, even assuming their willingness to participate in the research.

3.7 SAMPLING PLAN.

A non-probabilistic sampling was used because the precise population of the legal department and the Pikitup organization in the City of Johannesburg municipality was unknown (Tan, 2011). Non-probabilistic sampling was used for this research , which is commonly used when it is difficult to identify members of the desired population (Alfred et al., 2013). An initial contact was made with a municipality staffer who was a M.Sc. student at the University of Witwatersrand. He referred the researcher to other municipality staff. Referral was made to the Pikitup office for assistance in getting information for the purpose of this study. A number of other Pikitup staff who had experience in construction and demolition waste were interviewed, revealing different viewpoints on construction and demolition waste.

3.8 DATA COLLECTION

Primary data in form of questionnaires and interviews were collected. Interviews were considered to be the best way of collecting rich data from the legal municipal department as it had a minimal population.

3.8.1 Secondary Data

Some data from the integrated waste management plan were accessed from the municipality, and this data was considered to be reliable and valid as coming from a well-known government organization. Other information about reviewing of the legislation was obtained from the waste management department. (Saunders et al., 2012).

3.9 TIME HORIZONS

Two types of research time horizons exist, namely longitudinal and cross- sectional (Saunders et al., 2012). For the purpose of this research, cross- sectional time horizons were used due to the time constraints of one-year M.Sc. research. The survey and interview methods were applied at the same time.

3.10 ASPECTS OF VALIDITY AND RELIABILITY

For data to be reliable or valid, it has to come from a well-known source (Saunders et al, 2012). Interviews and documents from the City of Johannesburg legal department were used to gather data for the research. Top executives at the departments were the targets for this research as they are the initiators of the legal documents used in the municipality this made the research very valid and reliable also the documents used was given to the research from the legal department this further enhances the validity of the data that was been collected. Due to the small number of executives at the legal department, the respondent for the research was small. Face to face communication was used and this gave the research the opportunity to as in-depth questions and get first hand responds for the study. The respondent were interested in the study as this study was able to enlighten the department on some pitfalls of the municipal waste system, also there were recommendations and possible solutions given to help improve the waste minimization strategies already put in place.

3.11 ETHICAL CONSIDERATIONS.

The approval of the research ethics committee was sought for and granted before starting with the data collection. The identity of the respondents were hidden. Where there may have been bias due to factors that pertained to the respondents the researcher took up a neutral position even if there was a relationship with the respondent. All results were reported in true honesty and integrity. The respondents were treated with respect and acknowledgement of the values they stand for, even if these disagreed with the researcher. The empirical data collected was treated fairly and protected. All information given was protected with honesty and sincerity. A brief explanation for the research was given in a letter presented to each respondent and all respondents were free to decline participation at any time.

3.12 SUMMARY OF RESEARCH DESIGN

In conclusion, this study adopted the interpretivist approach, using a qualitative method approach. The onion model guided the research strategy, the philosophy, the approach, and the methodological choices. The strategy for collecting data was by interviews. Lastly, because this research study was constrained to a year a cross-sectional time horizon was used, meaning that the interviews and analysis were carried out at the same time. The figure below shows the research design.

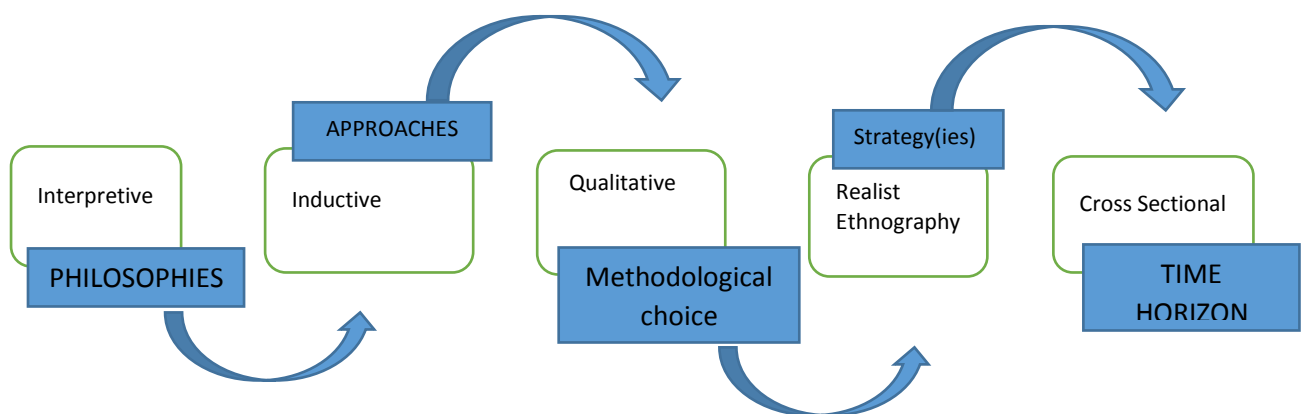


Figure 3.1 Research design summary

3.12.1 Constraints

Constraints existed at the proposal stage and also during data collection. The challenges faced at the proposal stage were to gather and prepare the final proposal within a given time frame.

At the data collection stage not all data collected could be expected to be reliable and accurate due to subjective responses; therefore data needed to be analysed equally without any alteration else it may not give an accurate answer to the research question. If it happened that a large portion of the research questions were not answered appropriately this would impact negatively on the research.

There were possibilities of respondents answering poorly, due to lack of understanding of the questions. This could be addressed by adding definitions to the questions for clearer understanding. The interviews administered needed to use clear questions that the respondents could easily relate to. The interviews were administered using a face to face approach.

3.13 SYNTHESIS AND CONCLUSION

This chapter has given details of the research design, methodological choice, and data collection process. The qualitative method approach was used for this study as it would be able to address the research questions and objectives appropriately this will further enhance the proper analysis of data collected from the respondent in both the municipality and the Pikitup utility in the following chapter. It allows for a broader perspective of the topic being researched. Semi-structured interviews were administered which allowed for validity and reliability. This research was time-sensitive with a time frame of one year which dictated a cross-sectional time horizon selection. Ethical considerations such as the anonymity of potential respondents were taken into consideration. The code of conduct of the University was upheld with the utmost integrity and honesty when carrying out the data collection.

Having gone thus far on this study the next chapter gives a report on the analysis of data collected from the field follow by conclusion and recommendations from the study.

CHAPTER FOUR: FINDINGS AND DATA ANALYSIS

4.1 INTRODUCTION

This chapter presents the research findings arising from the collected data.

As stated in the previous chapter, this research study used a qualitative research method, due to the “difficulty in drawing an adequate sample of respondents and obtaining a sufficiently high response rate (as in a survey)” (Yin, 2011). Because of the limited number of respondents in the legal and Pikitup departments of the City of Johannesburg municipality, the data was analysed using a narrative qualitative method. Semi-structured interviews were used to enable the researcher to explore deeper aspects of respondents’ day to day activities.

The research interviews aimed to answer the research question: what are the enforcement strategies for effective compliance to legislation on management and disposal of construction and demolition waste? The research sub-questions were:

1. What legislation exists that impacts upon waste minimization?
2. To what extent is the waste management legislation implemented?
3. How effective are these policies in managing and minimizing waste?
4. How effective is the legislation in optimizing waste management practices?

4.2 DESCRIPTIVE STATISTICS

Once the ethics clearance had been obtained from the School of Construction Economics and Management at the University of Witwatersrand an invitation was sent for interviews from which the total number of assessable respondents in the legal department of the City of Johannesburg was 7; 3 being members of staff in the Compliance department, 2 in the Policy department, 1 respondent in the Information department, and 1 in the Waste Management and Regulation department. There were 3 respondents in the Pikitup organization available for

interview. Only four out of the seven respondents granted audience for interviews. The response rate for the different departments is as shown below.

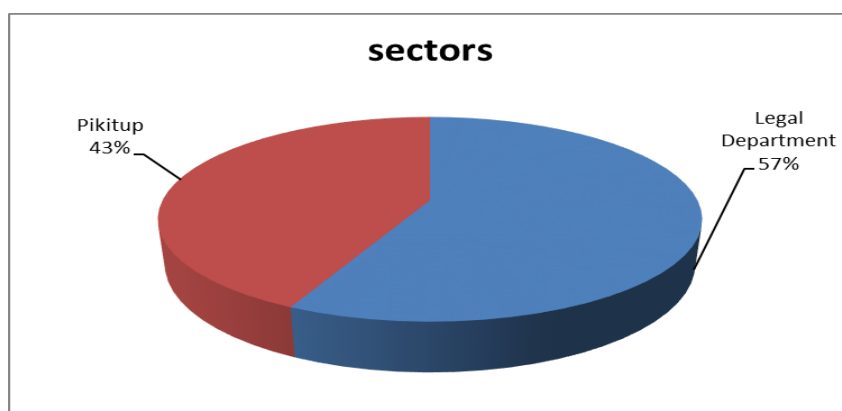


Figure 4.1: Showing response rates for the two departments participating in the research.

Table 4.1: showing the respondents in the two departments.

Population	Department	Sample size	Respondents
Legal Department	Compliance department	3	1
	Policy department	2	1
	Information department	1	1
	Waste management and regulation	1	1
Pikitup	Information and communication	1	1
	Builders' rubble	1	1
	Manager of Landfill site.	1	1

Of all who responded to questionnaires the specialist from the compliance department had 15 years' experience in waste regulation and waste service delivery monitoring, while the specialist in waste management and regulation, the senior specialist in the waste management

information department, and the senior specialist in waste policy and programmes had between 6 and 10 years' experience in the municipality.

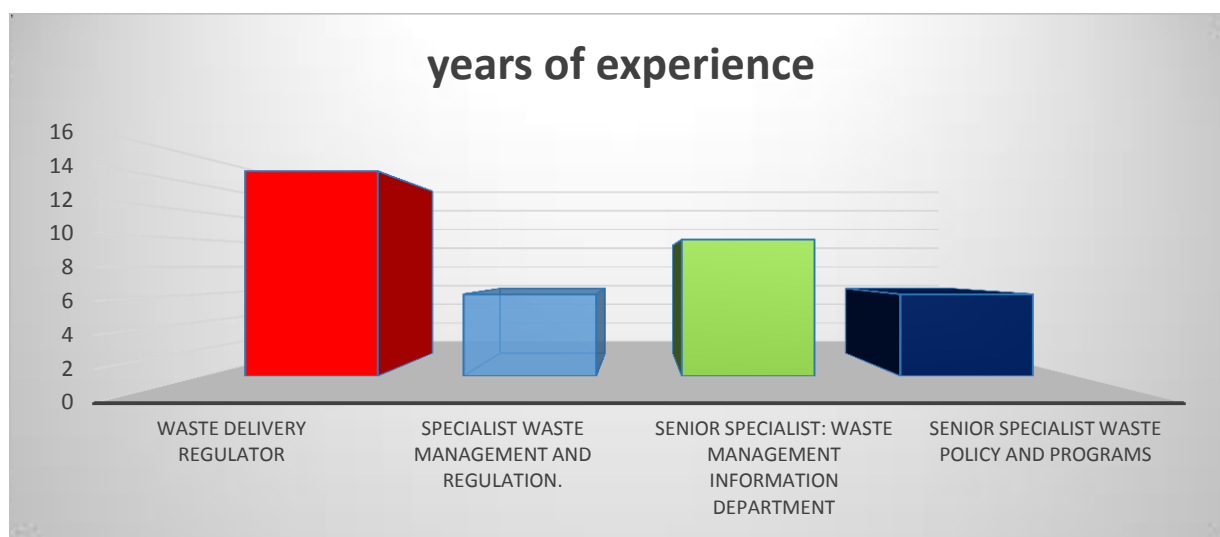


Figure 4.2: Years of experience of the legal department of the City of Johannesburg.

4.3 CONTENT ANALYSIS

Content analysis can be said to be a “detailed and systematic examination of the contents of a particular body of material for the purpose of identifying patterns, themes, or biases, these can be through human communication using human interaction, transcripts, videos etc” (Leedy, 2014).

The semi-structured interview questions arising from the research sub-questions sought information regarding the effectiveness of the National Environmental Management Waste Act, 2008(Act No, 59 of 2008) on management and disposal of construction and demolition waste, also the challenges to the effectiveness of the legislation, how effective the enforcement strategies put in place have been in minimizing construction and demolition waste and the barriers faced in enforcing the legislation. Content analysis was used to identify the links between the responses. Leedy (2014) regarded content analysis as a tool to examine or interpret communication in terms of interactions, transcript, conversation etc., to determine some variables.

According to Lu et al. (2013), a number of regulations, codes and initiatives have been introduced by the government to develop a sustainable waste management practice. This opposes the opinion of respondent 3 from the legal department who stated that there is no regulating board for construction and demolition waste or codes of conduct for construction and demolition waste. Furthermore, respondent 3 stated that the Waste Management Act has become inactive, due to lack of assistance from the national level.

All respondents from the legal department were very aware of the National Environmental Waste Management Act, 2008 (Act No. 59 of 2008). Three had worked in the department for 5 to 10 years, while 1 had worked for over 15 years.

All the respondents were able to answer question 1: **Based on your experience, how effective has the construction and demolition waste legislation been on classification and reclassification of construction and demolition waste?** This question in essence addressed research questions 2, 3 and 4. Different opinions emerged from the responses.

Legal department response:

Respondent 1 opined that the legislation has not been followed effectively, due to insufficient human capital. He also thought that the legislation is generally workable for mega construction firms because they have money to dispose of their waste as prescribed in the legislation. Also, some of these mega construction firms have their waste sorted on site, making its disposal a much easier process.

Respondent 2 acknowledged that some aspects of the legislation should be followed without question, thus the aspect of classification of waste must not be compromised. Furthermore, the time frames specified for waste classification in the Waste Act are dealt with in very impracticable clauses such as the “classification done within the space of 180 days of generation, reclassification of waste done if not approved by the Minister”, which is

impracticable because most construction firms merely understand that they have to dispose of their waste without understanding the stipulated timespan from the generation of waste to its disposal. He also stated that a high proportion of individuals working on site do not even understand the legislation, much less follow it.

Respondent 3 also attested that big companies follow the legislation because, to begin operation of their business, there has to be someone allocated to check the legislation and this person must be knowledgeable about the legislation and by-laws. For smaller companies, however, the respondent attested to a lack of knowledge of the legislation. Compared to other businesses or departments, municipal waste management control do not use any medium such as advertisement that could have helped to enlighten citizens of Johannesburg about the dangerous effect of waste in the environment and also how important it is to work with municipal staff, especially when they (citizens) see illegal dumping of waste. Also the municipality needs to build awareness of the municipal office because some citizens do not even have any idea of where the municipal office is situated. Some are unaware that they are supposed to go and pay fees to open a municipal account. Due to such factors, waste generators pay illegal waste dumpers who dispose of their waste on vacant areas of land where nothing is happening. Thus when someone dumps waste there, that area becomes a dump site. However, landfill areas are areas that have legal permits compliant to the legislation to receive waste. Illegal dump sites create a huge problem for the City of Johannesburg.

The third respondent confirmed the above by saying that new entrepreneurs just starting up their businesses find it hard to pay the regular fees for landfill sites. So they rather deal with the truck owners who collect the waste and dump it illegally for a small sum of money, not caring about where these truck owners are going to dump the waste. On being asked how high the fees paid for registration at the municipality and for the landfill sites are, respondent 3

answered that these are not high and that some of these entrepreneurs just want the easy way out. Rather than pay the actual sum due, they would rather pay a smaller sum of money to the illegal waste dumpers and keep the rest to fuel their cars. Disposal of waste to the landfill site follows a particular process. When a truck comes to a landfill, the waste is weighed and charged per weight/volume. Also the type of waste is inspected. If it is mixed builders' rubble with (for example) concrete and asbestos, the charges are higher, because the municipality will have to sort it before recycling some. However, if the waste consists of clean bricks, broken bricks etc., the charges are less as such types of waste are easy to crush and can be re-used. The cost implications push new business owners to find the easy way out.

Respondent 4 gave a clear understanding about the departments and their duties:

“This department has 3 elements, information, policy and compliance. These 3 departments assist each other. Compliance deals with the inspection of facilities and trucks. The information department deals with registration: when this is done, a report is sent by the registration department to the compliance department for checks to be carried out on site, compliance also stop trucks on the road for permit checks, if there is no permit they are referred to the information department. It is the compliance department that have the by-laws that guide our actions”.

As a senior specialist in waste management in the Information department, respondent 4 gathered information on waste for the City of Johannesburg. He gathered information on process issues, problems and challenges faced by the City and compiled data into a report submitted to the department for the management. Staff in the Compliance section are responsible for certain issues raised by the Information department. If the report is good and positive this is good for the department but if there are challenges then the information department will of course indicate them. In a monitoring session the information is collected,

issues identified and then send to the information department who ensures it is well analysed and presented in document form.

Responses from Pikitup department

The respondents from the Pikitup department were able to validate the information from respondent 3 from the legal department that the legislation is not known to them: that is, they know there is legislation but not what it says. The first respondent at the information department felt he was not in the best position to give any information about the legislation. The second respondent at the Pikitup Builders rubble department stated that *“I don’t know about the legislation that much but I can say it’s not been that effective, and I don’t agree with the fact that the legislation is new. It’s not new it hasn’t just been effective”*. Awareness must be a significant problem if even the implementers of the legislation do not understand that legislation. The last respondent at the landfill site had managed both closed and functional landfill sites, with working experience of 40 years. He advised that before 2013 the legislation had been very broad and wasn’t specific on landfill site and disposal measures, which had made it very stressful to comply with because the processes of waste management and disposal were not described in detail and this affected the landfill sites. However in 2013, the landfill clauses were reviewed and there were stringent prescriptions given for management and disposal of construction and demolition waste in the landfill site. Previously there had been no set targets as to how recycling processes could be managed but recently staff were working hard to meet up with the recent targets set out for the landfill site in the IWMP (Integrated Waste Management Plan) given to them.

From the above discussion, respondents in the legal department outlined the problems they faced regarding construction and demolition waste as well as indicating to what extent the waste management legislation is implemented and how effective the policies on managing and minimizing waste are. The National Waste Management Strategy (2010) outlined its

goals and objectives, which include adequate staffing and capacity for waste management, and in particular to employ additional technical staff and also develop them to be capable of working effectively as required. The Integrated Waste Management Plan (2011) set out targets for mobilizing and supporting the waste services and management from the private sector and also targets on increasing the human capacity in the monitoring department. These steps do not seem to be happening as the legal department staff still experience problems with human capacity and according to respondent 3 there were only three officials in charge of monitoring for the whole city of Johannesburg. This is not sufficient for effective implementation of the legislation. The awareness level of the legislation is low: according to respondent 3, some citizens do not know where the municipality is situated and are not aware of the processes for proper disposal of waste in the municipality. All this could be fixed if there were advertisements stating the processes and giving the contact details and procedures for proper disposal of waste.

Question 2 of the interview addressed research sub-questions 2, 3 and 4 in asking “**How effective has the construction and demolition waste legislation been on waste management?**”

Respondent 1 from the department gave some reasons why the legislation on management of construction and demolition waste is not effective. He stated that some of the smaller construction firm have issues with proper disposal of waste due to its high cost. The legislation also expects records of waste storage such as “date on which waste was first placed in the container, date on which waste was placed in the container for the last time and when the container was filled, closed, sealed or covered”. All this is not practicable for the smaller firm as some of them do not read the legislation to the letter, they just ensure that there is a waste skip and that when filled up it is simply disposed of. While some will employ illegal unregistered waste transporters that they can pay less, perhaps only R300, without being

mindful of where those transporters are going to dump the waste. This was also part of the views of respondent 3 on classification of waste. Respondent 1 further stated that some transporters repackage their waste by putting domestic waste at the top and builders' rubble below and so smuggle the waste to the domestic dump. This makes sorting of the waste very difficult and creates an accumulation of waste in the landfills until they are filled up.

Problems were also reported with the recycling processes: as there are few government recycling plants, the new policies promote an increase in purchase of plant for the recycling and recovery of waste. Some private companies are already involved in recycling activities and the government is encouraging more to collaborate with the government to help in minimizing waste in the city. Respondent 2 was of the opinion that the legislation is not flexible enough to accommodate the smaller construction companies. He further validated the opinion of the respondent 3 on this point:

“Some are not buoyant enough to afford the cost of disposal so they employ the services of the cart pushers or the illegal waste dumpers. These illegal services are very cheap and affordable and some of the construction firms have friends amongst the authority who overlook their attitudes”. He further stated that “stakeholders (waste manager) has the responsibility of ensuring the waste accepted must be classified according to the sub-regulation 4 but all this are not regular which become problematic to the enforcers of the legislation. The availability of the records to the department is very ineffective as some give a formulated figure of how they manage their waste. Work is further done on whatever records are released. Record keeping is very essential as it makes it very easy to assess and understand where there are problems and this helps solve problems faster and help the municipality move on”.

Respondent 3 followed up on the comment of respondent 2 that the landfill managers need to take it as a duty to check what type of waste is brought to the landfill site. The metro police

are working with the City of Johannesburg on environmental matters by stopping trucks carrying waste and conducting a thorough inspection of the type of waste and checking the code for the waste. So if the truck is not registered, a particular fine is given to the truck owner and the truck is impounded. On the aspect of management of legislation that requires that waste must not be diluted to reduce its concentration, and must not be stored for more than 18 months after generation (i.e. that prescribes waste treatment, reuse, recycling, and recovery), respondent 3 advised that these requirements of the legislation are followed by inspectors from the national level called the “green scorpions”. These officials are distributed by the national department to assist the municipality in terms of enforcement power. Their duty is to inspect all the areas that have been permitted to handle waste, and check if they comply with the conditions under which the national level has granted a company a permit to manage waste. The team responsible to national level for compliance in the city of Johannesburg enforces the Environmental Health Act and Health Act which, though not part of the Waste Management Act, work together with it to achieve appropriate waste management. Respondent 3 made a suggestion for measures that could reduce illegal dumping: “the municipalities need to have more working relationships with the councillors of the places where waste is being dumped because each and every area has a councillor and if there is an activity happening in an area the councillor needs to know if the activity has been permitted by the municipality and if the municipality is aware of the activities”. Respondent 3 added that construction companies should form boards as do the paper companies, glass companies etc. who register those in the business of manufacturing particular products. The municipality has close and direct relationships with such boards, which makes it easier for them to work together. The construction industry did not have such boards because builders’ rubble was not seen as a product: instead, rubble was just accepted at the municipal landfill sites for free until it started becoming a social nuisance. The legislation expects that records of

waste should be taken from time to time but because the municipality did not attach much importance to the construction and demolition waste, previously no record was kept. In recent times after the legislation review, however fees have been collected and these have to be recorded. Thus records are being kept of the type and volume of waste. The problem now is that because of illegal dumping, there are no accurate figures of the waste generated in Johannesburg as a whole, which makes it very difficult for the municipality to take accurate statistics and work effectively on minimizing illegal dumping of construction and demolition waste.

Respondent 4 outlined the multifaceted factors that contributed to the closure of a landfill site. He pointed out that the growth in population of Johannesburg places huge demands for more residential and commercial buildings, hence an increase in waste disposal trucks, both legal and illegal, and the short lifespan of landfill sites, etc. All these factors instigated an internal assessment by the city to change its thinking as landfill sites can no longer exist for long periods. This led to the city's Integrated Waste Management Plan (2011) proposing alternative waste treatment initiatives to convert waste, recycling rubble into other materials and using biogas to generate electricity. Respondent 4 further pointed out the 12 key competences in the IWMP of which waste minimization is one. The role the government has to play is another competence for compliance and enforcement supported by information. In his assessment there has been an improvement in the waste minimization strategy but it is very slow and more work has to be done to achieve the targets set by IWMP for 2011- 2016. In 2016, there will be a progress report on what has been achieved, and if there are failures in achievement of the set targets, there will be documentation and review of the report to understand the factors responsible for the failure after which the City can adjust the strategy. Respondent 4 also stated that from his viewpoint, there had been massive progress in implementing the IWMP, the by-laws had been effective, and there had been some initiatives

working now at small scale in private centres for crushing of builders' rubble. These initiatives exist at different levels, but according to respondent 3 their implementation is very slow. The policy department can only give guidelines to the municipality on how to implement the initiatives but are not involved in implementation. The JMPD (Johannesburg Metro Police Department) assist the compliance department in ensuring that illegal dumping is checked and anyone found dumping is prosecuted. There are programmes and projects initiated with a 25 years look-ahead for a plant in Johannesburg that will take all the waste from disposal trucks. Respondent 4 pointed out that the policy department makes policy but are not fully aware whether it is implemented as it is supposed to be: *"We are regulators we just provide policy and plan, our municipality must implement, we however give guidelines, so they worry about domestic waste, they worry about builders' rubble, they also worry about electronic waste, that's among key competences required by them"*. On the plans and programmes already introduced, respondent 4 stated that feasibility studies had been done on the phases of projects, which made the city recognize the importance of determining the viability of the studies already done. If the study is viable then there is hope for the remaining two functional landfill sites because there is no further available land in Johannesburg and citizens do not appreciate a landfill site in their area. The option of using a landfill far away from the city is not viable because it would be expensive, could affect the whole ecology of the area and give more excuse for dumping illegally. A better option is for there to be clean plants as in Singapore, where a disposal truck brings waste into the plant where the waste is sorted into various areas, then recycled as appropriate.

Interview question 2 was thus able to answer research sub-questions 3 and 4 as the respondents were able to identify significant problems with monitoring of waste going to the landfill site, and so explain why the first two landfill sites had to be shut down, as reported by respondent 1 who stated that some waste transporters repackage their waste, sending it to the

wrong landfill site and thus making it very difficult for the landfill site to sort out waste, most especially if it has some hazardous material. The recycling plants are also not sufficient to deal with the waste coming from the City of Johannesburg. The government needs to affiliate with the private sector to assist in the recycling process. The UN Habitat, (2010) sees waste as a resource and advises that a waste system should be designed to maximize the benefits flowing from it. If the city of Johannesburg can see the potential benefits of waste, a sound system might be designed to maximize the opportunities in construction and demolition waste.

Question 3: How do you think the legislation has helped in minimizing generation of waste?

Respondent 3 opined that legislation has been very slow but is helping the municipality and that if the legislation were absent, that would raise a lot of problems in all areas of the city. Furthermore, the legislation is clear in stating the processes of the waste and the types of waste, which makes it difficult for waste dumpers to get away with illegal dumping. The legislation also helped in creating waste management by-laws based on the Act. The legislation forms a backbone for the municipality to legally enforce waste minimization. The appreciation of legislation has been slow but people are beginning to understand it.

No doubt the legislation has been of help because without it there would not have been by-laws created from it. The earlier people are aware of the importance of waste minimization the better for the economy. And as respondent 3 stated, without the legislation the City would have been in a mess with no tool to prosecute for illegal dumping. As much as the legislation is an important document so also is the IWMP (Integrated Waste Management Plan). All these documents are necessary to help implement waste minimization in an economy.

To further answer research sub-questions 2, 3 and 4, the UN Habitat, (2010) discussed three features required in a good waste management strategy, the first being '*inclusivity*'. This document explains that the government cannot by itself minimize waste, there is need for partnership with other agencies, both private and public, and there should be sound communication links between these agencies. The UN Habitat, (2010) identified these stakeholders as “ the service providers which includes the local authority offering services in conjunction with the different private both formal and informal sectors also community leaders leading different groups/ sizes of community, the Users who are the key stakeholders/ waste generators (clients) and the External agencies in the enabling environment which includes both the national and local governments organizing the boundary conditions and making change a possibility”. Stakeholder involvement is highly significant and there should be no barriers or unnecessary boundaries erected by the government which could make the service providers perform less well than is required.

The second feature in a good strategy is '*financial sustainability*': this aspect is very important as funds are needed for waste management to be effective. In other developed countries there are technologies used to treat waste and there appear to be no magic solutions for waste minimization as the technology of dry waste may not work for wet waste. The municipality needs to understand the type of technology that will be effective for different types of waste. Funds must be provided to ensure the smooth running of this treatment facility.

The third feature is '*sound institutions and proactive policies*': a successful government is rated by the cleanliness and the effectiveness of its strategies and these cannot be optimal if the city does not have capacity and a good organizational structure to help in managing finance and also if the services provided are not efficient and transparent, or do not give listening ears to the public. The underlying issues must be effectively addressed and there

must be a proper accountability for all funds used. If this can be done, corruption in the society will reduce.

Question 4: What are the challenges to the ineffectiveness of the legislation?

Respondent 1 indicated that increased rates of waste contravention, illegal dumping and littering are major challenges contributing to land and water pollution. Factors contributing to illegal dumping are the high cost of legal waste collection, transportation and disposal of construction waste, as well as the early closure of the landfill site. There is also lack of understanding of the legislation. Respondent 2 gave a list of challenges, the first being lack of human capital. This supported the opinion of respondent 3, noting that there were only 3 monitoring and compliance officers for the City of Johannesburg. These are not sufficient for monitoring a single suburb in Johannesburg, much less the whole city. Respondent 2 further stated that there is not enough skilled staff to interpret the legislation, and training should be given to construction site owners and workers on construction and demolition waste management and disposal. This further attest to the findings of Nahman's (2010) who identified that there is lack of monitoring of illegal dumping and also enforcement capacity at municipal level. Advertisements should also be regularly placed in the media to build awareness amongst the general public of the importance of eradicating waste in the environment. Respondent 2 also remarked that there are no gurus (experts) in local government. Respondent 3 agreed that there is not enough human capital to monitor compliance to the legislation which results in illegal dumpers not being prosecuted. He added that people do not place enough value on the legislation, this is in support of Saez et al., (2015) argument that workers and stakeholders on site were not concerned about waste and this has made ineffective the waste minimization strategies put in place. There are no funds to support the work as appropriate and there is no profiling of the legislation in the sense of advertising it. No one was "talking about builders' rubble because they don't know much

about it”. Respondent 4 opined that the increase in the size of the city is a challenge, placing huge demands for disposal of waste while there are limited funds to maintain it.

Question 5: Apart from the National Environmental Management Waste Act, 2008 (Act No.59 of 2008), what other legislation do you apply in your waste minimization strategy?

This question produced responses relevant to sub-question 1 on legislation that impacts on waste minimization. Respondent 1 reported on the Waste management by-laws:

“This by-law is published by the municipal manager of the City of Johannesburg metropolitan municipality as approved by the council. The integrated waste management plan must be done as according to the by-law, there should be assessment of the type and quantity of waste that will be generated, a breakdown of the waste management services the generator requires, the process of separation of waste, sorting, treatment, recovery and disposal of waste. All the details of persons responsible for the waste at each step should be stated”.

Respondent 2 listed some other legislation used by the city, namely the Labour Relations Act, EHSA (Environmental Health and Safety Act) and Health Act. Respondent 3 noted some other legislation like NEMA (National Environmental Management Act), which gives details of the responsibilities of every individual for the policy. This was the first act used by the municipality to establish waste management by-laws and the integrated waste management plan/ policy. The integrated waste management plan establishes many policies the municipality uses, with set targets for a period of 5 years. After 5 years’ progress reports will be published to see if the targets were met. This helps the municipality know if they are moving forward, or if the targets are unrealistic.

The respondent from the landfill site reported:

“In 2013, the clause was reviewed and there were stringent clauses given for disposal of construction and disposal of construction and demolition waste in the landfill site. Previously

the legislation was more general and people didn't know in details the process of waste management and disposal as this affected landfill sites. But now we are trying our best to meet up with our targets on recycling and recovery of construction waste". This indicates that legislation has been there for a long time but was not directive so everyone applied it as they understood, but the details as to how the legislation should be applied are stated on the legislation as reviewed.

Question 6: In enforcing of construction and demolition waste legislation what enforcement strategies do you have to help promote minimization of construction and demolition waste?

This question addressed the research main question and this issue was also addressed by the implementers of the legislation. Respondent 1 from the legal department stated the enforcement strategies as quoted thus:

"The enforcement strategies flow from the city integrated waste management plan, the plan outlines clear compliance and enforcement goals, objectives and targets, then the departments work with compliance and enforcement, formulate key performance indicators (KPI) based on the integrated waste management plan targets. Annually reporting on enforcement achievement is reported and progress made is measured against integrated waste management plan targets. This is the way the enforcement strategy is outlined but this is not fully implemented which are barriers to our proper enforcing of the waste legislation".

Respondent 2 stated that notices are given if there is a default in a particular area of work, there are also spot fines given if illegal dumping is detected, vehicles are impounded if they are illegally carrying waste around the city, and charges and penalties are given to anyone caught violating the laws of the city.

Respondent 3 further noted that the “Joint Operation Committee” has been established, which inspects the city for any renovation, road construction or any construction activities happening. When these are found they question the contractors whether a plan for the construction work has been submitted to the waste management department. Submitted plans are examined, pointing out areas where there may be generation of waste. The Joint Operation Committee then informs the contractor what is needed which the waste management plan draft sets out, showing the different processes of how the generated waste will be properly disposed of, from generation stage to disposal stage. This plan must clearly point out the different areas where waste generation is envisaged and the processes of how the waste will be properly disposed of. After that process is found acceptable, the Joint Operation Committee approves the plan, but if the plan is not approved then the job cannot continue. Secondly, the legal department refers the builder to the compliance unit, which ensures that compliance to the Waste Act is effectively achieved. Also, there are building inspectors in the municipality who ensure that the construction work around the city is compliant with all the legislation of the council and that the construction is in accordance with the conditions set by the city, giving full details of the compliance measures. The construction work is monitored from the sub-structural phase of construction to the super-structural phase. Respondent 3 further affirmed that there are environmental health inspectors who work with the City to ensure that no hazards are arising. They do not fall under the Waste Act, rather they work in terms of the Health Act. These practitioners ensure that the health of the people in the environment is secured so if there is illegal dumping around a particular area, they take photographs of the illegal activity and alert the compliance department, asking whether they are aware of the activities and whether they comply with regulations. Respondent 4 was able to validate the report of respondent 3 on the application submitted to the City of Johannesburg and examined before commencement of construction work.

The Pikitup department had different opinions about the enforcement strategies used by the municipality; they faced difficulties when trying to enforce minimization of waste around the city. Respondent 1 from the Pikitup department stated that the enforcement strategies are not strong enough, but they are putting in place awareness activities around the city. Some awareness activities are implemented in the primary grade schools but not in the secondary grade schools because these do not grant them access to speak to the students. There are no advertisements provided in the media on construction and demolition waste. The motivation for promoting awareness in the primary grade has followed the adage of “catching them young”. They believe that by exposing the young ones to the negative effects of waste in the environment and emphasising how important it is that their surroundings should be kept clean and free from diseases, the children will be able to carry that knowledge with them as they grow older and transfer their knowledge to the next generation. There is also a slogan “it is a collective effort” so that everyone, both children and adults, should ensure they are protective of their surrounding and if they see any illegal dumping they should alert the municipality or any JMPD officer around their environment. This helps in minimizing waste.

Respondent 2 of the Pikitup department reported awareness only in limited areas of the city due to lack of human resources. Johannesburg is a big city and would need many people to monitor it. Furthermore, there is lots of illegal dumping done around the city which makes it essential for citizens to alert the legal department so that the offenders can be prosecuted. Respondent 2 added that the legislation dealing with penalties is not workable. The trucks of illegal dumpers are impounded while by-law penalties of R1500 and not the R10 million or minimum of 10 years that might be effective. There are no municipal courts available so if illegal dumpers are caught they cannot be apprehended; also the monitoring units are very few so it is impossible for them to monitor the whole of Johannesburg. Some offenders have relationships with the JMPD (Johannesburg Metro Police Department) so when they are

caught they are not prosecuted: rather they take the municipality to a higher court. Some companies will not pay the fines they have accrued when they are caught for illegal activities. Some of these companies are new and do not have enough money so they are left alone while some big companies when they are caught and fined will not pay that fine but rather go to court in the hope that in the long run the case may be forgotten or never brought to finality.

The respondent from the landfill site stated that there are landfill permits and licences are issued setting out the minimum requirement for landfill sites; operational plans are drafted and used from time to time. Waste minimization strategies and targets are given to the landfill site and so far they have been meeting their targets.

Responses to interview **Question 7: What barriers do you face in enforcing the legislation?** addressed research objective 3

Respondent 1 of the legal department indicated some barriers faced in trying to effectively enforce the legislation: namely, insufficient resources i.e. insufficient human intellectual capacity. Some officers do not have well-grounded knowledge of the waste management legislation, making it difficult to enforce the legislation as some of them do not prosecute the right people. Respondent 1 further discussed a political aspect which forms a barrier. There is a problem in communication with departments of higher authority so that whatever a subordinate department does never seems to satisfy them. There is also no formal communication link between JMPD (Johannesburg Metro Police Department) and the EMI (Environmental Management Institute) and other waste management sections within the city of Johannesburg.

Respondent 2 of the legal department agreed with respondent 1 that there is lack of understanding of the legislation due to its newness: “the environmental legislation is new and is a skill trade that requires many years of studies and knowledge for it to be implemented effectively”. He further opined that the legislation is not taken as seriously as the Health and

Safety Act and also there are no records kept on site as required by the waste legislation. So there is need for the policy makers to educate individuals on how to use the legislation. There should be training for workers on site and the waste legislation should be taken seriously just as the Health and Safety Act is treated with much importance. The waste record should be included in the sites records and produced during meetings, so ensuring effective record keeping as prescribed in the legislation.

Respondent 3 opined that there is lack of human capacity/ resources, and lack of effective monitoring which is due to lack of funds.

Respondent 1 of the Pikitup department reported a lack of awareness of the legislation and also lack of funds. Furthermore there is a need for partnership with community based organizations (CBOs). These organizations are focused within a certain suburb or province unlike non-governmental organizations (NGOs) that are allowed to operate in any part of the province or country.

Respondent 2 further affirmed a lack of communication links, lack of human resources, lack of funds and lack of cooperation amongst smaller and bigger companies, all as having affected the city negatively. The respondent at the landfill site stated that he did not see major barriers expected for weather change; when there is rain the landfill becomes moist and if there are hazardous wastes it will smell and also pollute the groundwater.

4.4 SUMMARY

In conclusion the study was limited to the views of the City of Johannesburg legal department and the Pikitup department due to time constraint and also the advice from the proposal defence panel who thinks the contactors view will be bias for the research.

This chapter discussed narratively the analyses of the research interviews; it was able to address all the research objectives set. The first research sub-question sought to know the

legislation that impacts upon waste minimization. This was addressed in the literature review presented in chapter two and also in the interview question 5. The respondents identified the other waste legislation that directly or indirectly has helped in minimizing waste. Thus the Health Act is not directly under the Waste Act, but helps to ensure there is no casualties when implementing the Waste Act. The by-laws were enabled by the Waste Act, giving a more focused and direct indication as to how to deal with construction and demolition waste. The Environmental Health and Safety Act and Labour Relations Act also work alongside the Waste Act. The National Environmental Management Act (NEMA) is important legislation which according to respondent 3, gives details on the responsibilities of everyone involved with policy. All these policies help the Waste Act work effectively. Unfortunately though, with all these policies working together with the Waste Act, there are still obvious problems in the City.

The second research objective was to assess the effectiveness of the legislation on construction waste management and disposal of construction and demolition waste.

Questions one and two of the semi structured interview were able to address the research objectives through the use of narrative analytical method. The problems affecting the effectiveness of the legislation were discussed and some recommendations were made.

The third objective was to assess the barriers to enforcement of waste legislation. Question 7 addressed the research objective. Most of the respondents from the legal department attested to a lack of knowledge of the legislation among most construction workers and contractors, and also lack of funds, lack of human capital etc. All these are bound to hinder the effectiveness of the legislation.

This section also discussed the enforcement strategies that have been put in place and the other documents used by the city of Johannesburg. It was found that there are documented

strategies that are supposed to be carried out by the municipalities, there are stated penalties given to defaulters of the legislation, notices are given if there is a default in a particular area of work, and there are also spot fines given for illegal dumping, but these fines are unrealistic as some offenders cannot pay them and there are no municipal courts functioning. Consequently, illegal dumpers continue their illegal ways in the confidence that they will not be brought to book. Communication links might also be a problem as there is a weak communication link between the JMPD and their sub-ordinate departments. Communication is a basic tool for progress in any field of work and if it is disturbed there will be problems and slow progress in operations. The municipality needs to have close communication between all the departments to achieve a good waste management strategy, this is in agreement with the integrated waste management plan (2011) which see the need for a formalised communication structure between all departments and companies directly involved with waste management services and delivery. The findings and data analysed helps to see the missing gaps in the studies that could be further researched upon thereby finding a lasting solution to the problems with understanding and obeying of legislation by all and sundry. This chapter further enhance the need for recommendation which will be done in the following chapter.

CHAPTER FIVE: CONCLUSION

5.1 INTRODUCTION

This chapter discusses the findings, implications, limitations and conclusions of the study and offers recommendations for further studies. The findings will discuss how the research questions and the three identified objectives were addressed. This will be achieved by incorporating existing literature and documents from the municipality with the data collected (findings) from the legal department at the municipality and the Pikitup department.

The aim of the research was to assess compliance with legislation pertaining to management and disposal of construction and demolition waste. The first objective of the study was to identify the relevant waste legislation for construction and demolition waste. This helped to set a direction for the research questions and other objectives. The literature review has identified the relevant legislation pertaining to construction and demolition waste, which is the National Environmental Management Waste Act, 2008 (Act No. 59 of 2008). This Waste Act was used as a basis for the interview questions, as the Act is the major legislation for construction and demolition waste at the national level. The second objective was to assess the effectiveness of the legislation on construction waste management and disposal of the construction and demolition waste generated on construction sites. Objective three of the study was to assess the barriers to enforcement of waste legislation management and disposal of construction and demolition waste management practices; this was done by involving the legal department of the City of Johannesburg municipality to air their views on how effective the legislation has been on their waste minimization enforcement strategy, and attempting to understand the barriers they face in enforcing waste minimization according to the legislation. The Pikitup department was also involved in the research in order to obtain their views on how effective the legislation has been in helping them to implement the waste minimization

strategies set out by the city of Johannesburg in terms of management and disposal of construction and demolition waste. The subsequent findings can enable greater awareness of the issues as well as recommendations of ways to improve the waste minimization strategies or plans in place.

5.2 FINDINGS

The first objective was to identify the waste legislation for construction and demolition waste. According to the Lu et al, policies are “codes of practice, ordinances, regulations, and initiatives introduced by government or its executive arms” (Lu et al., 2013). The respondents were able to identify the legislation used in regard to construction and demolition waste, the National Environmental Management Waste Act, 2008 (Act No. 59 of 2008) being the major Act attending to construction and demolition waste at national level. This Act was used to produce the waste by-laws for the municipality, and gives clear direction as to how waste should be managed and disposed of. It was found that there are other Acts used alongside the Waste Act, such as the Labour Act and the EHSA (Environmental Health and Safety Act) which gives direction on the health and safety issues that should be considered for workers and others operating in and around the work place. This document is taken very seriously on a construction site and induction programmes are conducted to ensure that everyone having access to the site is first made aware of the regulations applying to those on site. The attire of workers and visitors is assessed to ensure that it conforms to the health and safety regulations. The Health Act also works indirectly with the Waste Act to ensure there are no casualties during the process of waste management and disposal, and the NEMA (National Environmental Management Act) is the primary legislation used to identify the specific roles and duties of every individual in the municipality.

The second objective was to assess the effectiveness of the legislation on construction waste management and disposal of construction and demolition waste on construction sites. Questions ones and two of the semi-structured interview were able to substantiate the research objectives through the use of the narrative analytical method. The integrated waste management plan (2011) provides an action plan for monitoring of illegal dumping of waste; also, the National Waste Management Strategy (2010) sets out some goals and objectives to ensure that the following are in place: adequate staffing; effective enforcement and compliance with regard to waste regulations; monitoring and progress reports on the performance of waste management; and awareness of the impact of waste on the environment and on the health of individuals in the communities.

However, all these strategic objectives are not very effectively realized as respondents reported many persistent problems with illegal dumping due to lack of effective monitoring caused in turn by lack of human capital. It was discovered that the communication links between the municipality and JMPD are very low and ineffective. This constitutes a major problem as if there is no agreement on a certain issue and people merely do what seems right to them, conflicts of interest arise. The UN Habitat (2010) proposed a model of two ‘triangles’ that helps to give clarity and sustainability to waste management. The first side of Triangle One is *public health* i.e. maintaining a healthy environment across the city; the second side is *environment* i.e. the importance of having a protected environment; and the third side is *resource management* i.e. effectively managing the waste resources by recovery, reuse and recycling of the waste that is generated by the city. Triangle Two focuses on the importance of a good strategy in government to having a well-organized and effective system in place. The first side of triangle two deals with being *inclusive* i.e. ensuring there is transparency in dealings, and working with the other stakeholders involved in providing, using and enabling effective waste management system. The second side of triangle two deals with *financial*

sustainability i.e. ensuring there is transparency in the waste system also ensuring that waste management is cost effective and affordable. The third side of triangle two is *Sound institutions and proactive policies* i.e. ensuring there is strong and transparent institutional framework by the government, this framework will help the system over a long period of time. There were suggestions made in 2001 by the UN- Habitat world urban forum stating that when a city is clean, the solid waste management system could be used as indicators to show that there is good governance of the city. These two triangles reflect the importance of effective communication across a society. Awareness problems are generally due to lack of communication and problems of effective implementation result from a lack of effective communication links. There needs to be effective communication in society about waste and its effect on health and the environment; also, awareness of the full processes involved on proper waste disposal needs to be raised through public media, with programmes issued on a monthly or quarterly basis, and also through on-site induction courses on waste management and record keeping (including the punitive measures applicable to anyone caught violating the regulation). In this way everyone in the society becomes involved, there is less burden placed on the municipality and illegal dumping is reduced to a minimum.

The third objective was to assess the barriers to enforcement of waste legislation focused on management and disposal of construction and demolition waste. Question 7 of the research questions was able to substantiate the research objective. Most of the respondents at the legal department attested to the fact that there is insufficient knowledge of the legislation among most construction workers and contractors, as well as lack of awareness of the legislation amongst workers, lack of funds, and lack of human capital. All these factors hinder the effectiveness of the relevant legislation in the society. The municipality cannot work alone on these issues; this indicates the great importance of being inclusive: that is, involving other stakeholders, both private and public. Respondent 3 opined about the involvement of the

counsellors in the locations. These officers are present in the areas where illegal dumping occurs and they are amongst those being directly affected by it, which makes their involvement very important. Another respondent from the Pikitup department opined about the need for partnership with CBOs (community based organizations): these are private individuals and groups helping the communities. They are different from NGOs (Non-governmental Organizations), who may also be giving assistance, because they can only be situated in a community whereas NGOs may even be situated outside the city. The municipality has complained about lack of funds; however, this can be taken care of if the private sector of the economy is involved in the strategy. Fixed boundaries should be established as to what they can be involved with and there should also be very strong communication links amongst the private and government stakeholders. Stakeholders' ideas should be considered in meetings and there should be negotiating ground for ensuring the effectiveness of whatever strategies are put in place. For example, the government might want to make a decision that will not favour the private sector; there should therefore be consideration and discussion as to how everyone will work together in harmony.

It can be concluded that communication and inclusiveness are major aspects bearing on the effectiveness or otherwise of legislation, and there is need for effective communication in all sectors of the economy as well as involvement of all areas so that the whole community can effectively address the problem of illegal dumping and help to recover waste by supporting and enabling recycling processes. This study has identified some findings that were seen in the course of the data collection process.

- There were indications that the legislation is too rigid in terms of dates allocated for managing waste from generation to disposal, which are practicable for mega companies but not for smaller companies. The legislation should be reviewed and

flexibility should be applied for renovation works and other smaller construction works.

- Problems with lack of funds and lack of human capital were identified. It is obvious that the municipality cannot manage the volume of waste by itself and thus there is need to include the services of other stakeholders, both private and public. In addition, there is a need to include waste matters in the curriculum of schools. Finally, more City staff members should be employed and trained.
- It is very important that there should be training for site workers at intervals, also a waste management board should be created to help organize this training. For the small communities that are not educated, a simple framework of a process flow chart could show the waste processes from generation of waste to disposal, and include the negative effects on human health and the environment. It could also highlight the importance of alerting the municipality when they see an illegal dumper, and the punitive measures that are applied when an illegal dumper is caught. This should be designed and displayed in the media from time to time in the local language(s). This could be effective in raising awareness of the waste management policy and also urging the illegal dumpers to stop polluting the environment.
- One of the respondents at the Pikitup organization commented on the non-functionality of the municipal court which has made it impossible to prosecute the illegal dumpers, making it appear as if there is no punishment or measures adopted for illegal dumping in the society. Therefore it is recommended that the municipality should restart operation of the municipal court and ensure that the fines applied to illegal dumping are practicable, given that respondents opined that individuals are not paying the fine when caught.

5. 3 IMPLICATIONS

5.3.1 Practical Implications

Analysis of this research shows that it is a subjective study in that it is dependent on the views of the respondents. The responses given are also dependent on the mode or standpoint of the respondents involved, who stood as representative for all the other persons involved in the municipality and the community. The responses given for the barriers faced in enforcing the legislation provide a telling example. The respondent at the landfill site said there were no barriers faced, except in the case of certain hazardous wastes that came on site from time to time. However, the respondent from the Pikitup department said thus: *“You should go to the landfills site and ask the manager he will be aware because he has been there for long. I won’t know much because am not in that department and have not be here as long as he has been. He knows about how the problems of waste has been and has worked with the municipality long enough, he is got lots of information about the landfill site”*. This showed that the respondent at the landfill site was not open to giving full and transparent details of the real problems that had been experienced there.

5.4 LIMITATIONS

Research on assessment of the legislation has not been undertaken in many places so access to information from journals is very limited. This gives room for further studies and improvement on legislation and policies. The study was also limited to the South African national Waste Act using only the City of Johannesburg as the research focus. In addition, while the intention had been to use mixed (qualitative and quantitative) research methods, the small number of respondents and the probing required to obtain the type of result needed meant that the research went the qualitative route. Getting access to the municipality was rather difficult and also most of the respondents did not want to be recorded, fearing that their words might be used against them. Some of the respondents did not want to give access

because they did not have any idea of the legislation, and also some respondents were biased in their responses to some questions because they wanted to protect their jobs. The time constraint was also a problem as it excluded the possibility of conducting an observation of how the waste process is implemented.

5.5 RECOMMENDATIONS FOR FUTURE RESEARCH

There is a need for further studies assessing waste legislation that emanate from other municipalities in South Africa. This will help to determine whether they are facing the same problems as the City of Johannesburg. This study has identified some gaps that suggest a need for further research:

- The research was done with a small group of people, of which the sub workers were unaware of the legislation, which made it difficult for them participate fully in the research process. Similar research can be conducted in other municipalities including the other municipal departments and also field workers: this could either validate the findings or differentiate the other municipalities from the City of Johannesburg in terms of awareness of the legislation.
- Problems were identified around landfill sites getting filled up, and two landfill sites are now closed. It can be recommended that triangulated research should be done which will include observations of the processes of waste generation to disposal; also the landfill site should be observed in order to understand the process of recovery of waste as well as recycling of waste brought to the landfill site. This will help in identifying where problems arise. In addition, some quantitative research should be undertaken using questions concerning the effects of this waste in the environment; also there should be some interviews with the municipality and the JMPD involved with monitoring of construction and demolition waste disposal.

- Observations should be conducted on landfill sites around South Africa in order to determine the underlying problems that caused two of the landfill sites in Johannesburg to be closed, this will help with to sustain the two landfill sites that are still open and functional by ensuring that they are well managed.

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APPENDICES

Appendix 1 Waste management interview questions

INVITATION TO PARTICIPATE

School of Construction Economics and Management

University of Witwatersrand

Private Bag 3

Wits

2050

Company Address

Dear Sir/ Madam

REQUEST FOR VOLUNTARY SURVEY PARTICIPATION ON THE FOLLOWING RESEARCH TOPIC

Assessing the Compliance to Legislation pertaining to Management and Disposal of Construction and Demolition waste.

I am Olusanya Olubanke a Masters student from the department of Project Management in Construction in the school of Construction Economics and Management at the University of Witwatersrand. I am carrying out a research that seeks to understand the effectiveness of the waste legislation on management and disposal of construction and demolition waste on the construction sites. In order to answer the research question, the aim of my study is assessing the compliance with legislation pertaining to management and disposal of construction and demolition waste.

From the exploratory phase of the study, I have identified the waste legislation for Construction and Demolition waste and also some of the effect of Construction and Demolition on the environment, socially and economically. Therefore the objective of study is to identify the relevant legislation for construction and demolition waste, assess the effectiveness of the legislation on construction waste management and disposal of construction and demolition waste on construction site and also to assess the barriers to enforcement of waste legislation on management and disposal of construction and demolition waste management practices.

I will like to conduct an interview with you which will take 30mins to 45mins of your time. I assure you that your identity and that of your company or firm will be left anonymous. For further information on the research you can contact the researcher Olusanya Olubanke, +27785188987, 1006180@students.wits.ac.za, or the supervisor Dr Stephen Allen, 0710748590, stephen.allen@wits.ac.za.

Thanks for your participation.

CONSENT FORM

NAME OF RESEARCHER: Olusanya Olubanke

PROJECT TITLE: Assessing the Compliance with Legislation pertaining to Management and Disposal of Construction and Demolition waste.

AIM OF RESEACH: To assess the compliance with legislation pertaining to management and disposal of construction and demolition waste.

OBJECTIVE OF THE RESEARCH: To identify the relevant legislation for construction and demolition waste.

To assess the effectiveness of the legislation on construction waste management and disposal of construction and demolition waste on construction site

To assess the barriers to enforcement of waste legislation on management and disposal of construction and demolition waste management practices.

Please tick in the box after each statement to which you wish to consent.

1.	I confirm that I have read and understood the information sheet for the above titled study and I have had the opportunity to consider the information contained therein.	
2.	I have been made aware of the purpose of the study.	
3.	I understand that my participation is voluntary and that I am free to withdraw it anytime.	
4.	I understand that my participation is anonymous and confidential.	
5.	I agree to take part in the study.	

Name of person
taking the consent

Date

Signature

INTERVIEW QUESTIONS FOR THE LEGAL DEPARTMENT IN THE MUNICIPALITY AND THE PIKITUP DEPARTMENT

Please what is your role/ position in the department?

How many years of experience have you acquired here?

1. How effective has the National Environmental management waste Act, 2008 (Act No. 59 of 2008) legislation been on classification and re- classification of construction and demolition waste? The clause says classification of waste must be done within the space of 180 days of generation, Re- classification of waste must be done every 5yrs or within 30 days of modification to the process that generated the waste, if the waste initially classified is not approved by Minister, if the waste has been subjected to any form of treatment.
2. How effective has the National Environmental management waste Act, 2008 (Act No. 59 of 2008) legislation been on Waste Management. In terms of the waste transporters and waste managers not accepting waste that has not been classified in terms of regulations 4 unless waste that do not need classification (domestic, business waste not containing hazardous waste or chemicals).
Waste must not be diluted solely to reduce concentration
Waste not stored for more than 18 months of generation, ensuring waste is reused, recycled, recovered treated and disposed of within 18 months of generation.
3. How effective has the National Environmental management waste Act, 2008 (Act No. 59 of 2008) legislation been on waste treatment in terms of waste been blended and pre- treated to enable potential for re- use, recycling, recovery or treatment.
4. Record keeping of waste from generation till final disposal, ensuring the records are provided to the departments upon request.
5. Appropriate conviction of offenders of charges of fine not exceeding R1 million or imprisonment for a period not exceeding 10 years.
6. How do you think the legislation has helped in minimizing generation of waste?
7. What are the challenges do you face as regards the ineffectiveness of the legislation?
8. Apart from the National Environmental Management, Waste Act, 2008 (Act No. 59 of 2008) what other legislation do you apply in your waste minimization strategy.
9. In enforcing of Construction and Demolition waste legislation what enforcement strategies do you have to help promote minimization of construction and demolition waste?
10. What barriers do you face in enforcing the legislation?

Appendix 2 INTERVIEW 1: Waste Management Legal Department

QUESTIONS	RESPONSE
What is your role in the department	Waste regulation and waste service delivery monitoring
For how long have you been working	Over 15years
Are you aware of the national environmental management waste Act, 2008 (ACT NO. 59 of 2008)	Am aware.
Based on your experience, how effective has the construction and demolition waste legislation been on classification of waste	Looking at the legislation on waste classification the clause that says all waste generators must ensure that the waste they generate is classified in accordance with SANS 10234 within 180 days of generation has not be followed effectively because there has been insufficient human capital, also the legislation generally is workable for the mega construction firm as they have the money to dispose of their waste as appropriated in the legislation, some companies have their waste sorted on site which makes it very easy for the disposal process.
How effective has the construction and demolition waste legislation been on waste management?	Some of the smaller construction firm have issues with proper disposal of waste due to the high cost, the legislation expect there to be records of waste storage “date on which waste was first placed in the container, date on which waste was placed in the container for the last time when container was filled, closed, sealed or covered. All this cannot be practicable for the smaller firm as some of them done read the legislation to the letter, they just ensure there skip when filled up has to be disposed of. While some will even get some illegal unregistered waste transporters that they can pay less, not as much as the 300rands and then paid them to get the waste off the site not mindful of were those transporters are going to dump the waste. Some transporters then repackage there waste by putting domestic waste at the top and builders rubbles below and smuggle the waste to the dump. This makes it very difficult for the sorting of the waste and this create accumulation of waste in the landfills till it’s filled up. There are problems also with the recycling processes as there are few government recycling plans, those are part of the new policies, promotion of the recycling and recovery of waste. Some private companies are involved in recycling activities so the government is encouraging more of that in the city.
What are the Challenges to the ineffectiveness of the waste legislation pertaining to construction and demolition waste?	One of it is Increased percentage of waste contraventions. The other waste malpractice in the form of illegal dumping and littering, which contributes to land and water pollution. Like was earlier said this are challenges we face and some factors contributing to this illegal dumping is the high costs of collection, transportation and disposal of waste. So landfills and management facilities close early so this makes it difficult for there to be access into the facilities for the working population which is growing by the day. As we are trying to work with the legislation there are others out there putting stumbling blocks and making it difficult to move forward. There is also lack of understanding of the environmental

	and economic impacts of dumping of waste.
Apart from the National environmental management, Waste Act, 2008 (Act No. 59 of 2008). What other legislation do you apply in your waste minimization strategy?	Waste management by- laws. This by- law is published by the municipal manager of the city of Johannesburg metropolitan municipality as approved by the council. The integrated waste management plan must be done as according to the by-law, there should be assessment of the type and quantity of waste this will be generated, a breakdown of the waste management services the generator requires, the process of separation of waste, sorting, treatment recovery and disposal of waste. All the details of persons responsible for the waste at each steps should be stated.
In enforcing of Construction and Demolition waste legislation what enforcement strategies do you have to help promote minimization of Construction and Demolition waste?	The enforcement strategies flows from the city integrated waste management plan, the plan outlines clear compliance and enforcement goals, objectives and targets, then the departments work with compliance and enforcement, formulate key performance indicators based on the integrated waste management plan targets. Annually reporting on enforcement achievement is reported and progress made is measured against integrated waste management plan targets. This is the way the enforcement strategy is outlined but this is not fully implemented which are barriers to our proper enforcing of the waste legislation.
What barriers do you face in enforcing the legislation?	Insufficient resources. i.e human intellectual capacity. There are officer who do not have the relevant waste management knowledge making it difficult for the legislation to be enforced, as some of them will not prosecute the right people. There are also some political aspect which forms as a barrier. During meetings there are arrangements as to how enforcement strategy has been planned out in the meetings. But after the meetings everyone disperses and does what they want to do, without taking into consideration the opinions of other group of people in the initial agreement. They are the bosses and whatever they say is to be followed but when they don't seem to listen to us there is nothing we can do about it. Institutional arrangement between the JMPD AND EMI's. There is problem with communication link, there is no formal communication link between the JMPD (Johannesburg Metropolises department) and other relevant waste management sections within the City of Johannesburg.

INTERVIEW 2: Waste Management Legal department

QUESTIONS	RESPONSE
Please what is your role/ position in the department	Specialist waste management and regulation.
For how long have you been working	6- 10 years
Are you aware of the national environmental management waste Act, 2008 (ACT NO. 59 of 2008)?	Yes I am aware
Based on your experience, how effective has the construction and demolition waste legislation been on classification of waste	The legislation has some aspect that should be followed without any question, like classification of waste subjected to any treatment must be done, but the specifications of date has been very impracticable, like the once that talks about classification done within the space of 180 days of generation, reclassification of waste done if not approved by the Minister. Some companies work with the legislations as appropriate. But first, a large population of individuals working on site don't even understand the legislation how much more following the legislation. There should be awareness polies.
How effective has the construction and demolition waste legislation been on waste management?	The legislation is not flexible enough to accommodate the smaller construction companies. Some are not buoyant enough to afford cost of disposal so they employ the services of this cart pushers or the illegal waste dumpers. This illegal services are very cheap and affordable and some of the construction firm have friend amongst the authority who over look there attitude. The stakeholders (waste manager) has the responsibility of ensuring the waste accepted must be classified according to the sub- regulation 4 but all this are not regular which become problematic to the enforcers of the legislation. The availability of the records to the department is very ineffective as some give a formulated figure of how they manage the waste. Work is further done on whatever records is released. Record keeping is very essential as it makes is very easy to assess and understand where there are problems and this helps solve problems faster and help the municipality move on.
What are the Challenges to the ineffectiveness of the waste legislation pertaining to construction and demolition waste?	Human capital. Skills to interpreted it Premulzaton and copulate No set guru in local environment.
Apart from the National environmental management, Waste Act, 2008 (Act No. 59 of 2008). What other legislation do you apply	Labour relations Act EHSA (Environmental Health and Safety Health Act.

in your waste minimization strategy?	
In enforcing of Construction and Demolition waste legislation what enforcement strategies do you have to help promote minimization of Construction and Demolition waste?	Notices are given if there is something to be done and is not done, example is if there is payment to be done and is not done notices are given, There are spot fines given, if there was illegal dumping done in a particular place. Vehicle Impoundment, any illegal waste vehicle found around the city is been impounded. The person in charge will be penalized.
What barriers do you face in enforcing the legislation?	Environmental Legislation is new and is a skill trade that requires many years of studies and knowledge to implement effectively. So the policy makers need to educate on how to use the legislation, trainings in companies should be done for workers just has Health and Safety is taking very seriously on site. Waste legislations needs to be taken very seriously. It should be included in the construction site records during meetings and the records of the waste as stated in the legislation should be followed.

INTERVIEW 3: Waste Management Legal department

QUESTIONS	RESPONSE
What is your role in the department?	Senior specialist waste management information department I gather some information on waste for the city of Johannesburg i.e processes, issues, problems and challenges that we are facing and I will collect them and put them into a report and then I will submit the report to the department for the management. People there are responsible for certain things that they can act on those things I have raised. If it is a good and positive report then then it's good for the department but if there are challenges then I will of course indicate the challenges. So in a sense it's not a monitoring section it's sort of taking itself to that, that before the monitoring section they can have that information, they need someone to collect that information including packaging it, then the monitoring department sit and get the issues and the problems then send it to the information department.
For how long have you been working?	10 years
Are you aware of the national environmental management waste Act, 2008 (ACT NO. 59 of 2008)?	I did it.
Based on your experience, how effective has the construction and demolition waste legislation been on classification of waste	The big companies follow legislation because for them to start operating you find out they might have a check person in the company who looks at that and they know what the laws and By-laws says. There will be so many reasons why small companies do not follow the legislation. 1. Lack of knowledge In a situation where by I win a lottery and I get lots of money and I don't have any idea of what to do with the money and a friend calls me and says he really needs someone to remove this rubble from off his site and he doesn't know who to contact and you know as municipalities sometimes we don't advertise this things on billboards and they have to go to the office to make enquires and you find that people just don't have time to go to those offices they pay the actual price by opening a municipal account and this guys don't even know the door of the municipal offices so you find out that a person will just talk to me that this is a business and because we have never heard of anyone talk about the builders rubble before I will just go and buy a truck and decide to start taking the waste and in a developing area were you can see that there are lots of construction work going on and there is need for waste transporting and disposal then I just buy a truck and provide my services there without having in mind questions like 'what are the by- laws of the city saying?'
But then he is going to dump definitely so it is	That is the problem they don't even go to the.... We call them landfill site and not dump site. The landfill site are the areas that have permits to

expected that the dump site have records of people coming to dump	receive dumps. We do have the dump sites but we find out that they are not permitted. For example if I take this waste and I don't know anything about the landfill site I just take it and see a corner that is vacant and just dump there, that becomes a dump site. That is not a legally compliance place for me to dump but I just dump because I see a place that is open no one is in charge of the place. That is the first and most thing that happens especially when you talking to the... I don't want to say the African people, let me say the young entrepreneurs that is the first problem they are having. Secondly if I am taking this dump to the landfill site you know that I have to pay and am just starting this business were am I going to get this money to pay?
So the money is really on the high side or is it that it is not affordable to every one	It's not a big, big amount then again people don't like to pay. It is not a lot of money but someone could say that 300rand is going away from me I could use it for fuel so there is the second part of it that at the landfill site you are paying so what is the best option? Someone just takes the dump and go and dump it somewhere vacant were no one ask them to pay and you know at the landfill site they look at the weight and then they weigh the volume and charge you per weight of what you are bringing in and also very importantly when you are going to a landfill site they also look you are bringing in a builders rubble and in your builders rubble you are bringing in asbestos
That means it hasn't been sorted	And it's got those things, you will have to pay more money because we as a municipal we must sort the waste before taking it to the landfill site but if it is a clean one like bricks, broken bricks that one is easy because you just crush those things and then use it on the landfills so there are those cost implications that pushes people.... Not pushes them, it sort of makes them find an easy way of not doing the proper thing in terms of disposal of the waste. I think those are the two main issues.
The legislation speaks about the managers/ stakeholders, they are not supposed to accept waste that have not been classified as the legislation says the waste must be classified and approved before they accept.	That is also why for example if I just decide to buy a truck myself and am doing collecting waste, I don't know what is classified or not classified. But if I go to a landfill site that is where they are going to tell me about it and I will pay certain amount. So those guys at the landfills they need to make sure whatever is been dumped is checked but also again here in the city of Johannesburg we also have metro police who are working with the environment which means they are also using the same policy to actually stop a truck that is carrying waste and look at the type of waste and they will take the codes, we have codes according to the type of waste and then look at the waste in the truck and then if your truck is not is not registered for that waste, you are given a fine.
Ok so that is like an enforcement strategy	Yes it is
But then the waste that are been dumped the acts says waste must not be diluted solely to reduce concentration then waste not stored for more than 18 months of generation also waste treatment in terms of waste been	Yea its followed, remember it is not our own inspectors in the municipality we also have green scorpions those are at the National level they are distributed by the National department they are at the municipal level to assist the municipality in terms of enforcement power. Their duty is to go round all this areas that have been permitted to do the waste and go and check if they are following the constitution because when the national give your company a permit to management waste they will give there conditions, like 'we give you the condition that you do A B C D, so the responsible of the national plus our own compliance team plus

blended and pre- treated, to enable potential for re- use, recycling, recovery, or treatment. Like all this are they been followed	environmental health and health Act which is not per of the waste management Act they are still doing that.
And also the safety acts to the come along sides	Yes mostly the people there are compelled and the once who actually get the stake and the once that are non-compliant..... actually we don't know them so they do what they want to do. So it is a matter of maybe the municipalities need to have more working relationships with the counsellors of the places were waste is been dumped because each and every area has a counsellor and if there is an activity happening in an area the counsellor needs to know if the activity has been permitted by the municipality and if the municipality is aware of the activities.
But there should be like some trainings and awareness for this people	Yea those things do happen, the trainings happens maybe not often like once a year, and most of this companies they belong to I won't say society, like a structure/ body. E.g if you are dealing with glass there will be a glass over all company that certify you by giving you trainings, we rely so much on this bodies. Even like the paper we have a paper board that is sort of registering all of the paper manufacturers and there is their own plans so we rely on them and we make sure the municipality has working relationship with them because they can take care of their own people so it saves us the stress of having to deal with so many people.
But I think even for construction site there should be a relationship.	Construction I will say for now to tell you in all honesty we are not..... I don't think they even have a board because all along I don't think people took builders rubble as waste like that, also the benefits the builders rubble people were also having was that the municipality landfills sites were just accepting builders rubbles for free so they just go dump the waste without paying any amount so I haven't really, really I think this people that start up the boards haven't seen value out of it that much. But starting with the city of Johannesburg you know now we have rubble crushers, with rubble rushers we take all the builders rubbles we crush it, and we re-invent it, we reuse it for road constructions and use it to build houses and all those things
Because even the demolition works to the waste gotten from that is a lot too.	Before people will just demolish and no one considered it as a waste.
How effective has the National Environmental management waste Act, 2008 (Act No. 59 of 2008) legislation been on waste treatment in terms of waste been blended and pre- treated to enable potential for re- use, recycling, recovery or treatment.	This is one is not in terms of builders rubble the waste Act has not really been assisting remember with waste Act, remember with tyres, and plastic they will develop the Act and come with their regulation for plastic for example pay a 45c you know amount, but in the Builders rubble they are quit that is why you find that the board is not even there because there is no assistance coming from the National in terms of saying lets develop a regulation then will have a board that will say if you are building a house and having some waste you must pay a certain fee but the waste Act is quit its siting and not saying anything. It does recognises that there is waste but it's not assisting me as some who is sitting at the Municipality..... Ok let me not say me let me say a company so in terms of productiveness it hasn't been of course generally let's say if you are polluting this is how much will be done or paid but it's not specific

	on builders rubbles that much that is why am saying when it comes to builders rubble it's still quit right now and you see with the tyres the regulations came out, with the plastic the regulation came out, paper, glass things like that but with this one it is a little bit quit.
So the record keeping been that it is quit they don't keep records	The record keeping
Do they provide it like you know the department probably will need an update of how there waste is been maintained so do they provide their records as requested from the department regularly.	Yea
It's provided regularly.	Well Builders rubble before it was not keeping records as am saying they the municipal did not regard it as anything so they just say 'you can bring your waste free and they collect it, no one was recording anything because it didn't mean any business thing to anyone but starting now because now, you know with your rubble you can recycle, you can get money off it, so people are now starting to record it so now especially in the City of Johannesburg people that are doing rubble they are recording now because it is a business and they are getting something out of it. So this now it's happening now.
The offences and penalties are they appropriately convicted of the charges of fines not exceeding R1 million or imprisonment for a period not exceeding 10 years? Do they follow this penalties on those that are against the law	That one I think the right people that are the Waste regulation and waste service delivery monitoring and the Specialist waste management and regulation department. This is because they are the once working with them am not so much working in terms of monitoring and evaluation so they know all that and how it's been followed.
In your own view now how do you think the legislation has helped to minimize waste on site because according to the integrated waste management plan there were predictions of waste in the future years that it will be serious problem	I think the legislation has slowly very slowly, it is helping because can you imagine if there was no legislation then we would not know what to do with the waste. but the legislation is very clear because it tells you what you should do or should not do with it and also us as a municipality it has helped us because then we are able to convict people, we are able to do monitoring and say we are using this legislation saying Builders rubbles for example one of the good thing able the legislations is it defines the type of waste because can say for me this is not waste I can still use this cardboard, brick for something else but the legislation is clear and if the intention was to build a house and then there was a demolition process in some areas of the house and the area is fixed, which ever waste removed will be no longer needed then it becomes waste so I think when you look at it, it helps us a lot also telling us were should we take the waste or how often also the times for disposal so for me it has been helpful to have a legislation because it has helped in developing our by- laws in terms of the legislation we have the by- laws based on this Act. If the legislation was not there it will be open for debate. So at least we have something like a

	backbone that we can sit on and say the waste Act says this. So slowly people are beginning to grasp it but it's a very slow process and I can say it is helping.
Ok so because of the slow process I asked a question "what are the challenges you face now to the ineffectiveness of the legislation? You talked about the quietness of the Act on the builder's rubble now what would you say is the problems/ challenges you are facing?	Let me say one the challenge will be firstly not enough value for the legislation,
Someone said not enough human capital or.... That they don't have enough human capital.	That's a problem that you find government doesn't have enough people to even monitor this there are only three guys here that are doing the work.
For the whole of the City of Johannesburg	Yes. Capital will be the first, money(funds) there is no I can't say marketing but I will say you know the issue of water, you see it on T.V
Ok no Advertisement	Yes, there is no such thing, there is no profiling of this legislation. We did talk about the human capacity which we are lacking then it results to lack of monitoring of cause non- prosecution. That means that if I am doing it, I will keep on doing it until I am cut, I don't care if am damaging anything I just keep doing it until am cut because there are not enough people to go and do the monitoring.
Someone else talked about lack of understanding of the legislation because it is still new and up coming	Yea that is why I talked about the profiling, because if you put something in people's face that always talks about switch off your water, people are going to ask why they should switch off their water, then they start talking about it. But the builders rubble is quit no one is talking about it
So apart from the National Environmental, Waste Act, 2008 (Act No. 59 of 2008) what other legislation do you apply in your waste minimization strategy.	NEMA (National Environmental Management Act), this just says the responsibility of everyone in the policy it was the first of the policy, for us then we have the waste management by- law was also have the Integrated waste management plan/ policy, has much of the policy because it us from the policy and plan because that will give targets as a municipality
Yea I was reading it, the latest one I saw was 2011, so Kanti was telling me they are going to review the document after 5 years	Yes it will be updated after every 5year which means 2017 our year starts from June/ July so we are going to finish in 2015 so July 2016 going forth that's when the new one starts
But like for you now from that 2011 IWMP there were some things about enforcement strategies you want to put in place to curb waste. from that time till now has there	Yes definitely. There has been changes as I was saying because of the policy and the plan and looking at us seeing the need to minimize the waste because we only have four landfill site which are almost filling up

been changes	
Yes two of it are been closed down	Ye they are getting depleted, this things of carrying waste as am saying that now in the City of Johannesburg in the two landfill site we have crusher plants and we are not taking builders rubbles anymore to the landfill sites for free any more so it goes to this crusher plants and instead of taking it to the landfill site we are turning it into something we can use, instead of us buying soli for the roads we use it as rubble that is emanating, that is the result of the policy and plan as part of the minimization strategies, that came out of that and as a municipality we had to go and buy this machines and do everything and for us to be able to buy those machines it is because in our policies and plans we have indicated that we want to minimize the waste that is going to the landfill site and part of it is the Builder's rubble which was filling our landfill site because you can imagine with Builder's rubble it more of the volume part and also the weight because its heavy it's not like paper, paper is something within maybe two years its starts rotting and it becomes nothing but with Builder's rubbles it's not the same it just fills up. So the policy and the plan has assisted in those things to actually be able to buy those thing like the Builders crusher, so there has been change and then now let me return to the regions and tell them that you don't have to go also part of it is what my colleague is doing it is to say if you are going to renovate your house or Building a new place, part of it will require Environmental management plan and part of that plan I saying to us that we want to know what you will do with the waste that will emanate from the house that you are renovating, whatever waste is coming from the construction and you need to give us a step by step process by which waste will be generated and how you intend to dispose of the waste. All of this are part of the IWMP and policy that we developed, so with the waste that are coming, we develop this policies and plans which set out and told us the targets and actually gave us the mandate that told us we can start developing this and also start asking this from people. So it has helped.
What other documents do you use or is it just this three.	Hmmm yea it's just three because the other documents are sitting at the Pikitup because they are implementing the policy remember we are a policy overall developers like your minimizing strategy is with the Pikitup but I think I might probably have the document. But they one that talks to the Builders rubbles, that will be your plans, your by-laws, your waste Act that you have and your NEMA is what we have for now we have not developed any regulation yet.
Ok so In enforcing of Construction and Demolition waste legislation what enforcement strategies do you have to help promote minimization of construction and demolition waste?	One of it would be as I was saying my colleague is sitting next to me its "Joint operation Committee" were if you are either going to Build, or renovate or build roads the ask if you submit to the waste management or water plan but for us it's the waste management plan. that Is the first thing .If you are a builder and your job is to builder this stadium and we know there is going to be waste coming from there, so the question of how do we enforce that the waste that will be coming out of the construction process is taken to the right place so we bring you into the Joint Operation Committee then they tell you what you need which is your waste management plan draft showing the different processes of how you will deal with the waste or how it is expected of you construction process at what stage you envisage that there will be waste also the processes from generation to disposal, and they approve of the plan, but if they

	don't approve of the plan then the job cannot be done. The second enforcement is the application with the municipality because when you apply with the municipality you tell them what you intend to construction taking along with you the plan for the building, the municipality then reads your plan and if they see there is going to be a waste aspect they bring the plan to the legal department for commenting. So we have a unit which is the compliance unit, they ensure that compliance to the waste act is effective. There of cause there is the inspectors, there are Building inspectors. Each and every of the municipality must have a Building inspector that will ensure that the person Building is compliance to all the legislations of the council of all the conditions that is given. Those people need to do the monitoring from the foundation of the building to the roofing, or if it is renovation you are doing, they come and visit and tell you what and what is allow or not allowed in your construction process. They are always on their reflective jacket. Every municipality has a section for that. Let me include the environmental health because they are sitting on the ground and ensuring that each and every process that is happening there are papers, even though they don't fall under waste Act, they fall under Health Act but they are still working because as a City of Johannesburg we have a Health department that is just paid by the City. Their job is to ensure that were people are staying or in a certain area where there is waste they take pictures and make a call to the compliance department asking to know if the activities happening there is complying to the regulation. So those are the enforcement.
Ok so lastly what barriers do you face in enforcing the legislation?	It still goes back to Lack of Human capacity/ resources, sometimes those things like illegal dumping happens and no one sees them Secondly its lack of funds because you might have people who want to go and do inspection but there is no transportation for visiting those areas so they just sit in their offices and wait to receive the reports, they don't go to site for inspections, and that is a challenge because someone violating the law will not be caught and those in the municipality definitely will not have any idea of what is going on. Also for small guys who will go want to construct schools in an area like Soweto and no one visit the area in like 2months.
Ok thank you very much for your time.	You welcome and if I may ask

INTERVIEW 4 WASTE MANAGEMENT LEGAL DEPARTMENT

QUESTION	RESPONSE
please what position do you hold	senior specialist waste policy and programs
how many years have you had this position	6 years
Please in your view how effective is the legislation on national environmental reclassification of waste, especially construction waste products?	I work in policy that is IWMP ,this body is in charge for the city and is regulated by NEMA, so the direction and role it needs to play is influenced by NEMA and how the city should manage and classify waste from generation to disposal
The effectiveness of transporters and waste managers in accepting waste, with respect to registration	This department has 3 elements, information, policy and compliance. These 3 departments assist each other. Compliance deals with the inspection of facilities and trucks. The information department deals with registration, when this is done, a report is sent by registration department to compliance department for checks to be carried out on site, compliance also stop trucks on the road for permit checks, if there is no permit they are referred to the information department. It is the compliance department that have the by-laws that guide our actions.
It seemed people disposed waste freely and at least 2 landfills have had to be shut, so is the policy ineffective, and why did it take time to realise waste disposal would eventually become a problem	Many factors cause this problem, it is multifaceted, at first south Africa handled waste based on the laws formerly in place, also due to the financial means that existed, and these forced the use of landfills. Taking waste to landfills and having it compacted. However landfills are getting filled, with the population of Johannesburg growing, and demand is huge, disposal trucks increased, and landfills have shorter life span now. The city had to do an internal assessment to deal with waste differently, so city has changed its thinking as landfills cannot exist for long period anymore. So there is a plan to have alternative waste treatment initiative to convert waste. Converting rubble to other materials with recycling in mind to create such as biogas and similar materials to generate electricity. In the IWMP law there are 12 key competences, waste minimization is one, there is also the role government has to play, there is compliance and enforcement with information, if you read the challenges you realise there is progress but work needs to be done to achieve goals set from 2011 to 2016. After 2016, the progress made needs to be gauged and if failures exist it needs to be documented to know factors responsible for failures, after which the city acts on the proposed document.
From 2011 when the IWMP document was implemented , how do you rate progress made	The Progress has been massive, looking at legislation that needed to be tightened, we have moved faster on those levels, also we have effective by-laws now, and all the wings that need to assist us in ensuring compliance in the city, we also have initiatives working now from the smaller scale to the private centres to retainer

	programs to crushing of rubbles.
So are these programs implemented regularly?	No, the programs exist but they exist at different levels. We are regulators we just provide policy and plan, our municipal must implement, we however give guidelines, so they worry about domestic waste, they worry about builder's rubbles, they also worry about electronic waste, that's among key competences required by them. Everything is happening now. We also have some elements that are lax. GNPE play their part with compliance from our side, information also from our side, so it's a full force thing now that is working to make everything function. There are programs and projects initiated with a 25 year project in mind to have a plant in Johannesburg that will take all the waste from disposal trucks.
Is this plan on now?	Yes, the feasibility studies have been done and presented, based on phases of the project, so the city is already seeing the need, also to determine the viability, if this is done we save ourselves from closing another landfill, because land there is no land in Johannesburg and no one even wants to live with a landfill close by. If we get a landfill that is far away, like 100-200km from the city, It will be expensive and affect all the systems, so it's better to have clean plants like in other countries such as clean plants in Singapore, the disposal trucks drop waste and leave. The plant then sort through the waste
So is there enforcement of sorting out waste at site like the law prescribes, is it difficult to sort out, so a program where people sort it out on site before it is moved to make it easy, so is the policy enforced?	Problem is, this aspect of waste that we focus on, is on the niche of each. Let's say we are demolishing a building, first thing in the process is, they must apply to the city and the city grants approval before demolishing commences. They must also provide skips. We do not have space here, so the skip must be emptied regularly. Not on a 2week basis, but if possible, 2hours interval. The skip has to be sorted on site but that may not be feasible but can be done on small demolition jobs. I do not know if you are informed on sorting out, because that is another niche. With sorting on building sites, there are few things that need sorting, however with demolition of buildings, different things go to different places such as tyres, rubbles, corrugated iron all go to different places
In your opinion, what are the challenges faced in enforcing laws	In my opinion, the problem is the challenge of the size of the city, the city is huge and demand is high, so there are more vendors, so they just find an open place and just dump, saying they don't have enough petrol to drive to a legal landfill site. We have enforcement, but not all the corners of Johannesburg is monitored all the time, so they know that at certain times such as at night, they dump the refuse skips on open fields knowing the city personnel have to clean the place.

	Now we have to use funds that should service other things to do deal with this. Therefore there should be a proper way to deal with offenders that is the biggest challenge: enforcement. Because enforcement is not monitoring all the time but there is a new program involving communities, so if a truck is seen dumping in a neighbourhood, just take a picture, we have a twitter account and other social network, so attach pictures to media or call the hotline, so the truck is traced. With the national road network database.
Thank you so much for this opportunity and your expert analysis	Your welcome

INTERVIEW 1: PIKITUP DEPARTMENT

QUESTIONS	RESPONSE
Please what is your role I the department	Am in the information's and communications department
How effective has the National environmental management waste Act (Act No. 59 of 2008) in terms of construction and demolition waste management.	Ok about the construction and demolition waste I am not the best person to give you first-hand information and I won't want to say anything that will not help you.
Ok but I guess you will have an idea of the enforcement strategies you use to help promote the minimization of construction and demolition waste.	The enforcement strategies are not strong enough, there are awareness been done in the primary grade schools as the secondary school do not grant assess for talk as sure, there are no advertisement done on construction and demolition waste on the media. The concept of awareness in the primary grade has been on and the motivation has been from the adage of "catching them young", we believe when we start exposing to the knowledge of the negative effect of waste and how important the surroundings should be kept clean and free from diseases, they are able to carry that knowledge with them even till there older days. We also have a slogan of "it is a collective effort". Everyone should be in charge of their waste and there environment. Everyone should ensure they are protective of their environment by not allowing waste to be dumped illegally in there surrounding.
What barriers do you face in enforcing the legislation?	There are problems with awareness of legislation as I earlier said, there is not enough funds and we need partnerships with CBOs (Community based organization) this organizations are within a certain area like in Johannesburg the people will be focused only in Johannesburg and no other province. They are not like NGOs that are opened to operate any were.

INTERVIEW 2: PIKIUP DEPARTMENT

Please what is your role in the department	Am in the Builders rubbles department
How effective has the National environmental management waste Act (Act No. 59 of 2008) in terms of construction and demolition waste management.	I don't know about the legislation that much but I can say it's not been that effective, and I don't agree with the fact that the legislation is new. It's not new it hasn't just been effective.
What do you think is the reason for that	The lack of human resource, funds, corporation amongst the communication links, these challenges has affected the city negatively.
Are there not enforcement strategies that you have been applying	1. There are awareness in limited areas, the staffs are not enough, Johannesburg is a big City and needs lots of people that can help monitor the city. Also there is lots of illegal dumping done around the city which makes it essential for the city occupants to alert the legal department so that they are fined. But the legislation dealing with penalties is not workable. What we do is confiscate the trucks of the illegal dumpers, another thing is the penalties in the by-law is what we use which is fine of 1500 Rands and not the 10 million Rands or minimum of 10 years. There are no municipal courts available so if this illegal dumpers are caught we can't apprehend them. Because where are we going to keep them? So you see there us much bigger problem. So the issues of the JMPD trying to monitor is not enough even for brammforntein because they are only maybe 7 of them. Also even the fine if the offender is caught and he is just starting his company, he will not be willing to pay any amount no matter how small, some will even want to take you to court. And for large companies you can try to find them and some will still not pay by taking you to court

INTERVIEW 3: PIKITUP WATER MANAGEMENT LANDFILL SITE

Please what is your role in the department?	Manager for landfill site both closed and opened
How many years of experience do have?	40 years
Are you aware of the National environmental	Yes I am
How effective has the National environmental management waste Act (Act No. 59 of 2008) in terms of construction and demolition waste management.	In 2013, the clause was review and there were stringent clauses given for disposal of construction and disposal of construction and demolition waste in the landfill site. Previously the legislation was more general and people didn't know in details the process of waste management and disposal this as affected landfill sites. But now we are trying our better to meet up with our targets on recycling and recovery of construction waste.
Are there challenges you face as regards the legislation.	Some hazardous waste comes into site from time to time, some causes underground water pollution, basically environmental problems, with affect the health and well-being of individuals in the environment.
What enforcement strategies do you put in place	There are landfill permits and licences are given according to the minimum requirement for landfill site, there are operational plans that his drafted and used from time to time. There are also waste minimization strategies given to us as a target and so far we have been meeting our targets.
Are there barriers to enforcement of the legislation	There are no major barriers expect for weather change, when it rains the waste becomes wet and moist.

Appendix 3 Examiners Issues / Comments and Suggested Actions

	Examiner 1 - Issues / Comments	SUGGESTED ACTIONS (SA)	
A1	Other than the interpretivist approach other philosophical concepts have not been explained as to how they affect the decision making in the design of the study.	Delete sections detailing other philosophical concepts	Deleted in chapter 3
A2	Sanders, et al, 2012 tabulation on deduction, induction and abduction etc	Delete	Deleted in chapter 3
A3	Very small sample which needs to be justified (mentions this at least three times in the report!)	Not sure what can be done about this now. Maybe remove references to conducting a questionnaire and base the research around something like "A number of interviews were conducted with...."	References made to Questionnaire removed
A4	Sample selection - why were construction industry participants excluded?	Explain why construction industry participants were excluded from the study.	sample selection justified (page 60)
A5	Use of mixed method questioned	Remove mention of mixed methods and focus upon the use of interviews	mentions on mixed methods removed and qualitative method focused on. (page 62)
A6	Inclusion of Project plan not necessary	Delete from thesis	project plan deleted
A7	The research design and methodology is poorly presented	Hopefully the amendments suggested above will deal with this issue	Research design re- presented
	Examiner 2 - Issues / Comments	SUGGESTED ACTIONS (SA)	Action Taken (OO)
B1	Research focus not clear	Review questions and objectives and improve	Research questions and objectives aligned and

		clarity in their presentation. Maybe dealing with the comments made about paragraphs 2 and 3 in the abstract would help. Review abstract.	abstract restructured.
B2	No clear research problem stated.	Clearly state the research problem.	Research problem clearly stated
B3	Research questions and objectives not tightly focused.	Review and align questions and objectives.	Research questions reviewed and aligned to Objectives
B4	Literature review needs to be linked with a clear research focus	Link structure of lit review with the re-articulated research question and objectives. Include a comparison of legal issues around C&DW globally and in South Africa.	Literature review linked with objectives and research questions (page 49)
B5	Lack of conclusion on the review of literature which addresses the research aim and re-addresses / unveils the gap much more in order for a conceptual framework to be built.	Review the conclusion of the literature review.	Literature review concluded to address research aim and unveils gap in the study (page 49)
B6	Presentation and origin of the conceptual framework (Figure 2.4) is queried.	Outline where this came from, how it evolved what it means and how it was important for data collection, analysis and drawing of conclusions.	Conceptual framework explained in connection to the research. (page 50)
B7	Justification of methodological choice lacking.	I would suggest that you focus upon "interviews" and explain why this was an appropriate choice to collect data.	Research Methodology used justified. (page 58, 59)
B8	Sample selection and snowballing.	Did you do this? Delete references to this.	Deleted (page 60)
B9	Section 3.10 on Validity & Reliability needs more work.	This needs to be reviewed with choice of	Validity and Reliability reviewed (page 61)

		interview strategy and the small number of interviews that were actually conducted.	
B10	Figure 3.1 - Query?	What is Realist - Ethnography? How does this relate to your approach?	deleted
B11	Data Analysis section needs reviewing.	Address the issues listed by the examiner.	Data analysis reviewed (chapter 4 page 66)
B12	Lack of synthesis of findings in conclusion.	Add synthesis relating to other recent research. How does your work support / contradict the work of others.	relationship to other research added (page 84)
B13	Section 5.5 presents the recommendations of respondents.	Re-write as a research finding.	research finding re- written (page 91)
B14	Linkage of various sections could be improved.	Thing about how the thesis flows from chapter to chapter and insert relevant linking statements where appropriate.	Improved linkage of various sections.