Solid waste management in South Africa: Exploring the role of the informal sector in solid waste recycling in Johannesburg.

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A research paper submitted to the Faculty of Science, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Science

November, 2016

DECLARATION

I, Smangele Qondile Dlamini, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Science at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other university.

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On the _____ day of _____ 2016

ABSTRACT

Informal solid waste recycling has increasingly become part of the urban landscape in many South African cities and towns. In the city of Johannesburg, for example, waste pickers are now playing an important role in waste management and recycling. There is evidence in the literature that suggests these activities have both economic and environmental benefits thereby contributing towards job creation and environmental sustainability. Despite the role that the informal sector contributes to waste management and socio-economic development, as well as environmental sustainability, the urban development and planning policy in South Africa has not embraced and integrated informal systems of municipal waste management in its policy framework. Drawing on field-based study conducted in selected parts of the City of Johannesburg, and using methods inspired by the traditional participatory research, this study explored the institutional framework within which informal solid waste management can be pursued. One solution to this problem could be the integration of the informal sector recycling into the formal waste management system. To achieve informal sector recycling integration, this study identifies barriers that hinder the integration of the informal sector into an inclusive waste management: repressive policy, lack of evidence to support activity, social acceptance, illegal migrants and lack of valid citizenship documents. It is essential to note that the integration of waste pickers should not be grounded on a 'universal' model but should instead take into account local context and conditions.

ACKNOWLEDGEMENTS

For the realisation of this work, I am greatly indebted to a host of persons who supported me in one way or the other to make sure the best results were presented. I acknowledge the attention, corrections and direction from my supervisor, Prof. Danny Simatele, School of Geography, Archaeology and Environmental Studies.

Thank you to National Research Foundation (NRF) for the financial support throughout the research period. Thank you to the management and authorities of the organisations that were used as case studies for this research. Your willingness to participate and the provision of relevant information during my survey have allowed me to complete this study on time.

Friends, colleagues and staff of the School of Geography, Archaeology and Environmental Studies for academic support and encouragement.

DEDICATION

- This research report is dedicated to the ONE *"For I know the plans I have for you, declares the Lord, plans to prosper you and not to harm you, plans to give you hope and a future."* Jeremiah 29:11
- My parents for their constant support, love and encouragement throughout this journey and to family and friends who never stopped believing in me.
- To National Research Foundation (NRF) who generously sponsored my Master degree and accommodating my commitment.

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GDP: Gross Domestic Product

NGOs: Non-Governmental Organisations

CBOs: Community Based Organisations

GDARD: Gauteng Department of Agriculture and Rural Development

MDGs: Millennium Development Goals

NRF: National Research Foundation

PPE: Personal Protective Equipment

COJ: City of Johannesburg

CHAPTER 1

INTRODUCTION AND FRAMES OF REFERENCES

1.1 Introduction

Since the industrial revolution cities have grown enormously. Rapid urbanisation accompanies this growth with an estimated two-thirds of the world's population living in cities by 2025 (UNEP, 2005). As the population increases and cities grow, a high proportion from rural areas is steadily tilting towards urban areas shifting the socio-economic equilibrium and state of the global environment. For the first time in history, half the world's population lives in urban areas than in rural areas (UN-Habitat, 2008). Although urbanisation itself is not a challenge, unplanned population growth results in many environmental problems such as air and water pollution and municipal solid waste generation due to changes in people's lifestyles and consumption patterns (Chimuka and Ogola, 2015 & Troschinetz and Mihelcic, 2009).

Rapid population growth, migration to urban areas and industrialisation has frequently contributed to urbanisation (Wilson & Velis, 2014). Only 30% of the world's population lived in urban areas in 1950; 54% in 2014; and a projected 66% in 2015 (UNDESA, 2014). In particular, Africa is currently urbanising faster than in the late 1990s and is expected to be the fastest between 2020 and 2050. Johannesburg (South Africa) for example, is expected to emerge in 2030 with a projection to surpass the 10 million mark (UNDESA, 2014). As a result, African cities have continued to experience rapid growth of waste generation, which is directly linked to modernisation and urbanisation processes (Bolaane, 2006; Nzeadible, 2009a; Williams, 2005; Bagchi 2004).

The African continent, just like other developing continents, such as Latin America and Asia, has been greatly affected by the problem of solid waste management, particularly since the nineteenth century causing unprecedented demand on municipalities to provide services such as waste collection, transportation, treatment and disposal (Simelane and Mohee, 2012). These new developments have placed many local authorities under immense pressure to provide efficient and effective waste collection services in the cities (Mutanga *et al*., 2013 and Gumbo & Simelane, 2015).

Municipalities face a challenge in managing solid waste in that they have to deliver basic levels of affordable and equitable services for waste collection, transportation and disposal (Wilson & Velis, 2014). Despite spending between 20% and 50% of their revenue on waste management practices (Wilson and Velis 2014), they only collect 50% to 80% of waste generated to landfill sites (Medina and Dows, 2000). Local authorities in most sub-Saharan cities, which have traditionally been at the centre of managing solid waste in their jurisdictions, have repeatedly demonstrated a lack of capacity to effectively meet the demand for efficient and proper waste management practises (Okot-Okumu, 2012). Therefore, due to the lack of effective waste management practices, the informal waste sector has become an important part of and is increasingly playing a vital role in the recycling and management of municipal waste. Hypothetically speaking, the informal waste sector has closed the gap created by the inefficiency of municipal practices and institutions in municipal solid waste management.

In line with the above, South Africa is not an exception in terms of ineffective and inefficient municipal solid waste management. Informal solid waste recycling is increasingly becoming evident and becoming part of the urban landscape. This scenario is apparently a result of the exodus of rural people into urban areas in search for job

opportunities and a better life. However, the deterioration and stagnation of the urban economy, coupled with rapid urbanisation have created enormous pressure on local municipal authorities who have become overwhelmed and unable to provide adequate and equitable waste management services to the various segments of the urban population (Kubanza and Simatele, 2015; Chimuka and Ogola, 2015; Troschinetz and Mihelcic, 2009).

The Gauteng province, at 18 179 km^2 is the smallest of South Africa's nine provinces. However, it is the most populous province, with an estimated population of 12.9 million (Stats SA, 2015). The province generates 45% of South Africa's municipal solid waste (DEA, 2012). The city of Johannesburg, one of the largest metros in South Africa is regarded as a world class African city. It is considered a model for Africa's economic development and therefore the economic powerhouse of South Africa, with people in the city wealthier that their counterparts in smaller cities (City of Johannesburg, 2016). Contrary to this status, Johannesburg also exhibits high levels of poverty and an unequal society in its distribution of socio-economic service delivery as well as amenities. It is argued that a large number of the urban poor for example, are subjected to different vulnerability markers ranging from food insecurity to poor health (Karani and Jewasikiewts, 2007). As a result of this state of deprivation, the urban poor in South Africa are not passive actors but are actively engaged in weaving their own future by adopting multiple and diverse strategies to cope with the challenge of urban poverty and deprivation. Informal solid waste recycling has thus become a major source of income generation and contributes significantly to the urban food basket (Sentime, 2011 and Samson, 2008).

In view of the above observations, this research explores contemporary processes and mechanisms that contribute to the marginalisation and non- integration of the informal systems and processes of waste management into formal structures and mechanisms of municipal waste management in an urban context. This study seeks to contribute to the generation of local informal solid waste recycling information and activities relating to waste management in the city of Johannesburg in order to identify appropriate ways in which the informal waste sector can be integrated in municipal waste management in South Africa.

1.2 Problem statement

In cities throughout Latin America, Asia and Africa, the rapid rate of urbanisation has resulted in high volumes of solid waste which tends to attract a lot of informal waste activities at various commercial, industrial and residential zones and landfill sites (Sentime, 2014 & Rockson *et al*., 2013). Solid waste can therefore present both challenges and opportunities. Sembiring and Nitivattananon (2010) believe that waste is a subjective issue; to some waste is a public health and environmental risk, whilst to others it has a 'use' or a 'value'. They mentioned that in informal waste management activities, waste is understood as a resource. However, looking at the high unemployment rates and the urban growth in African cities, most people opt for informal waste recycling as it is an opportunity to provide a livelihood (Matter, 2013).

Conversely, in the context of environmental management, solid waste must be recycled because if not then landfills can be exhausted and this necessitates the construction of new ones (Wilson *et al.,* 2009 and Nzeadible, 2009). On that note, Seik (1997) and Williams (2005) acknowledged that informal waste recycling activities reduced

environmental damage, saved energy and saved municipal waste collection and disposal costs. Thus, in the absence of a formally recognised collection and sorting system for recyclables, waste pickers have provided a valuable, sustainable and low cost solution for moving recyclables from solid waste generation zones to the value chain (Rockson *et al.,* 2013).

One environmental concern that makes this research more feasible is that throughout South Africa, the largest route for waste disposal is the landfill (Sentime, 2014; Samson, 2010 and Ezeah *et al*., 2013). An in-depth research conducted (DEA, 2016) on informal waste sector found that between 60 000 and 90 000 waste pickers earn a livelihood from the recovery of recyclables from municipal waste in South Africa. This, therefore, implies that, the volumes of waste that goes to the landfill sites can be minimised and diverted away from landfill sites only if the government can acknowledge, and thus formalise the informal waste sector to ensure environmental protection and sustainable waste management. A sensitive area on the emissions of landfills is the issue of landfill gas from municipal solid waste. The gas is composed of mainly methane and carbon dioxide contributing to global warming (Williams, 2005). Secondly, the significance of this research is the issue on landfill leachate and the shortage of development space which tends to have an impact on the development of landfill sites (DEA, 2011). Thus, in order to reduce impacts of leachate on the environment, water bodies and the people, South Africa needs to divert recyclable waste away from landfill sites. One simple way to divert recyclable waste from landfills, thus reducing leachate production is to recognise and integrate waste pickers into the municipal waste management system through recovery and recycling. Informal solid waste recycling can therefore, be

achieved only through the integration of the informal sector into municipal solid waste management (Bolaane, 2006; Nzeadible, 2009a; Williams, 2005; Bagchi 2004).

Existing literature on informal solid waste recycling, suggests that South Africa is not the first or the only country to deal with an informal waste sector. However, in South Africa the state is the key player and the legislative framework governing waste management does not recognize the informal waste sector (Sentime, 2014). The state instead, tends to disallow and marginalise informal waste pickers rather than to promote and recommend them in municipal solid waste management services (Sentime, 2014). Again, the Waste Act 59 of 2008 does not include the informal waste sector in the national waste management strategy yet it emphasizes the establishment of a national waste management strategy through 'reduction, re-use, recycling and recovery of waste'. Local municipal authorities have acknowledged the fact that informal sector is not integrated by municipalities, since there are number of unique socio-economic and political circumstances that may complicate the integration of the informal sector into the formal municipal solid waste management system (Sentime, 2014).

The role of the informal sector in municipal solid waste management and recycling has been limited to only policy boardroom discussions. No concerted effort has been made to mainstream the activities of waste pickers into the official waste management strategies and policies. This lack of policy integration and ultimate neglect of the important sector in urban waste management has resulted in poor working conditions faced by informal waste actors including exposure to hazardous organic and chemical waste. From this observation, it can be argued that waste pickers around the city of Johannesburg supply buyback centres with recyclable solid waste. Therefore, there is a

positive relationship between waste pickers and buyback managers. However, waste management officials claim that informal waste recycling is illegal.

Based on the above findings, this research argues that within the municipal solid waste management system, the practice on ground regarding informal waste recycling does not conform to the municipal framework. The practical reality is that informal waste recycling is mostly operated by waste pickers. The informal sector is increasingly becoming part of waste management and recycling in the city of Johannesburg (Sentime, 2011 and Sentime 2014). The recycling of recyclables is actively being managed by the informal sector which is unfortunately not part of the policy and institutional framework of municipal waste management in South Africa. Informal waste pickers currently operate in the context where there is no institutional framework that exists within which their activities can be supported. It becomes surprisingly difficult to understand how South Africa will be able to climb up the waste hierarchy of modern waste management if the legislative framework deliberately eliminates the efficient and existing recycling system. This study argues therefore, that in a bid to search for alternative, sustainable and more effective systems in municipal waste management, it is important to identify local solutions that match local needs and possibilities. One such novel idea is identifying avenues through which those that are engaged in recycling from the informal sector, are supported and integrated into the formal systems.

In light of the aforementioned, it appears that studies on solid waste recycling in South Africa has not focused on the informal waste sector and its effect on municipal waste management system. The impact of waste pickers to municipal solid waste management and recycling has been debated in other developing countries (Rockson *et al*., 2013; Afon, 2012; Asim *et al*., 2012; Rankokwane & Gwebu, 2006; Wilson *et al*., 2006) and in

sub-Saharan African cities. South Africa has documented informal waste recycling as an illegal activity that is not acknowledged by municipal authorities and not supported in the policy planning and development strategies. Much of the current literature for example, Sentime (2011) pays particular attention to the social profile of waste picker's in Braamfontein. In his review on the effects of the legislative framework pertaining waste management and recycling in South Africa, Sentime (2014) suggested that if waste pickers can be well integrated by the municipality and formalised by the private sector, informal waste recycling can immensely contribute to waste minimisation and management. A considerable amount of studies on municipal solid waste management have focussed on the challenges of municipal solid waste management. Little or no significant attention has been paid to understanding how waste pickers can potentially be integrated and incorporated into the formal structures within the municipal solid waste management system. *Therefore, the purpose of this research is to investigate the barriers that hinder the integration of the informal waste sector in an inclusive municipal waste management system so as to enhance the sustainability and effectiveness of the informal waste sector in waste management. Secondly, to understand the extent to which the informal waste pickers, focusing on recyclable materials contribute in the recovery and minimisation of recyclable materials from municipal solid waste in Johannesburg.* This study provides a basis for identifying a suitable model of social inclusion of waste pickers that would be most appropriate for the City of Johannesburg and South Africa as a whole, given the country's set of social, economic and environmental conditions, in ensuring an increased recovery of recyclable waste while safeguarding the livelihoods of waste pickers.

1.3 Research questions

The following questions guided the research process.

1. In what ways do waste pickers contribute to municipal waste management and recycling in the city of Johannesburg?

2. What current barriers exist into the integration of waste pickers in the city of Johannesburg?

3. How can the informal waste recycling sector be integrated into the formal waste management system in the city of Johannesburg?

1.4 Research aims and objectives

This research investigated the barriers that exist in the non-integration of waste pickers into the formal municipal waste management sector and the extent to which the informal waste pickers focusing on recyclable materials contribute to waste minimisation and management in the City of Johannesburg. This was an attempt to enhance the knowledge base pertaining to the role of the informal sector in waste management and recycling. The results of the study could help authorities to develop a more integrated approach for a sustainable solution to waste management and recycling in Johannesburg. This knowledge is vital for planning, development and for the implementation of government policies in ways that tend to promote sustainable development.

Specific objectives:

1) To better understand the role of waste pickers in municipal solid waste management and recycling in the city of Johannesburg.
2) To explore challenges encountered by waste pickers in the process of waste management and recycling.
3) To identify various barriers that exists in setting up a system that can recognise the informal waste sector.
4) To propose a sustainable approach towards informal waste management and recycling in the city of Johannesburg.

1.5 Scope of the study

This research specifically focused on informal waste recycling, particularly street waste pickers and recyclable municipal solid waste materials. It is crucial to note that there are different sources of waste. According to Wilson (2014) the three main sources are domestic waste, agricultural waste and industrial waste. This research, while dealing with informal waste recycling focused on municipal solid waste and therefore industrial and agricultural wastes were not considered. The study was limited to only the City of Johannesburg (Remade holdings, Far-point recycling and Maningi scrap metals) because it portrays individuals who make an independent living reclaiming recyclable waste from the waste stream.

1.6 Ethical considerations

This research has adhered strictly to expected ethical considerations. Prior to the data collection phase, ethical clearance was obtained from the University of the

Witwatersrand (see Appendix 5). Ethical issues were addressed during course of the research including soliciting informed consent, providing information, ensuring participant confidentiality and anonymity. This study addressed ethical issues in the following listed manner:

1.6.1 Informed consent

Research participants had a right to withdraw from the study at any level of the research process as it was stipulated in the participant information sheet. Officials and key informants signed a letter of consent (see Appendix 4). For street waste pickers, the researcher explained the study verbally; an agreement was taken as a consent agreement. At no point during data collection participants were asked to record their names or any personal information that could be used to identify them. The participant's information collected in the research was confidential and participants remained anonymous.

1.6.2 Publication of the results

The researcher compiled an accurate research report and never manipulates the report results. A summary of the research paper was presented in the 8th International Conference on Waste Management and the Environment, 7-9 June 2016, Valencia, Spain. A research paper is published in the WIT Transactions Journal on Ecology and the Environment, volume 202, 2016. A copy was submitted to the National Research Foundation (NRF), Environment and Infrastructure Services Department and Department of Agriculture and Rural Development. As custodians of this research, a copy of the research will be published under the master's thesis section available in the University of the Witwatersrand library, as well as the university's website and journals.

1.6.3 Management of information

The data from semi-structured interviews, audio and text transcript of the interviews are filed and kept under a protected computer password which are accessible to until the research is completed and will therefore, be discarded 2 years after completion of the interviews and studies. The research report is a public research document. Therefore, participant's information was concealed, and so were some sensitive areas. Policy makers, academicians, interested parties can have access to this research, provided their interest is for personal and academic exercises otherwise permission is needed by the university for any other purposes.

1.7 Structure of study

This research paper is made up of six chapters. The first chapter is a review of existing literature on how informal waste recycling has emerged at different range of scales, from the global to the local spheres, particularly in the context of municipal waste management. The second chapter focuses on the different themes and the conceptual framework around municipal solid waste management, at all levels. The third chapter outlines the methods employed to recruit participants for this study and the techniques used to analyse data. The fourth chapter is a presentation, analysis and discussion of the results from both empirical and secondary data. The fifth chapter synthesises and discusses the findings presented from the different chapters listed above, and finally the last chapter concludes the discussions and provides some recommendations.

2.0 Conclusion

Information that relates to municipal waste management and waste pickers, responsibilities of municipalities particularly in waste management was covered in this chapter. Municipality issues with regard to waste pickers and municipal waste management were highlighted. Research aims and objectives, research scope and ethical considerations were discussed. Motivation for undertaking this research was outlined together with the nature of informal waste recycling in the context of waste management in South Africa. The present stage on waste pickers was discussed in accordance to the lack of policy and institutional framework on municipal waste management governing waste pickers. Worth noting is that, in the city of Johannesburg waste pickers operate in an unregulated manner and municipalities do not acknowledge waste pickers in the formal municipal solid waste management system.

CHAPTER 2

CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

2.1 Introduction

Municipal waste management is a global challenge; handling, separation, storage and processing of municipal waste vary between countries and within countries. Waste has a negative impact on the environment and is a health risk if not handled conscientiously. Two of the eight Millennium Development Goals (MDGs) developed by the United Nations are relevant to this research. The first pertains to the eradication of extreme poverty and hunger and the second is about the promotion of environmental sustainability (David *et al*., 2005). Currently, the world is concerned about issues and challenges of climate change and municipal solid waste management. Waste has an impact on global climate changes because it produces methane and carbon dioxide which are greenhouse gases that are responsible for climate change. Due to the effects of methane and carbon dioxide which contributes to climate change, waste recovery and recycling is therefore the promising environmental option for municipal solid waste management.

There are five objectives of local government found in the Constitution of the Republic of South Africa (1996) and again two of them are relevant to this research topic. The first objective focuses to the promotion of social and economic development and the second objective relates to the promotion of a safe and healthy environment. The Constitution (1996, sec.24(a) &(b)) further states that "everyone has the right to an environment that is not harmful to their health or well-being and to have the

environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation; promote conservation; and secure an ecologically sustainable development and use of natural resources while promoting justifiable economic and social development".

2.2 Solid waste management in a global context

The world is faced by the issue of municipal solid waste management and it is a major problem in terms of the volumes of waste generated as a result of human lifestyles. To date, population growth, higher economic development and improving human lifestyles contributes to the increasing generation of waste every day (Minghua *et al.,* 2009). Every year approximately 1.3 billion tonnes of municipal solid waste being generated and by 2015 this figure is projected to double (Gardner, 2012). As such, the large amount of waste generated is becoming a growing concern due to the ecological impact associated with improper waste management, which results in waste degradation and the release of noxious emissions (Karak *et al.,* 2012).

In spite of the municipal solid waste management challenges experienced by the developed and the developing world, the first-world countries are leading in the management of municipal waste in a way that they have made municipal solid waste management a priority by developing regulations and sustainable measures concerning the use of solid waste (for example, waste to energy generation). First-world countries have put in place monitoring mechanisms that seek to promote and support municipal solid waste in the developing agendas of cities (Nzeadible, 2009). Therefore, tremendous amounts of wastes are handled in different ways in accordance with the

physical characteristics of the waste generated. The main reason for this is the variation in physical characteristics of the waste generated. In developed countries, for example, waste composition tends to be more towards recyclable materials (Chandrappa and Das, 2012). This is because people in developed countries tend to buy ready-made and packaged products, while in developing countries there is a high dependence on subsistence farming, with limited post-harvest processing of food. Developing countries tend to buy more raw materials, depend in imported new and used goods, thereby increasing the fraction of organic wastes (Metin *et al.,* 2003). In various countries of the world, therefore different waste management practices exist. Among the best practices include: proper composting, recycling, waste-to-energy technologies and sanitary landfilling for the ultimate disposal of wastes (Guerrero *et al.,* 2013).

However, cities without adequate means of waste management practices suffer continuously from the indiscriminate dumping of waste, and this is worsened by negative attitudes about safe and secure disposal (Johari *et al.,* 2012). There are a number of factors that perpetuates attitude towards participation in waste management, these includes insufficient recycling and waste disposal facilities; lack of access to collecting, sorting and separating waste facilities; lack of government policies, incentives and enforcement measures; and the general mistrust of local government authorities by residents in most developed nations such as Canada, Ireland, the United States of America, Japan and Australia (O'Connell, 2011). Consequently, countries with improved waste management practices and infrastructure still face challenges which include the recycling of products that are not recyclables and insufficient waste sorting and recycling (Singh *et al.,* 2014).

A study carried out by Medina (2011) revealed that the amount of waste generated in developed countries is much greater that in developing countries. This observation was also confirmed by UNDP (2011), which states that the average municipal solid waste generation rate for developing countries being 0,79kg/capita/day, compared to 1,55kg/capita/day for developed countries. The reason behind these differences is that individuals in developed countries tend to have a higher income, a higher standard of living and GDP per capita (Simelane and Mohee, 2015 & Mohee and Bundhoo, 2015). As disposal income and living standards increase, consumption of goods and services also escalate, and this results in an increase in the amount of waste generated (Chen, 2010 & Khjuria *et al.,* 2010). It can also be noted that island such as Fiji and Mauritius generate high amounts of municipal solid waste. The huge amounts of waste generated are associated with the tourism industry (Hoornweg and Bhada-Tata, 2012).

2.3 Contextualising solid waste management in sub-Saharan African cities

Many cities in sub-Saharan African countries experience high rates of population growth due to increased processes of migration, urbanisation, industrialisation and modernisation (Simelane and Mohee, 2015). These processes have not only resulted in increased numbers of urban residents, but also increased generation of solid waste. These changes have unfortunately taken place in a context of rapid economic stagnation and deterioration coupled with weak institutional and policy frameworks. The lack of financial resources, as observed by Liyala (2011) and Simatele and Etambakonga (2015) has not only made it difficult for local authorities to effectively manage solid waste, but has prevented people from solving urban based problems and challenges.

Kubanza and Simatele (2015) are of the view that the available local authority resources have not been able to provide services to the growing urban population such as maintenance of roads, sewerage and water systems, infrastructure for waste management, and for running and supplying socio-economic amenities.

The deleterious economy is having pronounced effects on all sub-sectors of the urban economy, particularly on the urban poor. Gumbo and Simelane (2015) observe that in most African cities, provision for the regular collection and disposal of household refuge is highly inadequate, especially in poor neighbourhoods. The waste that is generated is hardly collected and therefore is dumped on any available space within the city (Simatele and Simatele, 2014).

Despite the above observations, waste removal still remains an unsolved problem in most suburbs of African cities (Cheru, 2002). Weak institutional frameworks, insufficient skilled labour, economic deteriorations has resulted in poor waste removal (Danny and Etambokong, 2015; Simatele and Kubanza, 2015). The above factors, as argued by Danny and Etambokong (2015), have made municipal waste management a challenge and an environmental challenge in many African countries. As a result, waste collection is still overlooked in sub-Saharan African cities with municipal solid waste collection rates ranging from 20% to 80% (Muzenda *et al.,* 2011 & Mohee and Bundhoo, 2015).

Therefore, illegal open dumping and uncontrolled burning practices are employed to reduce the mountains of stinking refuse (Mohee and Bundhoo, 2015). Henry *et al.,* (2006) observe that the main reasons for these poor practices include, among other things lack of education, poverty, lack of appropriate infrastructure and regulations, and

very little or no government willingness to implement a proper waste management strategy. Kubanza & Simatele (2015) and Simatele & Etambakonga (2015) observe that only 15 % of solid waste was collected in Lusaka, 17 % in Dar es Salaam and 13 % in Kinshasa due to poor infrastructure and a lack of refuse trucks. As a result of the above state of affairs, low income areas in sub-Saharan African cities not serviced by accessible roads have tended to sink in sewage and piles of stinking waste since these areas cannot have access to trucks (El-khattam *et al*., 2011 and Cheru, 2002).

It must also be noted that most cities in sub-Saharan African countries lack appropriate policies and legislation that would support investments in waste recycling. In instances where these policies and legislative instruments exist, their application has proven to be inconsistent (Sentime, 2014). In the eThekwini municipality in South Africa for example, the adopted technology for waste management is electricity intensive and costly to run. This situation, as observed by Chimuka and Ogolo (2015), has created a scenario in which the local municipality is increasingly turning to donors for financial help in order to continue operating and running the technology. Thus, the lack of comprehensive policies which are well aligned has resulted in the fragmentation of strategies which, if properly developed would contribute towards reducing associated costs and bring out effective and sustainable resource management and socio-economic service delivery (Sentime, 2014).

In view of the above observations, it can be argued that the lack of comprehensive policies and technical 'know-how' have in part contributed to failure in devising the appropriate strategies, approaches and technologies that would have resulted in effective waste management practices and contributed to sustainable municipal waste management development in sub-Saharan Africa (Mudhoo *et al*. 2015). Muniafu and

Otiato (2010), observe that the combination of the factors have and continue to compromise the ability of the local authorities to effectively manage urban change and processes.

Simatele and Etambakonga (2015) and Samson (2008), argue that to understand and appreciate the current challenges faced by urban authorities, it is therefore important to examine the entire urban municipal solid waste management system in sub-Saharan cities. They argue that the persistent implementation of colonial and out-dated urban development and planning policies by city authorities have limited the scope in which to imagine the future of African cities as well as the scope in which the talents of all urban dwellers can be captured (Simatele and Etambakonga, 2015; Simatele and Simatele, 2015). Furthermore, poor urban governance, marred with corruption, bureaucratic harassment of the poor and a lack of checks and balances have not only ignored the actions of the poor but has harmed the growth and everyday lives of the poor (Sentime, 2014; Binns *et al*., 2012).

Simelane and Mohee (2015) and Simatele (2010) argue that the development of effective municipal solid waste systems in the sub-Saharan African cities, will depend on looking for African urban management strategies and this will ultimately depend on the theoretical sharpness and practical abilities of both state and local authorities to adapt formal institutions to new and changing urban realities (also Samson, 2008 and Sentime, 2014).

2.3.1 Waste collection and transportation

As African cities continue to grow, Simatele and Simatele (2015) supported by Okot-Okumu (2015) argue that there has been a dramatic deterioration on the supply of basic

infrastructure and urban services due to the current economic situation. Therefore, solid waste collection and transportation still remains a costly practice in municipal waste management system (Chimuka and Ogola, 2015). The breakdown in the provision of public transport services and road maintenance for example, have negatively impacted refuse collection and recycling. Increased deterioration in the national and local economies has resulted in increased informalisation of employment and settlement patterns, a combination that has led to the horizontal growth of urban areas (Mbuligwe and Kassenga, 2004; Henry *et al*., 2006). This contemporary growth pattern in most African cities has tended to spread and stretch existing services, facilities and infrastructure even more thinly (Simatele and Simatele, 2014; Simatele *et al.,* 2012b). This is contrary to developed counties, such as Sweden, where, in most cases, household's place their waste at nearby centres and it is source separated (Mohee and Simelane, 2015). In the African cities, 95% of generated waste is neither collected nor recycled (Ahmed and Ali, 2004). Tukahirwa and Lukooya (2015) are of the view that adequate socio-economic facilities and amenities in African cities which are essential to improving the lives of the poor and raising urban productivity are now extremely inadequate and deteriorating making it difficult for local authorities to manage urban processes. Previous studies have suggested that population sizes, population density, size of an area, generated municipal solid waste, social justice, distance, design of streets and the level of traffic congestion impact the cost collection and transportation of municipal solid waste (Danny and Etambakong, 2015; Mohee and Bundhoo, 2015 & Danny and Kubanza, 2015).

South Africa faces similar challenges regarding collection of its municipal solid waste, just as many other developing countries. Simelane and Mohee (2015) and Koushk *et al.,*

(2004) suggested that the starting point to improve the system is source separation at household level, and the introduction of transfer stations. They mentioned that transfer stations have the potential to bring down the cost, as collection trucks will not be passing each household. However, Chimuka and Ogola (2015) observed that transfer stations could be subjected to vandalism by waste pickers and even stray dogs, thus ending up as human and environmental health hazards. Therefore, the most important argument is that if source separation is part of the municipal management system and waste pickers are organised, municipalities can provide security for transfer stations. Therefore, transfer stations can help to minimise the volume of waste that goes to the landfill.

2.3.2 Municipal solid waste disposal practices

A review of existing literature state that developed countries have specific procedures for the proper disposal of solid wastes, for instance, workable legislation, regulations and action plans (Mohee and Bundhoo, 2015). In many cities in African, proper waste treatment and disposal practices are almost non-existent. Algeria, for instance, dumps 80% of its municipal solid waste (Kehila and Gourine, 2010) while Egypt dumps 83.5% of generated municipal solid waste (Zaki and Khayal, 2010). Nigeria receives up to 2400 metric tonnes of waste each day at Olisosun landfill in an area of 42 hectares (Adegbola and Olawoyin, 2012).

It is important, therefore, to note that in poor and marginalised areas in urban areas, municipal solid waste is still a change due to the uncollected and illegally dumped waste that is a disaster for human health and in environmental degradation (Simelane, 2015). Medina (2011) studied the problems of waste in the developing countries and reported

that 90% of municipal solid waste collected end up in open dumps. Of the small amount of waste collected, only a small fraction received proper disposal while the remaining fraction is improperly disposed of, resulting in severe ecological and health effects (Mohee and Bundhoo, 2015). In Lesotho, for instance, the situation is worse. They only collect 7% of urban households and the rest is dumped in open spaces. Gaborone (Botswana) and Maputo (Mozambique), on the other hand, dispose in open dumps, rather than in regulated landfill sites. Lagos (Nigeria), is decorated by heaps of garbage pile up in every street corner (Afon, 2005 and Afon, 2012). This situation as observed by Henry *et al.,* (2006) accounts to the lack of education and politically instability among cities.

Besides dumping, landfilling is frequently practised in African countries, with Madagascar and Mauritius landfills accounting for 97% and 91% of their municipal solid waste, respectively (Zaki and Khayal, 2010). Tunisia landfills 65% of its municipal solid waste (Hoornweg and Bhada-Tata, 2012) while Mauritania and Morroco landfill 37.3% and 28% of their municipal solid waste, respectively (Labidi, 2010 and Mohamed, 2010). Therefore, this means that much still needs to be done to encourage other options, such as composting and increased recycling, to minimise waste to the landfill sites (Sharholy *et al.,* 2008 and Chimuka & Ogola, 2015). However, Mahar *et al.,* (2007) argued that disposal and treatment technologies, such as engineered sanitary landfill, composting and incineration, are now emerging in developing countries and that the problem is decreasing with the introduction of proper regulations and infrastructure. However, it must be noted that waste-to-energy and incineration, are technical solutions that do not encourage the integration of the informal sector since these systems requires waste to be produced to be profitable and does not encourage

waste separation at source and recycling. For example, Leonard (2015) looks at waste-to-energy and concerns of the informal sector integration in Durban. He mentioned that such innovations have implications on integrating the informal sector with the formal sector and contributes to the failure in devising integration strategies for effective waste management practices and sustainable municipal waste management. In view of the above observations, it can be deduced that proper waste management system is dependent on various factors, such as government incentives, proper infrastructure, applicable laws and regulations and public awareness and willingness (Gumbo and Simelane, 2015).

2.4 Contextualising municipal solid waste management in South Africa

Despite the strides that the City of Johannesburg has made in the management of its municipal solid waste, challenges on how to integrate a burgeoning number of informal waste pickers remains unaddressed. Part of the reason for this state of affairs is the lack of knowledge on how to align and integrate formality and informality into urban development and planning policy. Chimuka and Ogola (2015) for example, are of the view that in many cases, the lack of skilled labour and skills, as well as apathy at managerial level, corruption and mismanagement of municipal resources combined, work against the creation of a sustainable approach to municipal solid waste management (see Samson, 2008). For a big city like Johannesburg, population increase and rural-urban migration has worsened the problem of municipal solid waste management (Simelane, 2015 & Samson, 2008).

Some of the challenges are readily appreciated by looking at the entire current urban municipal solid waste management system, and comparing it with that of other sub-Saharan African countries. In summary this means, is that it is not enough for South Africa to simply have good legislation and to spend time thinking of appropriate technologies and methods to manage municipal solid waste. Other factors are also important, such as carefully planning strategies to integrate waste pickers into the municipal solid waste management system. In order for these strategies to be properly implemented and become successful, the role of communities also needs to be taken into account.

Background information on informal waste recycling in the sub-Saharan African cities acts as an introduction and stimulates broader interest in the subject, as well as contextualising the South African informal waste recycling system. In this respect, it should be noted that a large and dynamic indigenous waste management system exists in South Africa, largely driven by the informal waste sector (Simelane, 2015 and Samson, 2008). In many South African cities, thousands of waste pickers earn their livelihoods through informal waste recycling and are categorised as poor and less-privileged urban residents (Dias, 2012; Gutberlet, 2010 and Medina, 2007). For example, a total estimate of waste pickers in South Africa ranges between 18 000 and 100 000 (DEA, 2016). Across the world, waste pickers in South Africa form part of about 15 million waste pickers in developing countries (DEA, 2016). Thus, irrespective of where it occurs around the world and within cities, evidence from leading municipalities in Brazil, Colombia and Egypt proves that the most effective municipal waste management systems build on the informal systems. They need to be

acknowledged as a strategy to sustainable waste minimisation and management (Scheinberg, 2010).

In view of the above, researchers insist that informal waste recycling can be promoted successfully in African cities. They further assert that informal sector recycling has broader implications for urban livelihoods and environmental sustainability in Africa (Adam, 2011 and Adam, 2012). Benefits mentioned by scholars that are derived from informal waste recycling include reduced quantities of waste sent for disposal, cleaned up cities and environmental protection, thereby driving entrepreneurship, generating employment and income. Informal waste recycling also mitigates the challenges of climate change, green economy and the conservation of natural resources. On this score, some international organisations have recently argued strongly in favour of waste pickers and their integration in municipal solid waste management system.

Building on the above observation, solid waste management has become a major problem in the urban landscape in sub-Saharan African countries. Oguntoyinbo (2012) as well as Henry *et al.,* (2006) argue that the problem is a result of the failing institutions, civil conflicts (Simatele and Etamborang, 2015) and social injustice (Kubanza and Simatele, 2015). In light of the aforementioned, it appears that most studies that have focused on municipal solid waste management in the urban context, have rarely examined and analysed the importance of incorporating waste pickers into municipal solid waste management. It has been documented as a system that is not fully recognised in the urban policy planning and development strategies in sub-Saharan Africa countries in general and South Africa in particular. Integrating waste pickers in urban development and planning policy should form the basis that could enable changes in the promotion of green jobs and environmental sustainability. However,

work that has been done in South Africa focused on legislative framework governing waste management (Sentime, 2014), solid waste collection systems (Korfmacher, 1997) and management of municipal solid wastes (Ogola *et al.,* 2011), but no one understands how we can capture the different informal structures into formalities so that we can have an effective solid waste management system.

2.5 Summary

In spite of the municipal solid waste management challenges that are experienced in the sub-Saharan African cities, ambitious goals and targets that seek to improve waste management techniques and strategies have been implemented by the municipal authorities. These improvements include waste recovery and recycling, composting and incineration, and the transformation of waste to produce energy, even though incineration is not recommended as a sustainable innovation due to its environmental effect. The advancement made in municipal solid waste management thus far, and the methods adopted, are encouraging. However, cities in the sub-Saharan need to recognise waste picker's as a strategy that they can use to minimise and manage waste in their cities. They can build on the already available system rather than to implement advanced technologies that come with a huge budget. The waste collection, transportation and disposal systems in municipalities are still weak and poor because of low funding, lack of technical skills and technical difficulties and shortcomings. Insufficient municipal solid waste therefore results into environmental and human health issues. This is unfortunately the one of the biggest challenges in most sub-Saharan cities, which lack the financial muscle and the capacity to effectively manage municipal solid waste. The challenge of solid waste management therefore can be addressed collectively by looking at new approaches that include both the traditional

centralised municipal council-based approach and new decentralised-community based approaches, in order to create a mix that best fits the municipal council and its citizens.

CHAPTER 3

METHODOLOGICAL CONSIDERATION

3.1 Introduction

This chapter outlines the research methodology that was employed in the study. This is actually an outline of what was actually done during data collection, how it was done and why it was done that way. Generally, the methodology is a chapter that reports details on how this study was actually conducted. The contents of this research chapter includes: a recap on the research aims and objectives, research positionality, research design, data analysis and the methodological reflections of the study.

3.2 Recapping research aims and objectives

It is of paramount importance to remind the reader the purpose of this research study. This research revolves around understanding the role of waste pickers in municipal solid waste management in the city of Johannesburg. The purpose of the research is interested in identifying systems and mechanisms that need to be in place in order to integrate the formalities into formal systems in solid waste management. In addition, it identifies barriers that hinder the integrating of waste pickers into an inclusive municipal waste management system.

3.3 Research Approach

This research is embedded in the interpretive approach. The researcher's beliefs and feelings about the world guided the research. This implies a subjective epistemology

and the ontological belief that reality is socially constructed that is, people's experiences and behaviour in their natural settings is developed by the context of their daily lives which can be in the social, economic and cultural environment. In that way, the interpretive aspect is basically an approach that is used to understand people's lived experiences from their perspective (Hennink *et al.,* 2012 & Longhurst, 2010).

To be more precise, this research studied the subjective meanings that waste pickers attach to their experiences in informal waste recycling. So instead of developing facts, the researcher seeks to get information from individual's in order to understand their activities or experiences in the context in which waste pickers work. Therefore, this interpretive approach emphasizes the importance of interpretation and observation in understanding the social world of waste pickers. This approach acknowledges that in positivism there is a single truth but in the interpretive approach, people have multiple perspectives on reality therefore; people's perceptions and experiences of reality are subjective (Hennink *et al.,* 2011).

Along with the above, the choice of this position is justified by the fact that the researcher is a local and lives in close proximity with the study site. The author's proven knowledge of the study area influenced officials in the formal waste management sector to allow the researcher as an insider with regard to the issues in municipal solid waste management. The need of informal waste recycling data enabled the researcher to investigate the possible understanding on why waste pickers are still not part of the municipal waste management system and the extent to which the waste pickers focusing on recyclable materials contribute to waste recovery and recycling of municipal solid waste in Johannesburg. The researcher assumed that the issue of waste pickers in the city of Johannesburg is a subjective reality and needs to be investigated,

discovered and constructed through the researcher's engagement with different solid waste management officials as well as street waste pickers.

Therefore, to work towards the above-mentioned research aim, qualitative research methodology was used. It was very crucial for this study to use this method because it purposely targeted the understanding of waste pickers experiences and perceptions. This method was an ideal strategy in answering the research aim and objectives simply because each respondent narration or experience is knowledge on its own. Stake (1995) and Hennink *et al.,* (2011) state that qualitative researchers need to understand the complex lived experiences of individuals rather than to urged for explanation and control. As a result, the researcher identified issues, understood meanings and behaviours from the perspective of study. In line with the above, qualitative research data is rich in meaning as collected data is reported primarily in participant's words rather than in numbers. This then qualifies qualitative researchers as individuals who study and interpret phenomena in their natural world, and make sense of individuals' lived experiences.

The research design was therefore influenced by the nature of the research. This research explored detailed real-life and in depth data collection measures on multiple sources of information (Creswell, 2013). The above description then qualifies the use of a case study method. It was very necessary for the researcher not to study a phenomenon in general, but instead study a specific example within time and space. Therefore, a case study method is suitable because the research studied the current and real-life informal waste recycling issues as they progressed. Alternatively, the intent of this research was to understand the role, challenges of waste pickers and to capture their experiences. Johannesburg City and the suburban presented an in-depth

understanding and accurate information on informal solid waste recycling not lost by time.

3.4 Research design

This section gives a detailed description of the study area, the sampling procedures and the various methods used to collect data.

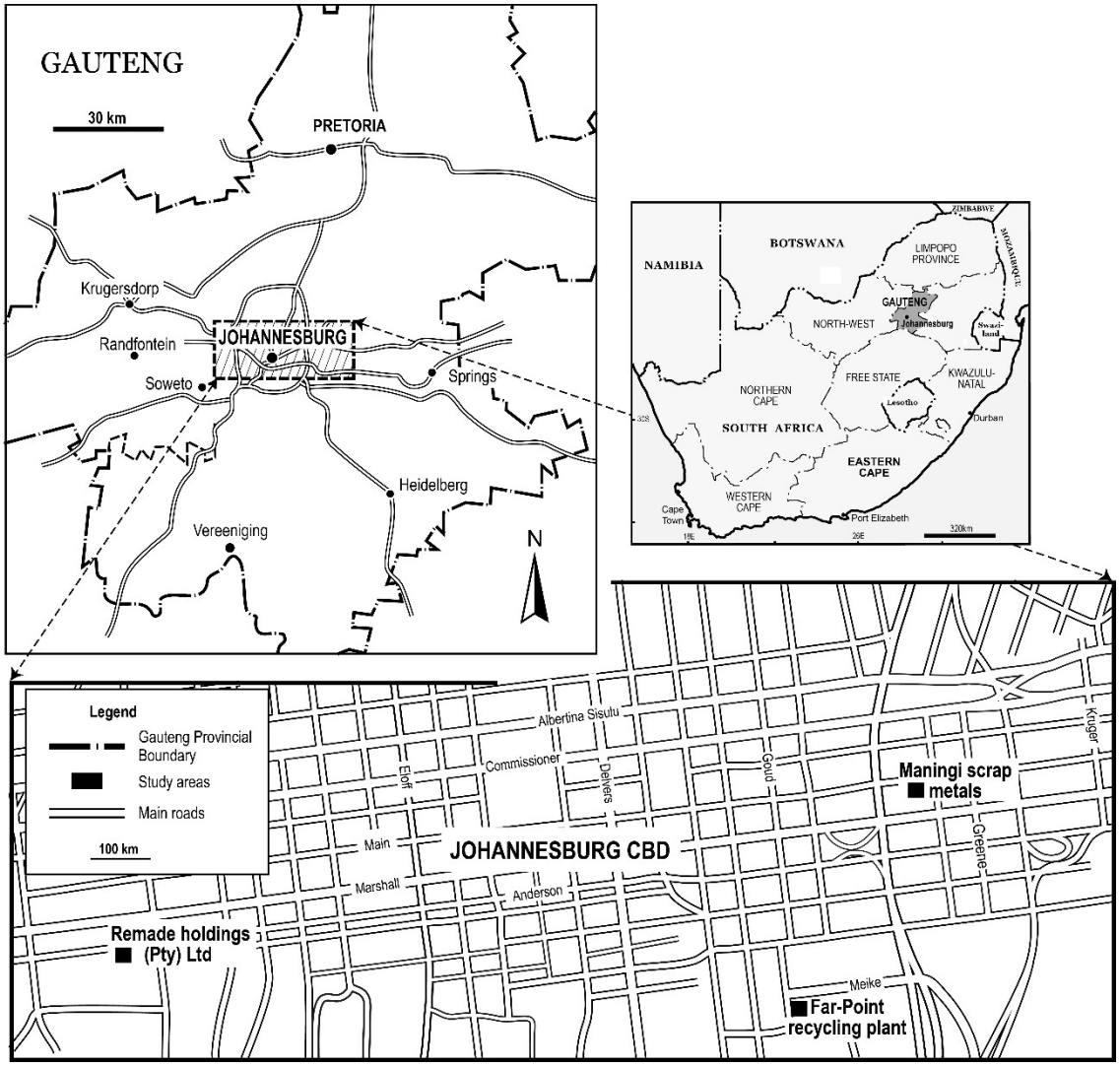
3.4.1 Description of the research site

The functions that Johannesburg City and the Suburban perform enabled it to be the study site. Johannesburg is a seat of government with a population of approximately 3.9 million inhabitants and an average population density of 1 962 persons per km^2 (City of Johannesburg, 2016). The city of Johannesburg is the economic powerhouse of South Africa with people in the city wealthier that their counterparts in smaller cities (City of Johannesburg, 2016). This caused a great increase of personal incomes and personal consumption of individuals in the urban areas. Consequently, there is now more disposed waste, while for the same reasons there is less incentive to recover or re-use items discarded after use. It also attracts more migrants due to the economic activities it holds, therefore, generates more municipal waste. It is also important to note that although Johannesburg is one of African's most urbanised settings (Simone, 2004), temporary labour migration has not declined, rather has increase in the post –apartheid South Africa (Posel, 2004). As a result, people from local and international source areas are continually settling in the city of Johannesburg.

In the face of high volumes of municipal waste in cities, ineffective municipal services, unemployment rates and failing formal institutions, Johannesburg City and the

suburban offers a better example that can be modelled in terms of the complexities in municipal solid waste management in African countries. This is because the City and suburban show a geographical profile of waste pickers which are a common in the streets of Johannesburg. Thus, as shown in Figure 1, the specific location made it easy to pinpoint the spatial location of waste pickers as well as buy-back centres in the metropolitan areas of Johannesburg.

Figure 1: Spatial location of the study sites



Source: Drawn by the cartographic unit, University of Wits, 2016

3.4.2 Study population and Sampling procedure.

This study was interested in formalities involved in formal and informal municipal waste management in Johannesburg. The study employed purposive sampling in order to select a representative sample from the study site. This sample comprised of 73 street waste pickers involved in informal solid waste recycling, 3 directors from buy-back centres (Maningi scrap metals, Far-point recycling and Remade recycling), key informants from (Environment and Infrastructure Services Department, Department of Agriculture and Rural Development (GDARD), Pikitup, Geza Jozi and Bathopele co-operative and 26 waste pickers in focused group discussions. Participants were chosen on the basis that they are involved in waste practices and management in the City of Johannesburg. In this case, the theoretical principle called saturation guided the number of participants to be recruited. A point of saturation is where information collected tended to be repetitive (Hennink *et al.,* 2011). Therefore, this research was driven by the motive to seek variation and context among waste pickers rather than volumes of participants.

A week before data collection commenced, a small preliminary pilot study was conducted. This was primarily done to know whether street waste pickers will be able to understand the interview questions, to test the data collection tool and to identify questions that needed modification and to see if the research questions were too long for the respondents. Data was collected between August 2015 and October 2015.

Johannesburg waste pickers are a common sight and are in every corner of the streets. With that in mind, the researcher targeted waste pickers in their selling points which in this case are the buy-back centres. Permission was obtained from the directors of the

centres to interview waste pickers in the buy-back centre vicinity. The researcher purposely interviewed street waste pickers in the Johannesburg City and Suburban buy-back centres vicinity. In order to extract undocumented information and activities, interviews were conducted in their vernacular language. Most waste pickers used their mother language as a medium of communication. Therefore, explanations and clarification of terms were used during the interviews which allowed the researcher to extract more information.

The researcher used purposive sampling; that is only street waste pickers that voluntary participated during the study were interviewed. Rice (2010) and Creswell (2013) state that it is the researcher who knows the research purpose and the sample that can give detailed and required information. Creswell (2013) adds that the participants are most of the time those who can inform an understanding of the research problem and are on sites. Therefore, waste pickers demonstrated features that can enrich the purpose of this research. Waste pickers provided detailed quality information as they are the masters in waste management and recycling actives within the city.

Subsequently, as the research frame grew snowball sampling was applied to recruit key informants from municipality and organisations. To elicit key information on perception and attitudes towards waste pickers snowball sampling was therefore used to compliment the purposive sampling procedure. Snowball sampling is basically a technique where one contact is used to help recruit another contact, which in turn can put in touch with someone else (Longhurst, 2010). This technique was necessary to employ in this research so to be able to interview people who work close with waste pickers and those that waste pickers knows. Snowball sampling method is

advantageous because the researcher can link trusted people that are familiar to the study thus enriching the participation and information on the research. Thus, to identify other buy-back centres directors were used and to visit waste management department and organisations, key informants were used. The researcher communicated with the key informants and appointments were scheduled verbally and through emails.

The researcher protected the waste picker's rights during interviews. To do this, the research objectives were verbally articulated to waste pickers, and to key informants and directors in writing. Information on the nature of this research, what would be expected of them, how data will be used and participants anonymity, how long the interview would be was provided in detail. Key informants from waste management departments and directors of the buy-back centres signed a consent letter. The letter stated that their participation is voluntary and that they can withdraw at any stage of the research. To maximise variation, to present diversity in understanding and to fully describe multiple perspective about informal solid waste recycling in Johannesburg, interviews were tape recorded and different question-themes were used for street waste pickers, directors in buy-back centres and key informants. Questions that were asked include the barriers that exist in setting up a system that recognises the informal solid waste sector and possible strategies that can be used to formalise waste pickers. Apart from these questions, when visiting organisations and departments officials, the study concentrated on the relationship between the field officers and waste pickers in as far as informal waste recycling is concerned. When visiting the waste picker's buy-back centres, this research concentrated on the challenges encountered by them, the

provision of waste collection services and the co-ordination between the municipality, waste pickers, organisations and residents.

Along with the above, street waste pickers in the Johannesburg City and the Suburban were recruited to participate in focus group discussions. The researcher formed four focus groups with street waste pickers at Far-point recycling buy-back centre. The flow of the discussion made it possible to go through all the questions that formed the research guide. Each interview session lasted for 45 minutes. To facilitate granting of the permission to conduct focus group discussions, directors at Far-point recycling buy-back centres were used as gatekeepers.

The research processes and procedures were explained verbally in the organised different groups since most of the waste pickers have low literacy level. These included the purpose of the research, participants of the focus groups and structure and sections to be covered. The discussions were tape-recorded. Interviews were in English and translated to isiZulu and isiSuthu. Participants verbally indicated to participate after explaining the research ethics and purpose of the study. Research participants were free to withdraw at any stage of the research process.

The discussions were facilitated and guided by the researcher, together with an assistant facilitator. Detailed notes on the interview process were drafted by the assistant facilitator in order to supplement tape-recorder discussions. As a back up to any problems with the tape recorder and traffic noise, detailed notes were taken. To allow focused attention during the interview process, non-verbal cues of participants, reactions, feelings and thoughts were monitored. The focus group interviews were guided by a number of questions which include: reasons behind non-integration of

waste pickers into the municipal solid waste management, and secondly, ways regarding integration of the informal sector into the municipal solid waste management.

3.5 Data collection tools

Both secondary and primary data were used to complement each other, thus providing interfaces of theory and practice and helping to extend debate and discourse around the methods that can be employed to integrate waste pickers. A comprehensive and intensive review of literature was done to generate distilled theoretical frameworks essential in municipal solid waste management. Primary data was largely gathered through interviews with key informants, officials working in the solid waste management departments in the municipality, and other relevant organisations. Observations of the phenomenon and photographic surveys are also primary data-collection methods, which were used to generate fresh data from the field, particularly to reveal waste pickers activities and recycling sites.

A. Semi-structured interviews

The interview process was conducted in a semi-structured manner so to unpack themes. This manner introduced the researcher into new concepts and new angles on municipal solid waste management. Additionally, the use of semi-structured interviews allows the researcher to understand the broad themes in informal waste recycling. A greater insight into how to integrate waste pickers and their activities was discussed in the data collection process. In conducting interviews, the researcher acted more as a facilitator than interviewer, digging out waste picker's stories. Interviews were conducted in English and translated to isiZulu and isiSuthu. Recorded interviews were transcribed and translated into English.

Hennink *et al.,* (2011) states that semi-structured interviews is not a platform or a two-way dialogue rather it is in-depth special kind of knowledge meaning-making conservation between the respondent and the interviewer. Therefore, the following strengths enabled semi-structured interviews to be employed in this research. Firstly, there was an interview guide in the research process where participants not only responded to questions but participated in the interviews. Secondly, non-verbal behaviour and communication on face to face with participants was mostly used. Thirdly, it guaranteed follow-ups and clarifications on the flow of an interview. Finally, it gathered detailed, complex, comprehensive information (Hennink *et al.,* 2011 & Longhurst, 2010).

B. Focus group discussions

The second stage involved personal interaction in focus groups to collect diversity in data. The discussions were conducted in the buy-back centres locality so that participants can interact in a productive, rather than dysfunctional way. Focus group discussions were conducted during data collection period and waste pickers were able to narrate their experiences, challenges and feelings towards waste picker's integration. A more naturalistic environment therefore, resulted from the interaction with waste pickers. Findings from the focus group discussions helped as a guide in the proceeding investigation.

Focused groups were used because they are not the same as semi-structured interviews which only rely on the interaction between the interviewer and interviewee. In that case, to obtain diverse views on a topic, focus groups and interviews can be combined (Longhurst, 2010). Focus groups are about interacting with six to eight pre-selected

participants but in a manner that is orderly structured. Hence, they enable the researcher to access participant's experiences.

The following strengths facilitated the selection of focus groups: they enabled and promoted interaction between the research participants, cheap and uncover unique perspectives on the research. They also promoted self-disclosure and yield detailed information on the research issue (Hennink *et al*., 2011 & Longhurst, 2010). The last strength is that it is rich in nature in a way that participants can build into each other's views (Hennink *et al*., 2011).

C. Key Informants

Key informant interviews were also used in this research, which is a technique that is used to utilise detailed and rich information sources. Key sources were national figures in leadership positions responsible for municipal solid waste management. Given the focus of the study, the appropriate informants were those in the Environment and Infrastructure Services Department, GDARD, Pikitup, Geza Jozi and Bathopele co-operative who have adequate knowledge of and information on municipal solid waste management in Johannesburg. An advantage of key informant interviews is that it guarantees an exchange of information and ideas through asking complex questions. It was very crucial for this research to tape record the information. This enabled the researcher to fill in formation gaps and to freely engage in the conversation.

D. Personal observations

Lastly, first-hand understanding on the perspectives of waste pickers was gained through the employment of personal observation. In order to corroborate responses from interviews, waste pickers working conditions were documented through

observation. Clearly through personal observation it was possible to ascertain whether what waste pickers say they do in reality tally. The researcher was able to capture data in more natural circumstances. Again, through personal observation, this study was able to capture the whole social setting in which waste pickers function, by recording the context in which they work and the influence of the physical environment. Semi-structured interviews only provided a piece of the whole waste picker's scenario which was then fitted into a "picture on the box" through observation. Various types of observational analysis were employed by the researcher as an observer, (1) researcher participant-the researcher took notes, observes and participated during before and after interviews in some waste activities. (2) Total researcher- the researcher silently observed waste pickers interaction from a distant.

3.6 Data Analysis

Since this is a qualitative research, Creswell (2014) and Miles & Huberman (1994) contended that data collection and data analysis is a very crucial stage in research and must be a simultaneous process. Miles & Huberman (1994) state that categorisation is mostly used in qualitative data analysis and entails classification of things, persons, events. In that case, they mentioned that case study researchers use many categories so need to code their data (Creswell, 2013). In other words, researchers describe themes and identify patterns then use the themes and patterns to understand the perspectives of the participants (Miles & Huberman, 1994).

Therefore, Tesch's method of qualitative data analysis as outlined in Creswell (2009) was used as an analysis tool. Interviews from focus groups and semi-structured were transcribed. Tesch method identified steps which this research followed. The steps

involved the following: the researcher went through all the information contained in the transcripts; selected and read again interesting transcripts; short notes, ideas, thoughts and emerging information were written in the margin with coloured pencils; information answering the research questions were clustered into themes, sub-themes and categories; all transcripts were coded; the data was grouped and most emerging descriptive wording for the themes, sub-themes and categories were noted. To finalise the process of analysis, re-coding was applied where necessary.

To ensure external validity, a rich, thick and detailed description was employed in this research. This strategy was utilised so that anyone interested in transferability can be able to do so on a solid framework (Creswell, 2014; Hennink *at al.,* 2012 and Miles & Huberman, 1994). To ensure reliability four techniques were used.

a) Applicability- the context from which data was collected as well as detailed focus of this research was provided by the researcher (Creswell, 2014).
b) Truth value- four different methods of data collection (Key informants, personal observation, focus group and semi-structured interviews) and recorded interviews which strengthens reliability as well as internal validity were used (Hannink *et al*., 2012).
c) Consistency- information was coded to check for accuracy and data collection and analysis strategies were outlined in details to give a clear picture of the research methods used.
d) Neutrality- statements made during the research process are indicated in quotes.

Creswell (2014) suggested that although data collection and analysis strategies are similar across qualitative methods, the way the findings are reported is diverse. Miles

and Huberman (1994) mentioned the importance of creating a data display and suggested that narrative text has been the most frequent form of display for qualitative data. This is a qualitative study; therefore, results are presented in descriptive, narrative form rather than as a scientific report. Thick description is therefore, the vehicle used in this research for communicating a holistic picture in the experiences in municipal solid waste management.

3.7 Methodological reflections

3.7.1 Language barriers

During data collection, interviews were conducted in English and translated to isiZulu and isiSuthu. The researcher was only able to translate to isiZulu and for isiSuthu, waste pickers translated among themselves.

3.7.2 Member domination

In each of the focus groups there was a 'spokesperson' who dominated the discussions. Some participants were unwilling to raise views and issues because they were shy and reserved. To make sure that all participants made their contributions, equal chances were facilitated. Participants were asked to share experiences as their names were not recorded.

3.7.3 Confidentiality or anonymity

Anonymity cannot be guaranteed in focus groups as members discuss controversial issues (Hennink *et al.,* 2011). Participants were advised to keep sensitive issues confident but that was not promised as members can divulge information. Waste

pickers did not want to disclose their daily pay for the recyclable materials even when told to use estimates.

3.7.4 Interviewee effect

During the interviews, waste pickers were asked information on the support that they receive from the municipal authorities. They did not disclose some of the crucial information because they were afraid that they can lose their relationship with directors from the buy-back centres.

3.8 Summary

This chapter outlined the research methodology that was used. A recap on the research questions, aim and objectives as well as the research design was discussed. The interest of this research was to explore lived experiences, behaviours, thoughts and feelings of waste pickers, buy-back centres and officials; therefore, a qualitative approach was used. Sampling methods employed in this research includes the purposive sampling and snowball sampling.

Focus groups, key informants, personal observation and semi-structured interviews are the data collection techniques. Details included interviews with waste pickers, directors of recycling buy-back centres and key informants in formal waste management sector and focus groups. Tesch's method of qualitative data analysis was used and it involved coding and identification of themes. To ensure trustworthiness of research findings, criteria's such as truth value, applicability, consistency and neutrality was employed. The study further outlined the methodological considerations of the research design.

CHAPTER 4

EMPIRICAL FINDINGS AND DATA PRESENTATION

4.1 Empirical Findings

This chapter is based on the empirical evidence that was collected through interviews and discussions with participants in this research. The survey revolved around these important themes and aspects: socio-economic characteristics of research participants; reasons for involvement of waste pickers in waste management; challenges faces by waste pickers; contributions of waste pickers on municipal waste management; barriers to an integrated waste management system and lastly, an approach for a sustainable solution to informal waste recycling in the city of Johannesburg.

The results are further divided into sub-themes, categories and verbatim quotations as expected in the tradition of writing qualitative research. Verbatim quotations are all in English. It is important to first identify demographic features of the waste pickers and these is illustrated in Table 1.

Table 1: Research participant's demographic characteristics

Variable	Category	No of respondents	%
Gender	Male	69	95
	Female	4	5
Age Range	15-25	13	18
	26-35	44	60
	36-45	11	15
	46-55	4	6
	56-65	1	1
Total		**73**	**100**

Source: Field-based material, 2015

Table 1 shows that the majority of the waste pickers were men 95%, while only 5% were women. Table 1 also reveals that 60% of the entire waste picker's ranges between 26 and 35; 18% between 15 and 25 and 15% ranges between 36 and 45 years. The high representation (60%) of the age group between 26 to 35 years is indicative of the fact that the informal waste sector is predominately characterised by the youth and is a reflection of the current high unemployment rate (26.6%) in the country (SSA, 2016). The most affected by this development are the youth who increasingly are not being absorbed in the formal sector. Thus, the lack of formal employment opportunities in the context of rapid urbanisation has resulted in compelling the youth to search for alternative employment avenues in order to obtain their livelihoods and incomes necessary for the procurement of other services and amenities.

According to Statistics South Africa (2015), it is argued that urban population growth in South Africa is estimated at 2.4% and if not addressed will result in 71% of the urban

population by 2030, and 80% by 2050 respectively. An official from the local government in the City of Johannesburg stated during interviews that:

> *"The current rapid urbanisation in the city of Johannesburg has in a way led to economic, social and physical problems and this definitely requires and will continue to require the attention of both legislators and policy makers. If we leave it to spiral out of control, it will have devastating impacts on the urban areas*" (Pers.com, 2015a).

It is important to note that rapid urbanisation in Johannesburg city is escalating as a result of increasing rural-urban migration, population growth and industrialisation (Sentime, 2014 and Samson, 2008). The growth in urban population, as pointed out by a city official has brought challenges that need to be mitigated by the government, for example, decay of urban infrastructure, inefficient service delivery capacity, overcrowding, environmental degradation and the generation of volumes of solid waste.

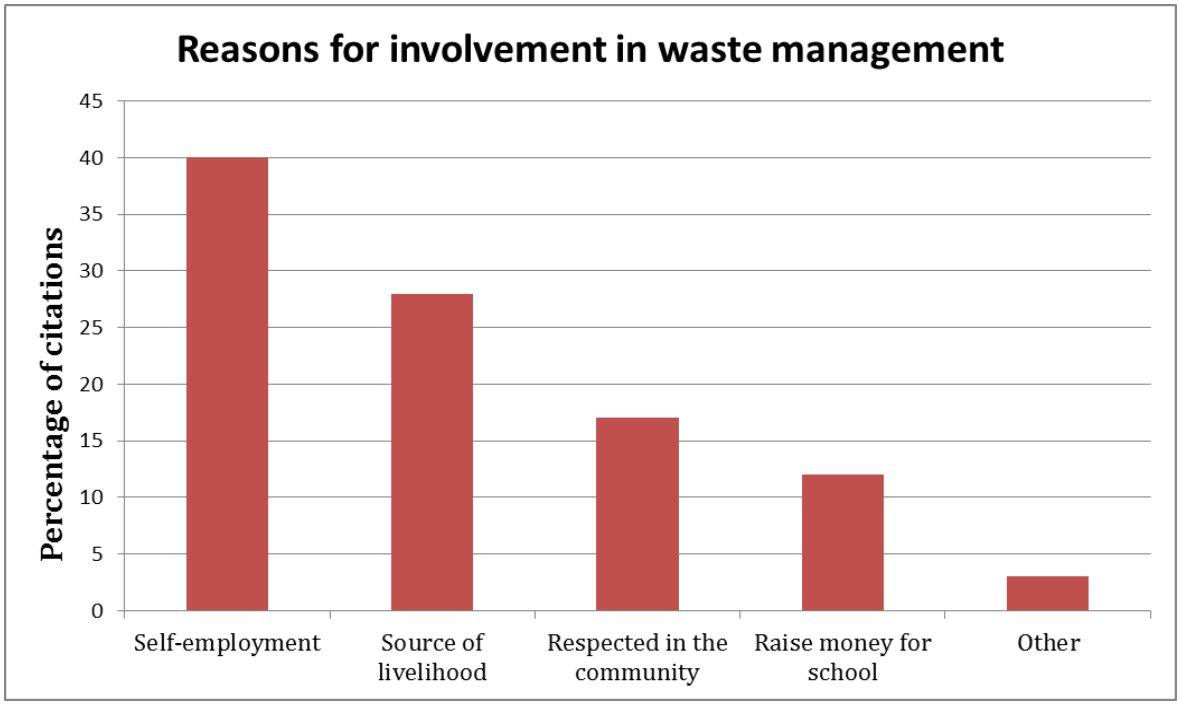
Furthermore, Simatele and Simatele (2014), for example, observe that in most sub-Saharan African countries, urban explosion has tended to co-exist with an inadequate economic base to cater for job provisions or provision of urban services to the population. In view of this observation, it was important to identify factors that have contributed to influencing the waste pickers' involvement in municipal waste management and recycling. These views are reflected in Table 2 and Figure 2.

Table 2: Research participant's reasons for participating in informal solid waste recycling.

Reasons	Frequency of citations	No. of respondents	%
Self-employment	IIIII IIIII IIIII IIIII IIIII II III IIIII	35	40
Source of livelihood	IIIII IIIII IIIII IIIII IIII	24	28
Respected in the community	IIIII IIIII IIIII	15	17
Raise money for school	IIIII IIIII	10	12
Other	III	3	3
Total		**87**	**100**

Source: Field-based materials, 2015

Figure 2: Reasons for involvement of waste pickers in waste recycling



Source: Based on Table 2.

Table 2 and Figure 2 clearly indicates that the main reasons for involvement in solid waste management by the waste pickers is economic and financial gains. An estimated 68% of the responses for example, suggested the need for employment and income generation as the basis for engaging in waste management and recycling. An additional 17% argued that solid waste recycling affords them an opportunity to be recognised and respected in their respective communities. Most waste pickers, suggested the need for employment and income generation as the basis for engaging in solid waste recycling. These findings are consisted with the findings from other studies which have suggested that the increases in urban poverty and unemployment have combined in triggering the heavy reliance of many urban poor households on the informal sector, one of which is solid waste recycling (Simelane and Mohee, 2015; Sentime, 2014; Simatele and Etambakonga, 2015).

From the information collected in the three research locations as well as discussions with officials from solid waste recycling plants, it is evident that in as much as waste management and recycling contributes significantly to the livelihoods of the waste pickers. However, waste pickers contribute extensively to waste minimisation and management.

Empirical evidence suggests that waste pickers play a significant contribution in municipal waste management; yet they are informal and unregulated in nature. Waste pickers gather recyclable materials from mixed solid waste in the streets, dustbins, shops, clubs, parks, clinics, factories, hotels and residential flats in the urban fabric. Discussions with waste pickers as well as officials from waste recycling plants revealed that although the motive behind collecting waste is purely economically driven, a significant amount of recyclable materials are usually collected and recycled. Figure 3

and Figure 4 for example, shows the different types of recycled solid waste. The overall impression in Figure 3 is suggestive of the fact that informal waste pickers significantly contribute in waste management and recycling.

Figure 3: Truck load of recyclable materials in Johannesburg city

Source: Photo by Smangele Dlamini, 2015

Waste pickers have become highly skilled at identifying solid waste with potential values, and locating buyback centres across the City of Johannesburg. Figure 4, shows how waste pickers have become involved in waste management and recycling in Johannesburg. The most frequently targeted municipal solid waste are plastic, cardboard, paper, metal scrap (tins and cans), PET bottles.

Figure 4: Mostly recycled solid waste materials

Source: Photo by Smangele Dlamini, 2015

It is important to note that these contributions must be understood within the context of frequent instabilities in the formal systems of municipalities in Johannesburg. A discussion with one of the waste picker who sells his waste to Far-Point recycling plant for example, stated:

> *"It works very well for me when pick-it-up workers go on strike. If they are on strike, it means that all the waste is not collected and I can take my time and collect as much as I want. When pick-it-up workers are working, it becomes a race against time and they always beat us as they have vehicles that they use to collect waste. We walk and it is difficult to get there before they do. So it's always good for us when they are on strike"* (Pers.com, 2015b).

Further discussion with an official from Remade recycling plant revealed that a significant amount of recyclable waste is usually delivered by waste pickers who normally trade it at a fee. They trade their recovered recyclable materials in the buy-back centres around Johannesburg, namely Remade recycling plant, Fa-rpoint recycling plant, Maningi scrap and metals recycling plant, Emazulwini recycling plant, Paulos recycling plant and Emantombazaneni recycling plant. Most waste pickers select their best buyer in terms of the prices offered to them and also in terms of the buy-back centres proximity. The buy-back centres are the middlemen in recycling of recovered waste especially because industries do not buy recyclable materials directly from individual waste pickers instead they buy in bulk in buy-back centres. An official from Far-point recycling plant for example, stated:

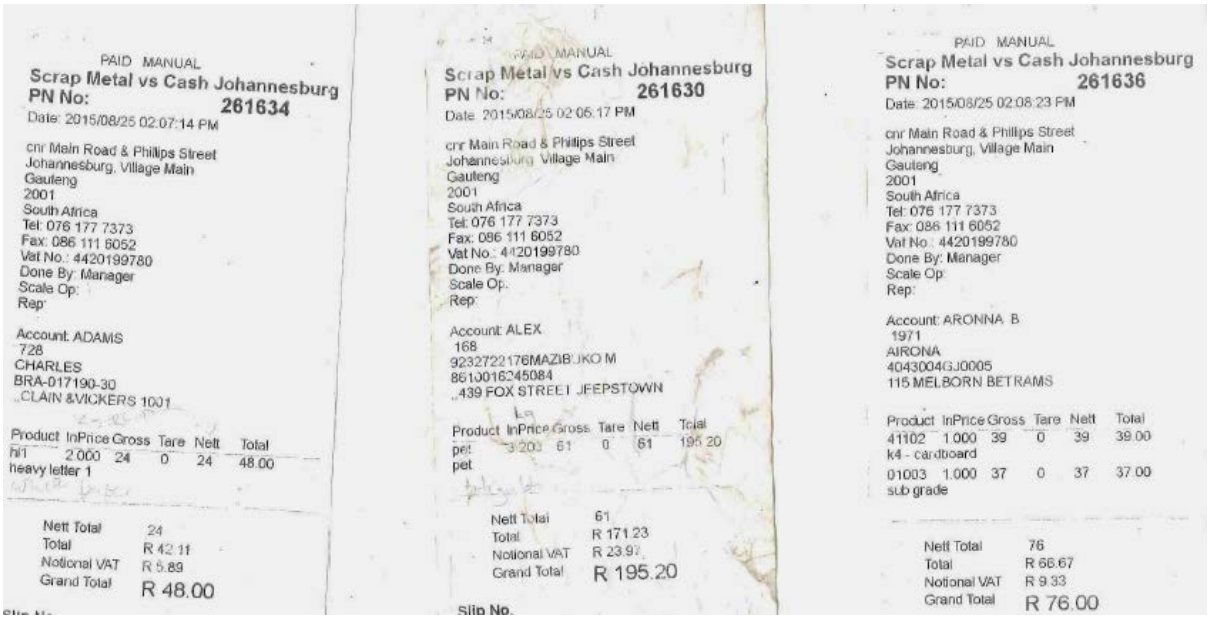
> *"A lot of the waste that you are seeing here was brought in by waste pickers. We buy recyclable materials from them and we also sale it to the manufacturing industry who then transform it into re-usable materials. Our bailing machines compact and bale sorted recyclable waste. The baled recyclable materials are then delivered to paper and plastic mills, where the recyclable materials are used in the manufacturing process"* (Pers.com, 2015c).

From this quotation, it can be argued that the informal sector, through recycling activities is contributing to municipal waste minimisation and management. Therefore, the engagement between buy-back centres and waste pickers seems to be increasingly a major form of employment and a source of livelihood.

Based on the above, it is important to have an understanding of the monetary value of the recycled materials and this is presented in Figure 5. The buying price of recyclable

material from waste pickers according to Wilson *et al.,* (2006) and Medina (2001) depends on the price of virgin materials, existence of local markets, supply and demand for secondary materials, level of accessibility, convenience of transporting the materials.

Figure 5: Monetary value of waste collected and recycled in the study sites



Source: Taken by the Researcher, 2015

Figure 5 shows three different waste picker's receipts from the Maningi recycling plant. The receipts show that the waste pickers are paid per kilogram of recyclable materials (paper, plastic and cans). In comparison with experience from other countries, Oguntoyinbo (2012), states that the price paid in Nigeria depends on the quality and quantity of the recyclable materials. In the context of the City of Johannesburg, waste pickers are generally paid based on quantity (kilograms) of the recyclable materials collected.

However, a discussion with a waste picker from Maningi recycling plant mentioned that apart from the quantity of recyclable materials, there is an extreme fluctuation in the

prices paid in buy-back centres. Waste pickers confirmed that *"Many industries close towards December, so demand is low during that time and therefore the buying price decreases. We end up getting nothing."* The view expressed by waste picker seems to suggest that waste pickers are exploited mainly because they operate as individuals and in this scenario they do not have a supporting management board. They accept any offered price as they are not under a representative body that can represent them and negotiate prices.

4.2 Contributions of waste pickers in waste management and recycling.

Data shows that in as much as solid waste recycling contributes significantly to the livelihoods of the waste pickers. The waste pickers make extensively important contribution in cleaning of the city, environmental protection and waste minimisation and management. Research participants pointed out important contributions of waste pickers in waste management and recycling. The contributions are grouped into four sub-themes which are (A) waste minimisation, (B) minimise waste to landfill, (C) cleans up the city and reduces municipal expenses, (D) source of employment and livelihood.

A. Waste minimisation and management

The recovery of recyclable waste in the city of Johannesburg is mostly run by the informal sector. Table 3 shows the different types of recycled solid waste including the estimated average amounts that each waste picker collects in seven working days a week.

Table 3: Averages of solid waste collected per week in the three research sites.

Recycling Plant	Type of solid waste and estimated amounts in KGs							
	Glass/ bottles	%	Plastics/ bottles	%	Paper/ boxes	%	Scrap metals	%
Far-point recycling	200	47	120	47	80	46	25	21
Remade recycling	230	53	134	53	93	54	18	15
Maningi recycling	-	-	-	-	-	-	78	64
Total	430	100	254	100	173	100	121	100

Source: Field-based materials, 2015.

Figure 6: Waste pickers queuing to sell recyclable waste at Remade recycling plant.

Photo by Smangele Dlamini, 2015.

Table 3 shows that waste pickers make a significant contribution to municipal waste minimization and management in Johannesburg city. It is suggested for example, that an estimated 53% of recyclable glass or glass bottles and 64% of scrap metals received at Maningi recycling plants respectively, are a result of the contributions made by individual waste pickers.

Discussions with an official from the Johannesburg local authority revealed that waste pickers have become important players in waste management and recycling. They recycle solid waste from street bins, industrial, commercial and household's zones. He further argued that in the context of increased and prolonged episodes of strikes by workers from formal organisations and institutions (e.g. Pickitup) mandated to manage waste, waste pickers have demonstrated an ability to be flexible in dealing with the

waste that is left uncollected in the streets. They collect the recyclable materials in their makeshift trolleys and sell it daily to buy-back centres, while others sell their recyclables on weekends. He stated:

> *"Indeed waste pickers make a huge difference as far as recycling is concerned. The streets of the city of Johannesburg are populated by waste pickers recovering recyclable waste at household, industrial and commercial levels. The activities of the waste pickers in Johannesburg are organically grown and as such these activities are highly adaptable and flexible and as a result they are very responsive to the waste challenges that the city faces. We can actually argue that the activities of the waste pickers in Johannesburg do not exists in a vacuum but are highly demand driven"* (Pers.com, 2015d).

However, as waste pickers spend the whole day in the city in search for recyclable waste. They mentioned that there is no source separation at household level yet households produce the most waste; plastics, papers, bottles and hazardous wastes are disposed as common waste. Residents are not aware of the practice and do not see the need to separate their waste since government has not initiated the implementation of resource recovery programmes. A waste picker from Maningi recycling plant narrated that:

> *"I know how important my job is, but residents are not aware of source separation and recycling. They mix every waste in one dustbin and this delays me because I have to search for recyclable materials inside the dustbins. Government need to educate people to separate their waste when disposing it"* (Pers.com, 2015e).

This behaviour by residents towards waste management and recycling needs officials in municipalities to implement and educate citizens on recycling and separation at source. Municipal authorities need to understand that a more effective way to reduce waste is to deal with it at source through recycling.

B. Minimise and divert waste to landfill

Waste pickers and officials felt that recycling can be the best solution to minimise waste that goes to the landfill sites. They mentioned that it is cost effective and creates employment for the urban population. A discussion with an official from Johannesburg local authority revealed that the activities of waste pickers make a huge difference on the volumes of waste that is deposited in the landfill sites. He mentioned that a strategy to reduce waste to the landfill is through the recognition of the informal sector taking into consideration that Johannesburg is running out of development space. Waste pickers, officials and key informants unanimously agreed that waste pickers in the city of Johannesburg reduce the volumes of waste that goes to the landfill. Another official from the city of Johannesburg agreed that *"Currently, as the city of Johannesburg we do not have enough space in the landfill sites. So waste pickers help reduce waste to the landfill and at the same time prolong the lifespan of the landfills that we have."* An official from the department of Environment and Infrastructure Services further states that: *"Recycling not only reduces waste to the landfills, but also helps to lower greenhouse gas emissions, leachate and saves energy from producing or importing products like cardboard and plastic."*

C. Cleans up the city and reduces municipal waste management expenses

Although waste pickers are marginalised and rejected by residents, they contribute in the urban economy in that they reduce the volume of waste in urban areas. In view of this observation, discussions with officials pointed out that recycling makes a difference in the urban landscape. It removes usable and recyclable waste on the environment and thus cleans up the city. A senior official from the city of Johannesburg for example, stated:

> "*Waste pickers play a role in reclaiming recyclable waste from the dustbins. They reduce municipal expenses by collecting waste that would otherwise have to be transported and disposed using public funds. Pikitup trucks can now get half-full bins and this reduces the number of rounds trips which accordingly reduce petrol costs. For us, the activities of the waste pickers in waste management and recycling, is a huge cost saving measure"* (Pers.com, 2015f).

D. Source of employment and livelihood

Lastly, it cannot be left out that as much as waste pickers contribute to waste minimisation and management. It is also an approach in which waste pickers alleviate urban poverty. Most waste pickers mentioned that as much as this activity benefits the environment, they too feed their families through informal recycling. A woman aged between 26 and 35 years believes that the informal recycling is a form of employment; she stated: *"It is my source of income. I have three children and managed to put two of my children in tertiary education through this money."* Further discussions with waste pickers confirmed that waste recycling activities means a meal; they buy food, support

themselves and their families. This view therefore confirms that informal waste recycling contributes to the welfare and well-being of waste pickers.

From these observations, it can be argued that waste pickers are not passive actors, are actively engaged and involved in adapting their methods to ensure that their income and livelihoods are not impacted negatively. What is interesting from the observations made above is that as much as the activities of the waste pickers provide an income, they also play a significant contribution to environmental protection (Simatele and Etambakong, 2015 and Sentime, 2011). Further discussions with local government authorities from the city of Johannesburg revealed that waste pickers account for an estimated 80% recovery rate of recyclable waste because the ability to recycle is intrinsically linked to their incomes and livelihoods.

4.3 Challenges faced by waste pickers in the city of Johannesburg

It must also be noted that waste pickers highlighted a number of challenges in waste management and recovery. The challenges are divided into two sub-themes, namely occupational problems and operational problems. The challenges are then sub-divided in the following categories. 1 Occupational problem (A) Social issues (B) Health issues. 2. Operational problems (A) Exploitation by the middlemen, (B) Competition, (C) Ill treatment by motorists, and (D) Distance, theft and long working hours.

4.3.1 Occupational problems encountered by waste pickers

A. Social issues experienced by waste pickers

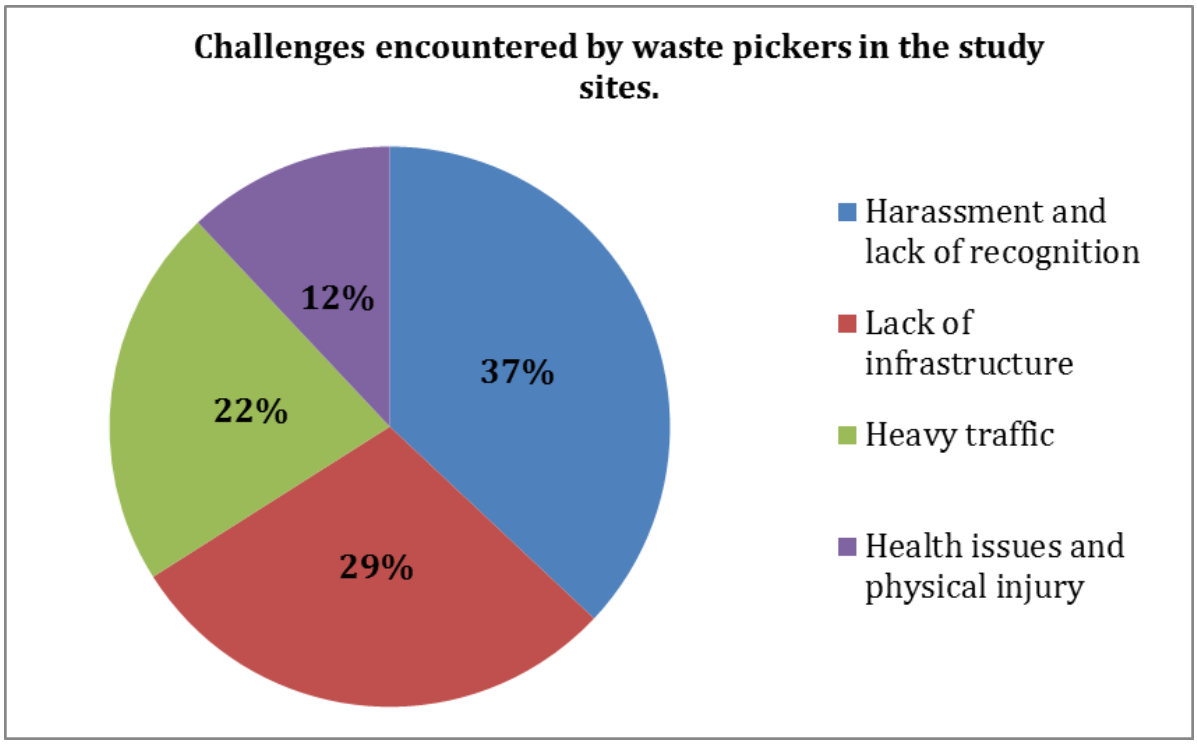
Despite the contribution of waste pickers in waste minimization and management, they work under extreme weather conditions. Table 4 and Figure 7 show some of the challenges waste pickers face in the city of Johannesburg. Table 4 indicates that two major challenges faced by waste pickers in Johannesburg is harassment at different scales of society and the lack of physical infrastructure represented at 37% and 29% respectively. Many waste pickers pointed out that harassment at the point of waste collection is very prevalent because residents always consider them as criminals who remove waste from the bins and scatter it indiscriminately.

Table 4: Social challenges encountered by waste pickers in the city of Johannesburg.

Challenges/ Problems	Frequency of citations	No. of respondents	%
Harassment	IIIII IIIII IIIII IIIII IIIII II	27	37
Lack of infrastructure	IIIII IIIII IIIII IIIII I	21	29
Heavy Traffic	IIIII IIIII IIIII I	16	22
Health issues and physical Injury	IIIII IIII	9	12
Total		**73**	**100**

Source: Field-based materials (2015).

Figure 7: Challenges encountered by waste pickers in waste collection and recycling.



Source: Based on Table 4.

A discussion with one of the waste picker at Far-point recycling plant adds that: "People *along the streets see us as criminals and drug addicts. They do not appreciate our duties. So I always make sure that I focus on getting more materials for money other than trying to fit in this society which does not appreciate my work."* Another waste picker confirms *that: "The worse problem is the metro police, they do not want to see us, but we have no other plan, we must continue."* Residents are always on the view that waste pickers are more of a nuisance and must be stopped from recycling waste. The negative behaviour could be argued as being a result of the lack of knowledge on the contribution of waste pickers by metro police, taxi drivers and residents.

B. Health issues and physical injury

A further 12% (Table 4) of the responses identified ill health as a major concern. It is connected to the lack of appropriate equipment and attire necessary for ensuring the waste pickers safety and protection from hazardous waste. They argued that the lack of appropriate safety clothing subjected them to hazardous waste and often resulted in illness. The combination of these challenges, it was argued compromised their ability to effectively engage in waste recycling. They manually handle waste and get to be in direct contact with broken glass, human and animal faecal matter. A waste picker from Maningi recycling plant narrated that:

> *"It is not easy to reclaim recyclable materials in a dustbin without taking out what is inside. When trying to take out recyclables from the waste, I receive cuts from objects and poisonous substances because I use my bare hands. It can be better if government can provide us with gloves, nose mask, boots and overall to protect ourselves"* (Pers.com, 2015g).

Due to the carelessness, waste is not separated and sorted carefully from hospital waste. Then the entire composition becomes infectious and lead to the transmission of diseases like HIV. Another waste picker expressed his dissatisfaction on carelessness of hospital waste in the following words *"I was diagnosed of HIV in 2009 particularly from contacting sharp material and hospital waste."*

Moreover, most waste pickers complained of the gaseous smell that they come across when reclaiming recyclable materials in dustbins. Wilson *et al.,* (2006) states that since waste pickers are prone to inhale gaseous emissions, this can cause respiratory issues, skin and eye infections which can result in health risks like flue, bronchitis, ulcers, high

blood pressure, musculoskeletal injuries (chronic back ache and soreness in arms, legs and shoulders). Discussions with waste pickers confirmed that they contact many diseases at the point of waste collection and recycling. A discussion with a woman aged between 26 and 35 years who sells her waste to Far-point recycling plant for example, remarked:

> *"I am currently taking medication on Tuberculosis (TB) and it is a result of the smell from the dustbins. I have no choice but to live with it and force myself to recycle every day because this is the only job that put bread on my table"* (Pers.com, 2015h).

4.3.2 Operational problems encountered by waste pickers

Despite the occupational problems experienced by the waste pickers, they are again confronted with operational challenges. Table 5 for example, shows some of the operational challenges that waste pickers face in the city of Johannesburg.

Table 5: Operational problems encountered by waste pickers in the city of Johannesburg.

Problems	Frequency of citations	No. of respondents	%
Exploitation by the middlemen	IIIII IIIII IIIII IIIII IIIII II	26	36
Competition	IIIII IIIII IIIII IIIII III	23	32
Ill-treatment motorists	IIIII IIIII IIIII I	16	22
Distance and Theft	IIIII III	8	11
Total		**73**	**100**

Source: Field-based materials (2015)

A. Exploitation by the middlemen

Table 5 suggests that the major operational problem experienced by waste pickers in waste management and recycling is over-exploitation by the middlemen represented at 36%. Many of the waste pickers pointed out that they feel the stigma of being used by the middlemen. Middlemen constitute wholesalers, brokers, primary and secondary dealers, recycling buy-back centres and intermediate processors (Wilson *et al.,* 2006). This group contributes to waste management and recycling of materials as they buy directly from the waste pickers. Discussions with officials from the three recycling plants revealed that it becomes difficult to work with waste pickers because they are not formally employed by the middlemen (buy-back centres) let alone by the government, they are actually self-employed. Therefore, they operate at their own schedule. Furthermore, the issue of a middleman in waste management is a challenge in a sense that the buying price is not controlled by waste pickers and the buying price is

low. A discussion with a waste picker who sells his waste to Remade recycling plant mentioned that:

> "This *work is tiring and not paying. We do not have a stable price hence we go around chasing better prices in buy-back centres. I may find recyclables that only yields 30c, but cannot leave it. When accumulated to 10-20 kg then it is when I can sell them and pays about R6 to R7. With a good quantity of cardboard boxes R60 to R70 is normal"* (Pers.com, 2015i).

Another waste picker from Far-point recycling plant mentioned that:

> "*I travel from Orange Farm to the city every Monday where I live in the streets for the entire week. I return to my family on Saturdays. I make little money; on a good day about R80, but usually about R40 or R50. The prices are a big problem because with this money I must support my family, buy food and pay rent"* (Pers.com, 2015j).

Ezeah *et al.,* (2013), for example observe that individual waste pickers do not have an organised supportive network therefore are most susceptible to exploitation. From the above statements, it is evident that the middlemen grossly take advantage of the waste pickers by paying low prices on recyclable materials.

B. Competition over valuable recyclable materials

On one hand, waste pickers felt that there are valuable recyclables that are in the commercial areas, residential areas and street dustbins which do not deserve to be landfilled, and on the other hand, they are too many of them who make a living through informal waste recycling. Of the 73 participants who responded, a further 32% (Table

5) of the responses complained that there is competition among themselves, companies and Pikitup. They indicated that it is possible to spend days in search for recyclables. A waste picker from Maningi recycling plant mentioned that:

> "*People have now realised that recycling has money. Companies, individuals, metro police and Pikitup are now recycling. The main challenge then is that waste collectors from Pikitup takes recyclables in the dustbins and recycle it for themselves. So when we arrive, we find that they have already taken the recyclables and we have to search the whole city of Johannesburg for recyclables and that takes time. Again, companies now collect papers and cardboards in their premises and recycle them in the buy-back centres. In short we are just too many with limited recyclables"* (Pers.com, 2015k).

Further discussions with waste pickers confirmed that even the metro police compete with them. The waste pickers mentioned that "*They arrive where we spent our nights and confiscate our materials, and go and sell it themselves."* As if that is not enough, some waste pickers went as far as to colonise streets. Waste pickers do not just reclaim in every street, streets belong to certain individuals. One waste picker mentioned that "*Competition has resulted into the colonisation of streets. We are so many, waste pickers are now claiming streets. We then end up fighting and killing over recyclable materials."*

C. Ill-treatment by motorists

A number of responses from waste pickers 22% (Table 5) identified ill-treatment by motorists as another major concern and is connected to the lack of appropriate infrastructure which shows that the relationship between waste pickers and motorists does not exist. This is because waste pickers do not have gazetted routes, so they drag

their trolleys down the streets of Johannesburg every day. Therefore, motorists in any case do not tolerate waste pickers. Discussion with a waste picker from Remade recycling plant emphasised that:

> "*We want to make a difference on the environment and earn a living too, but motorists do not tolerate us. More especially taxi drivers, every day they beat us and call us names, saying we are blocking the road. They hit us on purpose, others they ran over our trolleys. I decide not to entertain them because at the end of the day we are all trying to make ends meet. It is true others understand us but most of them insult us. It seems people do not yet understand our work*" (Pers.com, 2015l).

Despite the number of challenges that are faced by waste pickers, evidence confirmed that they do not have personal protective equipment (PPE) with reflectors so that they can be easily seen by motorists especially during the morning and late hours. The challenge, as pointed out above is generally felt when motorists run over waste pickers along the roads. It must also be noted that residents are always of the view that waste pickers are more of a nuisance and must be stopped from collecting waste. The combination of these different perspectives, it was argued compromised their ability to effectively be seen as important players in waste management and recycling. A common view amongst waste pickers was the lack of secured road networks which results in a number of fatal accidents. One woman from Remade recycling plant aged between 26 and 35 narrated that *"we all work in traffic. I was bumped by a taxi and had to jump to the side. They are always in a hurry. They create a 3rd lane where there are 2 lanes, and drive on the pavement."*

D. Distance, theft and long working hours

It has been noted in this study that distance and long working days are other major challenges experienced by waste pickers. Waste pickers in the city of Johannesburg use their makeshift trolley to collect and transport 50 kg and more of recyclable waste over a distance of 30km a day. It does not matter what the extreme weather event of a particular day. Their work is physically gruelling and dangerous but waste pickers push there trolleys throughout the streets of Johannesburg in search for recyclable materials. As if that is not enough, they have to find their way again to the buy-back centres to sell their recyclables.

Apart from walking for long distances in search for recyclable waste in the waste streams, they steal and fight over recyclables waste. A woman recycling at Far-point recycling plant mentioned that:

> "*This trolley is heavy when full. To push a trolley and negotiate a way on the streets from Greenside to the buy-back centres is not easy, but people do not care they just say anything and you cannot answer back, you just continue with your work. If you can answer back they may be stressed and pick a fight with you over the materials"* (Pers.com, 2015m).

Another waste picker adds that *"I am up at 4 am; I have to visit each dustbins and search for recyclable materials."* An official from Remade recycling plant mentioned that:

> *"We have a big base of waste pickers; they travel from Rosebank, Johannesburg Central, Killarney, and Newtown to name a few. They travel every day by foot in search for recyclable materials around the city and to the buy-back centres. Every*

day there are fights over recyclable materials. It's a daily problem, and sometimes we kill each other over recyclables" (Pers.com, 2015n).

The persistent fights towards recyclable materials could be argued as being exacerbated by the lack of good sorting space and storage facilities for waste pickers. The absence of such facilities contributes to the least preferred practice in solid waste management: illegal littering and dumping.

4.4 Barriers to an inclusive municipal waste management system in the city of Johannesburg.

Discussions with officials and waste pickers expressed concerns on why the contribution and the role of waste pickers is not recognised and incorporated within the formal waste sector. The barriers are grouped into five sub-themes which are (A) illegal migrants and lack of valid citizenship documents, (B) lack of supporting evidence, (C) repressive policy and social acceptance, (D) Lots of middlemen and, (E) Lack of co-operation between waste pickers and municipal authorities.

A. Illegal migrants and lack of valid citizenship documents

Discussions with an official from the Johannesburg local authority revealed that solid waste pickers are not recognised as important players in waste management and recycling. One of the drawbacks mentioned is that it is hard for them to recognise waste pickers because most of them are originally not from South Africa. More than half come from South Africa and most originate from three different countries namely: Zimbabwe, Lesotho, and Mozambique (Sentime, 2011). He stated:

> *"We have approximately 40% of waste pickers who are not from South Africa. Again those who are South Africans do not have citizenship documents. So these are some of our main challenges*" (Pers.com, 2015o).

Likewise, interviews with waste pickers pointed out that most of them do not have identity cards or at least passports. Officials made it clear that they can only consider waste pickers who are originally from South Africa, of which a majority of them are not South Africans. Another official revealed that most waste pickers are crime bearing individuals hence they do not have identity documents. He mentioned that "*So even if government can try and help such people, it will not help because the system will pick up individuals who once committed crime."*

B. Lack of supporting evidence

Officials from Johannesburg local authority pointed out that amongst challenges, waste pickers do not have a database. They see them in the streets of Johannesburg but their activities are not documented and organised. An official from Pikitup mentioned that "*in this essence, government cannot give opportunities to individuals*." He further mentioned that *"it is thus hard to help people without knowing their contributions in waste management and recycling. In general, we do not know their numbers, their working networks, and their working stations."* On that note, a waste picker from Maningi recycling plant remarked that he loves his job. He said *"I do not want to be employed by the government because they have their own way of doing things and I have my own. The problem is that government use a dictatorship system; they will tell me how to operate as a waste picker when I already have experience. I know my job better than*

anyone else." The above narration can result in that waste pickers lack of trust and confidence in municipal and government authorities.

The lack of data on waste activities and the difficulty in measuring many important aspects makes it difficult to tackle some important players in waste management (Wilson and Velis, 2014). From this angle, it can be argued that municipal authorities mostly use a top-down approach that favours elite groups and places very little emphasis on the significance of waste pickers. It is without doubt that waste pickers are making a difference in as far as waste management and recycling is concerned, but there are only few individuals who are dedicated to make a difference instead not on paper but on ground.

C. Repressive policy and social acceptance

Another difficulty towards the recognition of waste pickers is social acceptance. As mentioned before, most waste pickers stated that society and authorities view their activities as shameful and a public nuisance that needs to be removed. The obvious challenge is that of confiscation of trolleys and recyclables by the metro police. In extreme cases, waste pickers are accused of theft, and residents do not allow or feel safe around waste pickers. A waste pickers from Remade recycling plant narrates that "*society do not see our activities as a resource recovery strategy but as a job for the lower class people."* Because waste pickers are not recognised, they are not acknowledged as effective players in waste management and recycling.

D. Lots of middlemen and buy-back centres around Johannesburg city

Discussions with waste pickers pointed out that there are a lot of buy-back centres in the city of Johannesburg. So it becomes difficult for the municipality to convince waste pickers to operate in groups and to manage them. This is truly because waste pickers have already developed a relationship with officials in buy-back centres. As a result, waste pickers tend to sell in any buy-back centre of their choice, depending on their buying price of the recyclables and distance. In developing countries, industries encourage and support the integration of waste pickers and formation of the middlemen in order to ensure guaranteed supply of recyclables (Medina, 1997). In this scenario therefore, municipal authorities need to come up with a strategy to work with the private sector and to regulate buy-back centres around the city of Johannesburg.

E. Lack of co-operation between waste pickers and municipal authorities.

Waste pickers from the three research sites mentioned that there is lack of co-ordination between them and the municipality. The lack of effective co-ordination has led to conditions that are harsh on waste pickers. They mentioned that "It *is hard to even get funding, resources or to break through the municipal channels. It is difficult to work with the municipal waste officials. What we try to do now is to ask for personal protective equipment's in companies. A problem is that meanwhile, we are not organised yet companies want us to first register with the city of Johannesburg."* This observation suggests that municipal waste officers are not informed about waste pickers needs. They do not have an idea of the real issues that waste pickers come across on ground. Through direct involvement with waste pickers, municipalities can better understand the real issues or challenges pertaining informal waste recycling.

In view of the above observations, there is an urgent need to re-imagine myriad and different avenues through which waste pickers can be integrated into main stream systems of waste management in Johannesburg. Sentime (2014) and supported by Samson (2008) for example, are of the view that historically, the focus on municipal waste management in South Africa involves waste collection, transportation and disposal. However, there is now a need to search for alternative methods that can facilitate a process of waste recovery and recycling waste that is generated in Johannesburg city. Such an agenda would not only contribute to an effective solid waste recycling system, but also to job creation and improve economic growth (Ogola *et al.,* 2010). Thus, it is important for the municipal authorities to seek strategies that can help in the organisation and training of waste pickers on waste management and recycling. This process will then facilitate the acknowledgement of waste picker's activities in the municipal solid waste management system.

4.5 An approach for a sustainable solution to integration of waste pickers in Johannesburg.

Apart from recycling companies, buy-back centres and their agents, a good deal of waste pickers exists in the city of Johannesburg. This research makes a case to acknowledge the informal sector to improve waste recovery and recycling in the city of Johannesburg. It does this by drawing attention to the capability already portrayed by waste pickers, arguing that the informal sector represents current possibilities and a future strategy to improve waste recovery and recycling in Johannesburg. With that mentioned, waste pickers can be successfully organised as a means to promote sustainable grassroots development. This research argues that it is feasible for waste pickers to be

incorporated in the municipal waste management system through the following approach.

Table 6: Integration of the informal sector into municipal waste management and recycling in Johannesburg city.

Model:	Integration
Driven by:	Local government or municipality
Regulation:	Regulate and control
Financial support:	Give support
Legal framework:	Develop norms and standards or guidelines
Institutional arrangement:	Establish structure or body for waste pickers
Recognition:	Recognised role
Where:	Source separation
Collection system:	Competing

Source: Field-based materials, 2015.

4.5.1 Legal framework

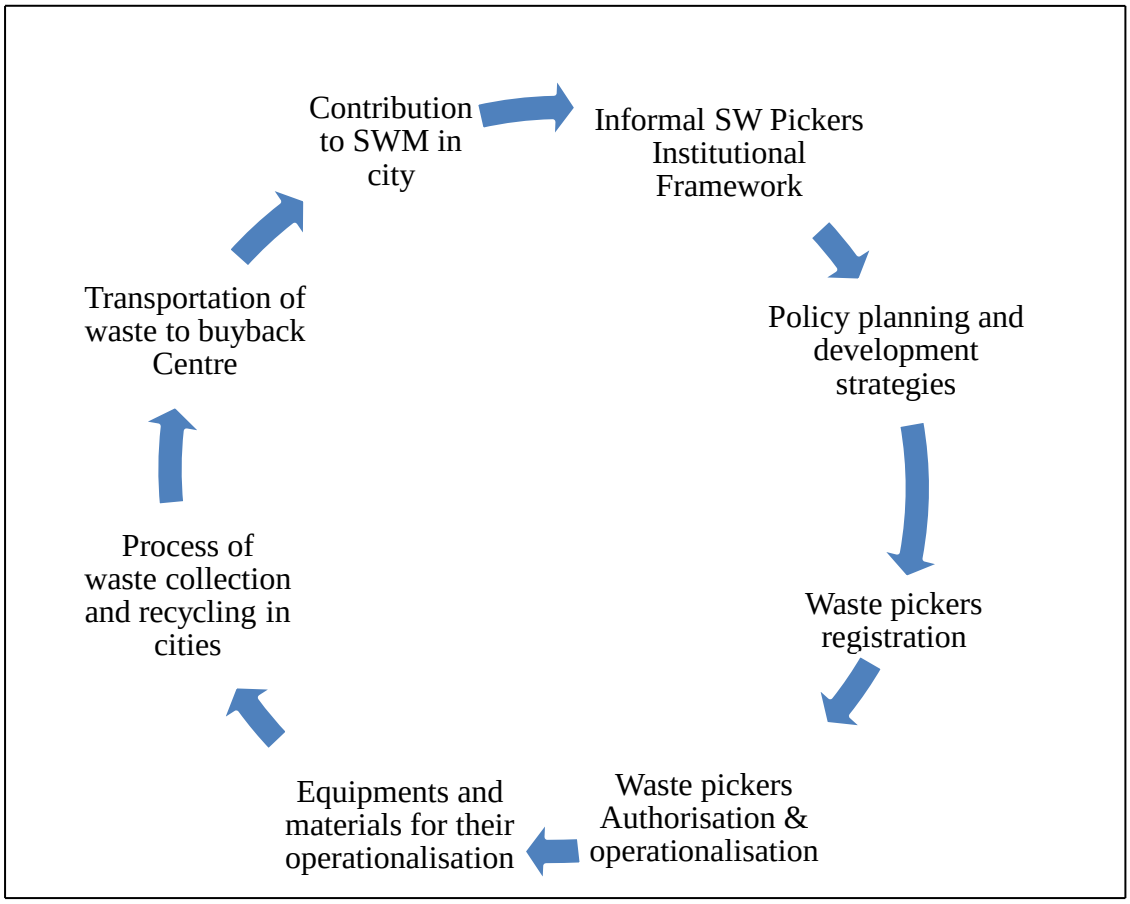
Johannesburg municipalities with the help of the national Development of Environmental Affairs can develop guidelines to be used by municipalities for the integration of waste pickers into municipal waste management sector. The guidelines or norms and standards as indicated in Table 6 should include the following.

A. Identification and registration of Johannesburg waste pickers.

A database of waste pickers can be developed and updated on regular basis in the city of Johannesburg. The registration process can be undertaken through the assistance of waste committees and buy-back centres. Through this process, the municipal department can be able to gather information on waste pickers operating within the city. This information can give the department an indication of where reclamation activity influx is at and the role that waste pickers play in the waste management value chain. This process can develop a platform of communication amongst committees, association and waste pickers where the city can engage on waste management issues. Environmental department can also work with the Department of Economic Development and other Non-Governmental Organisations (NGO's) to assist waste pickers to form co-operatives and collaboration.

Thus Figure 8 presents a model for waste picker's inclusion and recognition in urban waste management planning policy and development strategies. This model explicates how authorities can register and regulate the waste pickers operation in urban development. These waste pickers, once formally registered and authorised to operate, they have to be provided with materials and equipment susceptible to execute their recycling activity. This operation, not only help the waste pickers earn an income but it contributes to urban environmental waste management and sustainability.

Figure 8: Towards a pro-solid waste management and recycling model



Source: Field-based materials, 2015.

B. Conduct a needs analysis workshop.

In view of the above model, the municipal waste department can conduct a needs analysis workshop. The workshop can be used as a platform to understand issues that waste pickers encounter and for the city to be able to prioritize their needs. Environmental departments can engage with relevant stakeholders to find additional ways and means of empowering waste pickers. The departments can profile waste pickers into waste management so to understand and documents challenges that waste pickers face on a daily basis, so that informed interventions can be taken by Pikitup and

environmental departments. The workshop can therefore be used as a strategy to profile waste pickers activities to relevant stakeholders on empowerment. The workshop can also be for the relevant stakeholders to identify the role that they can play and commit themselves to the empowerment of waste pickers. The stakeholders can include: Industries, National/ Provincial Departments and City of Johannesburg departments.

C. Procurement of proper protective clothing.

Personal Protective Equipment (PPEs) for waste pickers can be procured by the Department of Environmental Affairs, Pikitup, Department of Environment and Infrastructure Services, GDARD and Department of Economic Development. Protective clothing must consist of a reflector vest which is visibly to motorists during the day and night, as waste pickers use roads. Ergonomically boots which can be comfortable in their everyday walking distance. Protective clothing can also include dust masks and gloves; this can protect them when they are reclaiming not to inhale dangerous or hazardous substances which might be found in reclaimed waste. The proactive clothing can be issued to the waste pickers on the day of launch and made available in committees.

D. Investigation and design of makeshifts that are user friendly

Waste pickers needs efficient and user friendly trolleys that they can drag around the streets of Johannesburg. Municipal departments together with waste pickers can undertake in a practice to design trolleys suitable and user friendly. A specification of the trolley desired by waste pickers, industry that can manufacture the trolleys can be developed. Industries can develop a trolley prototype using the specification developed

by the departments and waste pickers committee. The prototype trolley can be taken to buy-back centres with the city of Johannesburg for comments. The comments from the buy-back centres can be factored to the design of a sample trolley that can be given thumps up by the waste pickers.

E. Identification of training needs of Johannesburg waste pickers.

Training can be conducted in collaboration with Pikitup, Gauteng Department of Agriculture and Rural Development, Department of Environment and Infrastructure Services and Department of Economic Development. The training can focus on business skills, recycling and the city of Johannesburg by-law requirements and compliance. The training can give an opportunity to the waste pickers to understand the application of legislation. The training can also give waste pickers an opportunity to get clarity on issues they are not clear with and to learn about recycling from industry. When the project is rolled out, the city can further retrain waste pickers in order to reskill them if there are new developments in the recycling industry. A pilot project can be launched in the city of Johannesburg and thereafter be rolled out to other parts of the city.

F. Development of guidelines for the operations of the Johannesburg waste pickers.

Industries, national/provincial departments and city of Johannesburg departments can develop a guideline for waste pickers. The pilot project can be a learning project that can help in the development of a guideline. Municipalities can conduct a comprehensive study to record lessons learned from the pilot project. The study can serve as guidelines for the operations of waste picker's city wide.

4.6 Conclusion

This chapter has presented the results of the research, which especially focused on the empirical findings. Five themes were unpacked namely demographic aspects of research participants; challenges faced by street waste pickers; contributions of street waste pickers on waste management and recycling; barriers to an integrated waste management system and lastly, an approach for a sustainable solution to integration of waste pickers in Johannesburg. Most waste pickers for example, suggested the need for employment and income generation as the basis for engaging in solid waste recycling. It has been revealed that, waste pickers are vulnerable more especially to harassment by metro police, urban residents and motorists. However, it has been argued that government needs to acknowledge and recognise waste pickers activities in the urban policy planning and development strategies. This situation owes much to the barriers to inclusive waste management: lack of cooperation, social acceptance, lack of valid citizenship documents and lack of supporting evidence. In view of the above observations, municipalities can empower waste pickers through institutional and legal framework on informal waste sector inclusion and recognition in urban waste management planning policy and development. Urban authorities can conduct workshops to register, train, discuss issues and provide protective equipment to waste pickers. Integration of waste pickers will therefore ensure increased community commitment and participation, both in terms of waste management and recycling.

CHAPTER 5

ANALYSIS AND DISCUSSION

5.1 Introduction

In order to realise, cultivate and capture the full contribution and potential of waste pickers in municipal waste management and recycling in the city of Johannesburg, it is important to place special focus and emphasis on the integration of the informal actors into the wider urban waste management programmes and strategies. Based on the empirical data informing this study, it is evident that waste pickers in the city of Johannesburg and the sectors in which they operate in, have demonstrated the ability to function as efficient individual partners in the local municipality in municipal solid waste management. They have demonstrated the ability to collect and recycle significantly large amounts of solid waste. It is thus important that appropriate policy intervention entry points are identified in order to support the activities of the informal waste pickers and enable them to obtain secure livelihoods and contribute to sustainable waste minimisation and management. For these interventions to occur there is need for improvement in the urban governance systems.

5.2 Urban governance system.

Improved governance will for example, result in the creation of self-confidence and trust amongst waste pickers, the government, NGOs and the private sector. The development can potentially trigger and help facilitate the establishment of a forum through which common interests on solid waste and recycling can be expressed and strengthen collaboration among different actors. Through this increased interaction,

there is a higher likelihood that cooperatives, associations, small enterprises and networks can be established and can be the main avenue where informal waste activities can be supported and integrated in the formal systems of waste management (see Medina, 2005).

As regards an approach for sustainable solution in informal waste recycling in the city of Johannesburg, recommended development interventions can be derived from issues raised by informal waste pickers during workshops. The findings of this study suggest that organised workshops can be a platform in which the process of mapping waste picker groups can be initiated. Many cities around the world have implemented solutions to pressing social challenges through 'social innovation' (Mohee and Simelane, 2015). There is some evidence from (Nigeria, Brazil, Egypt and India) for example, that suggest that the informal sector is integrated into municipal solid waste management governance and is known to be inherently innovative and resilient under rather difficult circumstances (Nzeadible, 2015).

5.3 Infrastructure, equipment and protective clothing

Secondly, improved governance, through the provision of solid waste infrastructure, equipment and protective clothing, can trigger a cultural transformation involving increased acceptance of the waste pickers' activities. For instance, it has been argued that waste pickers tend to come from very poor backgrounds with very low social status in the community (Schenck and Blaauw, 2011). The integration of waste pickers would basically improve their livelihood and standard of living. The most interesting finding in this study is that an estimated 68% of the responses suggested the need for employment and income generation as the basis for engaging in waste management and

recycling. The provision of waste management infrastructure and associated factors would potentially result in the integration of waste picker's activities in the broader urban policy. However, the non-integration of waste pickers has negatively affected their activities in the following listed challenges.

A. Social issues

It is important to note that in Johannesburg, as is the case in other cities of the developing sub-Saharan African cities, integration of the informal sector activities tends to suffer from bureaucratic processes and are subject to public opinion (Simelane and Mohee, 2015). Solid waste pickers are always perceived by the public as vagabonds and criminals who are always a danger to society (Simatele and Etambakonga, 2015). Evidence from this research suggests that 37% of waste pickers found themselves threatened and harassed by the metro police. The findings appear to support that harassment is the main challenges experienced by waste pickers. According to Simatele and Etambakonga (2015) the negative behaviour towards waste pickers could be argued as being motivated by a lack of knowledge of citizens on the contribution of waste pickers in municipal solid waste. Therefore, a positive public acknowledgement on waste pickers is an important step to guarantee a healthy working environment. There is an urgent need for improved governance to bring about a change in public perception in order to facilitate a situation where waste pickers can be perceived and understood within the context of the role that they play as environmental agents contributing to a common goal of waste minimisation and sustainable development (Samson 2008). Improved governance is the key that will bring about the social recognition and acceptance as well as integration of the waste pickers activities into more formal systems of waste management.

B. Lack of physical infrastructure

With regard to waste separation at source, research participants not only experience a challenge with unsegregated solid waste but also with the lack of internal infrastructure and appropriate collection systems. The results of this research indicate that there is lack of physical infrastructure represented at 29%, mostly at the point of waste generation. Separation at source at household level is not emphasised and encouraged. The result of unsegregated waste therefore, delays the operation of waste pickers and affects the recycling rate because waste is not separated at generation points. Gukhool (2015) showed that waste separation from the source is mostly developed in the western countries and this practice consists of segregating plastic, paper, metal, glass, kitchen and green waste into separate bins. This differs from the findings presented in this research in that in the city of Johannesburg, waste segregation is not practised.

The State of the Environment Report (2003) compiled for Johannesburg, estimated waste generated as follows: 23% commercial activities; 10% industrial waste, and 67% from households and is expected to be increasing annually (Chimuka and Ogola, 2015) due to urbanisation and changes in consumption levels. These findings suggest that Johannesburg generates more household waste than industrial and commercial waste yet no recycling programmes are in place, let alone source separation which are the first step towards effective waste management and recycling.

In this regard, residents of Johannesburg need to be encouraged to adopt the practice of waste segregation at source. Municipalities needs to provide appropriate and sufficient coloured bins and bags at household level. The bins should be at least two per household, one for recyclables and the other for organic materials. The separation of

organic materials such as food and yard is useful in composting, which is a strategy that the city needs to adopt. With the proper infrastructure in place, residents can be encouraged to co-operate with local authorities to establish and maintain a sustainable waste management system. However, in the absence of statutory requirements for waste segregation at source for recycling, the informal sector has become skilled at identifying materials with value, as such, has been active in sorting recyclables. In general, therefore, it seems that increased waste management and recycling activities work hand in hand with public awareness and participation. It is therefore of prime importance to educate citizens to be environmentally conscious.

C. Lack of public education, public participation and awareness programmes

Information collected in the three research locations as well as discussions with officials from solid waste recycling plants, it is evident that effective municipal solid waste management strongly depends on the level of education of citizens, government commitment and financial incentives and proper infrastructure. Appropriate education of the citizens and awareness can change public and waste picker's perceptions, establishing a new waste-to-resource perspective. In order to improve public education, educational programme should go beyond passive lectures, to the creation of small pilot projects that generate empirical data, supporting and proving how waste can be transformed into wealth. Similarly, Matter *et al.,* (2013) observe that as households waste is one of the major components of municipal solid waste, education awareness at family level needs to be encouraged. This should lead to families viewing waste as a resource, and initiating their own source separation schemes. Schools should also support the efforts, especially at primary school level, where science textbooks feature aspects of environmental education. Again, waste management authorities should

showcase their success in waste forums to educate the public. Bottom up inclusive activities such as conferences, workshops, community meetings, radio, print and television programmes, seminars, and awareness campaigns, should be used to disseminate information and enhance the participation of various sectors of the population.

D. Social acceptance

Although informal recycling is an age-old practice that promotes resource-recovery and recycling from waste, this research showed that waste pickers still remain stigmatised and socially downgraded. In Johannesburg, the informal sector has not been integrated into the municipal waste management system, which is a major limitation to social acceptance. Social acceptance of waste pickers as a legitimate economic activity in South Africa is important in order to achieve the objective of an 'Inclusive City' (Simelane, 2015). Consideration of waste pickers perception, motivation and desires is thus required, before integrating them into improved waste recycling programs. Waste pickers also need to be motivated in various ways such as the provision of shelter, uniform and safety equipment, database of recovered materials, seminars and workshops on recycling, writing and presenting recognition letters to recyclers and offering competitive prizes.

Despite the challenges faced by waste pickers, empirical evidence suggests that waste pickers contribute to the local economy and environmental sustainability. Their influence, as pointed out above is generally felt through their contribution in waste collection, recovery and recycling as well as merchandising (Sentime, 2014; Samson, 2008; Medina, 1997; Muzenda *et al.,* 2012). It is worthwhile to note that whereas waste

pickers activities contribute to environmental protection, the activities can also have negative impacts. To illustrate Simatele and Etambakonga (2015) and Oteng-Ababio (2012) observe that there is usually a high likelihood that waste pickers can scatter waste through sorting that might eventually impact the soil and water pollution or even the environment. Furthermore, Kubanza and Simatele (2015) observe that in most cases, waste pickers tend to lack knowledge on environmental standards as their interests lie in merchandising the waste and not environmental protection.

5.4 Improved legislation and legal structures

Thirdly, improved governance will also bring about the formulation or adoption of existing legislation and legal structures that will contribute effectively to the protection of waste picker's activities. Improved legislation in this case enables the empowerment of waste pickers and creates a vibrant network to compete with other economic ventures within Johannesburg (see Wilson and Velis, 2014). However, political will and transformation is a prerequisite for these developments to be realised. Simatele and Simatele (2014) are of the view that integration of any phenomena with formal urban development and planning systems is usually determined by the willingness of decision makers and creativity of municipal authorities (see Kubanza and Simatele, 2015). This research suggests that possible legal framework need to be in place in order to integrate waste pickers. It has been suggested that institutions fail to incorporate the informal waste sector through direct involvement, empowerment and engagement with the already existing pool of waste pickers.

A. Institutional deficiencies in municipal waste management

In view of the above observations, Simatele and Etambakonga (2015) argue that failure of integration of any phenomena with formal urban development and planning system has been exacerbated by increased levels of institutional deficiencies. This situation can be observed in the city of Johannesburg where lack of accountability and transparency in the entire waste management supply chain proved to be of paramount. The lack of transparency among institutions results into low government willingness to implement proper waste management strategies, infrastructure and regulations which then results in inability of municipalities to provide waste management services (Egbu *et al.,* 2012; Mohee & Bundhoo, 2015). Thus, waste management challenges in South Africa particularly Johannesburg has resulted from lack of an institutional policy framework and corruption not political instability.

5.5 Non-Governmental Organisations (NGOs) and Community Based Organisations (CBOs)

Finally, in order to integrate waste pickers into the formal system in municipal waste management, it is important to involve participation by NGOs and CBOs. In most cases, community organisations play an important role in community mobilisation but their effectiveness in limited to some extent by political and policy statements. Utilisation of grass-root organisation is therefore a challenge in local municipalities (Chimuka and Ogola, 2015). Local government authorities need to recognise that their role should be one of facilitating community initiatives in providing urban services and facilities (Mohee and Bundhoo, 2015). In view of these observations, it is important for municipalities to review the contemporary regulatory framework to ensure effective

interaction and cooperative alliances with communities and other stakeholders. Local government authorities should also be in a position to provide training and funding to waste pickers in order to engage them in more sustainable waste management and recycling activities. Co-operatives can act as an effective tool through which support and advocacy is provided. The increased interaction also provides a platform for their integration into the formal systems of municipal waste management.

A. Formulation of co-operatives amongst waste pickers

The role that waste pickers play is often under-recognised. Local municipalities should support and amplify waste pickers through organising them into co-operatives. Co-operatives are a powerful means of promoting grassroots development of the informal sector. Organising waste pickers into co-operatives should facilitate the implementation of capacity building and training programmes, while providing the opportunity for effective enforcement of health, safety and quality standards (Wilson *et al.,* 2006). NGOs and CBOs can be a platform for municipalities to create potential jobs associated with waste management and recycling. In addition, waste management and recycling can attract technical innovations, leading to the creation of small and medium sized businesses.

NGOs and CBOs provide a platform through which waste pickers are assisted to improve on their working conditions and managerial techniques; improve their negotiating power, exchange ideas and information and source separation methods (Nzeadibe, 2015). In countries like Brazil and Bangladesh, for example, waste pickers are trained to reduce occupational risk and increase the quality and quantity of recyclable waste (Gutberlet *et al.,* 2013 and UN-Habitat, 2013).

Waste pickers energy, creativity and familiarity with local conditions means that they can effectively establish goals, define action strategies, create structures and adopt targets (Medina, 2008). Qualified personnel or local authorities can serve as facilitators, supervisors and enforcers of the rule of law and can help setup a monitoring committee which must deal with administration, accounting, consultancy and technical assistance (Damghani *et al.,* 2008). Furthermore, qualified personnel can also help in accessing subsidies, grants to develop infrastructure (environmental education programs, skills development training, sorting and storage areas, social services) and purchase adequate equipment (for example safety equipment , tools and branded uniforms).

Johannesburg is in short of landfill space. In 2015, through the City's Integrated Waste Management Policy and Plan, the city had set a targeted to divert 20% municipal waste thereby creating an estimated 4 000 sustainable youth jobs in waste sector. The successful implementation of such forward-thinking policies requires the identification, prioritization and empowerment of waste pickers and their organisations. Furthermore, given that nothing has been implemented to integrate waste pickers, it is crucial that municipal authorities adopt the suggested strategy that is tailored towards creating job opportunities and sustainable recycling practises. The informal sector is currently marginalised and unregulated. It is imperative to try and maintain this semi-autonomous structure while at the same time providing some level of increased monitoring, regulation, and support in the access to recyclables through, for example, source separation programmes together with buy-back centres to increase the tonnages collected. Inclusion of the informal sector in the municipal waste management system also reduces the likelihood of conflict to occur between the informal and formal sector participants.

Although collaboration with the informal waste management sector may be understood as acceptance of waste picker's activities that contradict existing environmental regulations and traffic regulations, nonetheless, for collaborative governance, co-operation still remains a necessary tool (Scheinberg *et al.,* 2010). Again, strategies for improving waste pickers conditions means establishing a resource-based management approach to waste management which requires that waste management authorities to rise above dependence on government funds to a sustainable, economically independent status. This requires a paradigm shift from providing hygiene and sanitation services to becoming a profitable environmental resource management agency. Combining income from government subsidies, waste disposal fees and the marketing of recovered waste and energy will allow municipalities to become major economic players that offer excellent working conditions to all their waste pickers. Such an agenda would not only contribute to an effective solid waste recycling system, but also to job creation as well as improve economic growth (Ogola *et al.,* 2010). Thus, it is important for municipal authorities to adopt strategies that facilitate the acknowledgement and integration of waste pickers in municipal waste management system.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

This research investigated the barriers that exist against the creation of an inclusive municipal solid waste system which could involve and recognise the informal waste sector in municipal waste management. The research also proposed an approach for a sustainable solution in informal waste management in the city of Johannesburg. It has been demonstrated in this paper that waste pickers play a significant role in waste minimization and management. Despite this contribution, the evidence suggests that no significant progress has been made in addressing issues of how informal systems of solid waste management can be aligned and integrated with formal systems. Part of the reason for this state of affairs is rooted in the perception of the role of waste pickers as 'a nuisance' to the urban environment. Many municipal authorities consider informal waste recycling as an activity that contributes to littering and has the potential of triggering environmental degradation.

The findings of this research have, however, shown that the informal sector is not just for the urban poor but is intricately linked through casualization to formal firms with a circuitry that stretches nationally and even beyond in embedded hierarchies. Merchandising of the waste by waste pickers has facilitated a process that has linked the informal system to formal systems. To this end therefore, it is important that urban governance systems and structures in the city of Johannesburg become more flexible and local authorities must show keen interest in supporting and linking both horizontal and vertical exchanges of best practices in order to bring out effective and sustainable systems of solid waste collection and recycling.

There are barriers that hinder waste pickers from being recognised in the municipal waste management system which includes: being illegal migrants, lack of regulation, and lack of supporting evidence, repressive policy and lack of social acceptance. These conditions exclude rather than include waste pickers operations in the South African legal framework. In spite of the aforementioned challenges, waste pickers play a major role in the waste management sector through minimising waste to the landfill, cleaning up the city thereby reducing municipal expenses, providing a supply of secondary raw materials, enhancing environmental protection and minimisation of waste in general. Their activities are also a source of employment and livelihood with considerable economic benefits.

Given the interrelated nature of the informal waste sector to formal systems, local authorities must move away from narrowly focused sector perspectives towards more inclusive multidisciplinary approaches of waste management and recycling. This will require promoting and creating the much needed public-private partnerships and may result in increased investment in the development of municipal waste management and recycling. Expanded governance through participation of NGOs and CBOs can play an important role in organising the waste pickers into cooperatives and strengthening the entire supply chain. Networking and collaborating with NGOs and CBOs can add credibility to the role whilst opening channels of communication with the government, formal stakeholders, decision makers, industry and the community. Until a point where waste pickers are empowered and their activities are integrated into the municipal waste management system, their contribution in waste management and recycling will remain neglected and unrecognised.

Recommendations

In order to recognise the role that waste pickers play in waste management and recycling, it is paramount for the government to integrate waste pickers into the national formal waste management system. Therefore, to achieve recognition, this research recommends that:

1) Government should promulgate a shift toward recycling of recoverable materials to empower individuals economically, waste pickers and green entrepreneurial initiatives.
2) Government needs to acknowledge and integrate the informal sector in its current format, rather than replacing them. Measures needs to work towards improving the efficiency and to protect their livelihoods.
3) The barriers that hinder household source separation should be addressed. Economic incentives, legal framework, institutional arrangements and operational matters could overcome this, however in some instances it may be social aspects that hinder achieving efficient recycling targets.
4) Cooperatives should be formulated and evaluated, with results incorporated into the development stage of other projects and programmes. This could be used as a 'learning curve'; helping to strengthen the structure and producing a more efficient collection and disposal system.

Suggestions for future research

A lot of gaps still exist in municipal solid waste management and recycling in South Africa that needs research. Areas of concern include: the extent to which municipalities are planning to integrate waste pickers in the formal waste sector; the role waste

recycling is playing as an option towards a zero-waste concept; to what extent waste pickers are organising themselves into co-operatives; and whether any of this has increased their governance and improved performance; research to quantify the contribution of waste pickers to the economy and the environment, from national and to regional scale. Waste pickers integration into the municipal solid waste management system will guarantee them the benefit of recognition of their activities, government support and protection.

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LIST OF APPENDICES

APPENDIX 1

Invitation to the research on informal solid waste recycling in the city of Johannesburg.

Dear Sir/Madam

My name is Dlamini Smangele. I am a master's student at the University of the Witwatersrand. I am investigating the ways in which waste pickers contribute in waste management and recycling and the current barriers that exist in setting up a system that will recognise the informal sector. This will help the authorities develop a more integrated approach for a sustainable solution to waste management and recycling in the city of Johannesburg.

I am inviting you to participate in the interview and will take 30 minutes. You are selected because you are involved in solid waste recycling in the city of Johannesburg. Participation is voluntary, you will not receive any reward and you have the right to withdraw from the research at any time without explanation. Confidentiality and anonymity will be guaranteed as your name or any identifying information will not be required.

The result of the research will be used to write a master's thesis. For further information can email me (smngldlamini@gmail.com) or supervisor (danny.simatele@wits.ac.za).

APPENDIX 2

Questionnaire on waste pickers involved in waste management and recycling.

1. Gender (please tick)

Male ☐

Female ☐

2. Age of the respondent being interviewed.

Age range	Put a tick
15-25	
26-35	
36-45	
46-55	
56-65	
66-above	

3. Are you able to share what made you to work in the city of Johannesburg as a solid waste collector?

……

……

……

4. How long have you been collecting recyclable solid waste?

……

5. Which materials do you recycle?

……

……

……

6. Where do you get the recyclable materials?

……

……

7. To whom do you sell your recyclable materials? Name as many as possible

……

……

……

8. How does your buyer get the recyclable materials from you?

We take it to them	
Come to collect from us	

9. In your sort of recyclable materials, how much do you earn?

Earning per day	Earnings per month (estimate)

10. Have you ever experience any major problems or challenges in your work?

	Physical injury	Sickness	Harassment	Heavy traffic	Other specify..
Always					
Sometimes					
Never					

11. Does the city of Johannesburg help you as an informal solid waste collector?

Yes	
No	

If no why?

……

……

……

12. In what ways could you improve the collection of the recyclable materials?

……

……

……

13. What must the municipality do for you in order to be recognised in the formal system of waste management?

……

……

……

14. Are you aware of any legislation or laws concerning informal solid waste collectors?

Yes	
No	

15. What are your comments on the following principles?

Supply	High	Low
Demand	High	Low
Prices	High	Low
Competition	High	Low

16. What can you say about the safety and health of your job?

Unsafe		How?	
Unhealthy		How?	
Safe		How?	
Healthy		How?	

17. From your own understanding, what challenges you from obtaining more recyclable materials?

……

……

……

……

……

18. How can the problem be solved?

……

……

……

……

APPENDIX 3

Questionnaire on informal solid waste recycling in the city of Johannesburg.

Questions for local authorities and partners involved in waste management.

A. Information related to solid waste management and informal waste recycling

1. Are you in a position to share the role of the organisation?

……

……

……

2. Are you in partnership with any organisation?

……

……

……

3. In what ways does your department work with informal solid waste recyclers found in the city of Johannesburg?

If so how?

……

……

If not why?

……

……

4. Do you realise any role that is played by informal solid waste collectors in solid waste recycling?

……

……

……

5. How do you think informal waste collectors can help in addressing solid waste recycling in the city of Johannesburg?

……

……

……

6. What is your opinion on the integration of informal solid waste collectors into the formal solid waste system?

……

……

……

7. How will the integration of informal solid waste collectors contribute to solid waste recycling and well-being of the collectors?

……

……

……

……

8. According to your understanding, what problems or barriers exist in setting up a system that will recognise the informal solid waste sector?

……

……

……

9. What can be done for the informal waste collectors to be recognised by the formal solid waste management system?

……

……

……

APPENDIX 4

Informal waste pickers, officials in institutions and officials in recycling stations in Johannesburg- consent to be audio recording, text transcripts and participation in the survey.

I have been given information about the research on solid waste recycling and discussed the research project with Dlamini Smangele who is conducting this research as part of a master's degree supervised by Prof. Danny Simatele at the University of Witwatersrand.

I have been told that:

- Participation is voluntary and interview will take 30 minutes.
- I am free to withdraw from the research at any time.
- I will not receive any reward or benefit from the research.
- I will remain anonymous and information is confidential.
- I am told that the data will be used for thesis purposes.

By signing below I am indicating my consent to participate in the research.

❒ I agree to be audio-recorded.

❒ I disagree to be audio-recorded

Signed Date

…… ……/……/……

If I have any enquiries about the research, I can contact the researcher (smngldlamini@gmail.com) or supervisor (danny.simatele@wits.ac.za).

APPENDIX 5: CLEARANCE CERTIFICATE

Research Office

HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)
R14/49 Dlamini

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER: H15/06/21**
PROJECT TITLE	Solid waste management in South Africa: Exploring the role of the informal sector in solid waste recycling in Johannesburg
INVESTIGATOR(S)	Ms S Dlamini
SCHOOL/DEPARTMENT	GAES/
DATE CONSIDERED	19 June 2015
DECISION OF THE COMMITTEE	Approved unconditionally
EXPIRY DATE	12 July 2016

DATE 13 July 2015 **CHAIRPERSON** _____
(Professor J Knight)

cc: Supervisor : Dr D Simatele

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10005, 10th Floor, Senate House, University.

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to completion of a yearly progress report.**

_____ 21 / 07 / 2015
Signature **Date**

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES