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Comprehensive contributions of the informal sectors in Solid waste management Systems: A case study of Central Johannesburg

Pursooth, Takshita

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Pursooth, Takshita. (2025). Comprehensive contributions of the informal sectors in Solid waste management Systems: A case study of Central Johannesburg. [Master's dissertation, University of the Witwatersrand, Johannesburg]. WIReDSpace. https://hdl.handle.net/10539/47799

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Comprehensive contributions of the informal sectors in Solid waste management Systems: A case study of Central Johannesburg.



School of Geography, Archaeology and Environmental Studies.

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

Written by: Takshita Pursooth (551358)

Supervisor: Dr Nzalalemba Serge Kubanza

Ethics clearance number: WGAES-2024-90

February 2025

Declaration

I, Takshita Pursooth, declare that this research report is my own, unaided work. It is being submitted for the Master of Science in Environmental Science degree at the University of Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.



(Signature of candidate)

27th day of May 2025 at Johannesburg

Abstract

The informal waste management sector has become one of the most key components of solid waste management and has been part of society and the economy for three decades. Waste picker activities are within the lower spectrum of the waste management value chain. However, their challenges in functioning as waste pickers are misunderstood, given the rise in the waste within areas in Central Johannesburg. Waste pickers are paramount in the effective diversion of solid waste by steering and processing waste, further creating resilient systems in urban environments, and ensuring recycling practices. The study was completed to comprehensively understand the current contributions of the informal waste collectors within Central Johannesburg. The study area of Central Johannesburg, particularly Mayfair and Braamfontein, was selected as these two areas exhibit over population and urbanization coupled with residential and business-related activity. With these factors, Central Johannesburg has a high waste output. The study had four main objectives being the identification of the challenges the informal waste collectors in Central Johannesburg experience, the identification of the effectiveness of waste picker contributions from a citizen perspective, the examination of existing policy documents for solid waste management in Johannesburg as well as the identification of the best theoretical framework for the inclusion of waste pickers into formal solid waste management strategies in Johannesburg. The research used qualitative methodology with aspects of quantitative methodology. Using snowballing and purposive methods, twenty-five (25) waste pickers were surveyed along with twenty-two (22) citizens, four (4) informal waste pickers NGOs and NPOs and two (2) local authoritative figures. Semi-structured interviews were conducted with the relevant individuals, based on ethical grounds. A total of sixty (60) published data such as journals and news articles were analyzed to substantiate the objectives of the study. Furthermore, four (4) solid waste management policy documents from a national, provincial, and local perspective were analyzed. The research identified that waste pickers along with informal waste NGOs and NPOs, have challenges with coordination such as effective trolleys, being accepted by society and the amount of money they earn from their operations. Citizens had stated that they do have their recyclables collected by waste pickers on a weekly basis and have identified that waste pickers do play a role in waste

management within Central Johannesburg, and further aid recycling efforts within the area. However, local authorities have stated that there is a need for waste picker involvement in decision-making and policy formulation. Solid waste management policy documents enforce effective waste management strategies for citizens and the city however there are gaps regarding waste picker integration into strategies, as waste management is regulated. The Inclusive Governance Framework is the most effective theoretical framework as it involves all individuals in decision-making, including marginalized groups. The study revealed the various dynamics among citizens, and waste pickers, and local authorities. There is a need for awareness programs for waste management education for citizens. Local authorities within Central Johannesburg identify with the waste picker operations however have also identified challenges such as poor relationships between them and waste pickers. Solid waste management policy documents are integrated however do not cater to waste picker activity more effectively and the Inclusive Governance Framework would allow for all stakeholders, including waste pickers, to deliberate in policy formulation and decision-making, providing them with equity and justice.

Keywords: Waste management, waste picker, Central Johannesburg, Theoretical Framework.

Dedication

To Dad and Mom, this paper is dedicated to you. Dad, thank you for teaching me to be more conscious of the decisions I make and for teaching me about recycling. Thank you for all your support during this study. To Mom, thank you for instilling good values and showing me how to be kind and gracious in all I do. I am because of you.

Acknowledgements

This research project was exceedingly difficult to do, but rewarding, nonetheless. Nothing in this world is possible without the belief that God is watching over you every step of the way. To my supervisor, Dr. Nzalalemba Serge Kubanza, thank you for your support and guidance throughout every point in this research. A special thank you goes to the waste pickers who went out of their way to assist in taking the surveys for the research. A thank you is reserved for the NGOs and NPOs in informal waste management within Central Johannesburg for their kindness and assistance for ensuring this research was a reality. To the citizens of Central Johannesburg, thank you for your input that made this paper valuable. A thank you goes to the local authorities for their time and input, knowing that their time was of the essence. To my family and friends, thank you for believing in my abilities, and for pushing me through countless days I wanted to give up. To my partner, a thank you and special appreciation goes to you, for the words of encouragement and undying support during this research and for believing that I can do anything I put my mind to. This paper is because of all of you.

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List of acronyms

NGO- Non-Governmental Organization

NPO- Non-Profit Organization

CBO- Community-Based Organization

Chapter 1: Introduction

1. Background of the study

The informal waste management sector has become one of the most important components of solid waste management. It has been part of society and the economy for three decades (Godfrey, 2021). Waste management has become a focal point of the informal sector, which are namely, Non- Profit Organizations and waste pickers. Their services are considered informal due to the lack of formal contributions such as tax and having no trading license (Wilson *et al.*, 2006). Due to the expansion of global society, especially within urban areas, there has consequently been an increase in solid waste generation (Viswanathan and Telukdarie, 2022). The industrialization process has also contributed to the generation of solid waste, which has negatively impacted the environment, with solid waste predicted to increase by 70% by the year 2050 (World Bank, 2022).

The informal sector of waste management in developing countries has become the source of livelihood for many people as unemployment is a major factor driving the sector in its functions (Wilson *et al.*, 2006). Within developed countries, informal waste management is seen in the process of resource recovery and recycling, however, within developing countries, waste pickers participate in the total processing of waste (Morais *et al.,*2021). Even though the informal sector of waste management is seen as an important activity, in developing countries waste pickers are excluded from the formal economic society (Solaja *et al.*, 2024).These are individuals who are marginalized and are living in extreme poverty but are reliant on the activity for money and thus have taken onto waste sorting and processing to make a living (Velis *et al.*, 2022).

Within Sub-Saharan Africa, waste collection and management continue to have challenges, with only an estimated 57% of total waste being collected (Muheirwe *et al.*, 2023). In Kenya, for example, informal waste management is controlled by criminal cartels with formal waste management strategies not being fully enforced (Haregu *et al.*, 2017). In Sub-Saharan African countries such as Kenya, waste pickers are often females who experience gender-related inequalities such as nonpayment, safety, and security as well as poor working conditions (Ogando and Roever, 2017). However,

many informal sectors such as Community-Based Organizations (CBO's), Non-Governmental Organizations (NGOs) and faith institutions such as churches are participating in informal waste management and are not privatized (Muheirwe *et al.*,2023).

South Africa is considered the same in comparison to developed countries, regarding waste management systems and challenges (Godfrey and Oelofse, 2017). This is due to the assistance and emergence of waste pickers and the general informal waste management sector. The informal sector has been key in creating a link between governmental services and value chains (Godfrey and Oelofse, 2017). Waste pickers within South Africa have also resorted to waste sorting to make an income due to the high unemployment rate in the country (Yu *et al.*, 2020). Informal waste management is seen in urban areas such as Central Johannesburg where many of the waste pickers collect waste and earn a living by selling the waste products to buy-back centers or recycling plants (Godfrey and Oelofse, 2017). Society may frown upon such individuals however it has been noted that waste pickers have a pivotal role in environmental upkeep and minimizing the waste that ends at landfills (Schenk and Blaauw, 2010).

1.1. Rationale of the study

Waste pickers form an essential part of effective waste management efforts by steering waste collection and processing, creating resilient systems in urban environments, reducing greenhouse gases by reducing waste to landfills and empowering recycling and reusing practices (Buch *et al.*, 2021). Though the function of waste pickers is imperative in waste reduction efforts, their full potential and contributions are not effectively realized and understood. Solid waste is seen with great contention and is often plagued by complex dynamics in society (Salvia *et al.*, 2021). In this context of complexity about solid waste and its management, waste pickers are sidelined due to being marginalized, along with the lack of acknowledgment by higher authorities and not being part of the formal economy (Buch *et al.*, 2021).

The study aimed to understand the unique challenges that plague the waste reclaimer community within Central Johannesburg. It also focused on understanding the contributions of waste pickers from a Central Johannesburg citizen's point of view.

Central Johannesburg has seen changes due to its rapid increase in urbanization and overpopulation (Schoeman and Rampedi, 2022). In this regard, Central Johannesburg, as the study area, gave way to understanding the dynamic of waste reclaimer activities against the rapid increase in people, urbanization and therefore, waste generation and disposal. Furthermore, the available South African legislative frameworks and strategies were examined to be able to holistically find current efforts at the formalization of waste pickers. The theoretical aim of the study was to find the best way forward analogy by evaluating and deciphering the best theoretical framework to be used for the effective formalization of waste pickers within Central Johannesburg, as this has not been effectively found. Challenges by marginalized groups are often overlooked and misunderstood (Mendis *et al.*, 2023). This study was crucial in understanding the dynamics in society, from a solid waste management perspective, and giving rise to an effective understanding of the many sides of the informal waste sector.

1.2. Problem statement

The City of Johannesburg has seen an increase in population over the years due to the migration of people to the city center in the hopes of employment (Rasmeni and Madyira, 2019). With the rise in urbanization, the amount of solid waste within areas of high population has also seen a sharp increase and has further strained the local government's ability to manage the waste created (Zondi *et al.*, 2023). The Department of Environmental Affairs (DEA, 2012) has stated that in 2011, only 10% of solid waste was effectively recycled with up to 90% of the waste ending up in landfills. Informal sectors in waste management are responsible for 80%-90% of paper and cardboard collection for recycling which may fill the gap between value chains (Godfrey and Oelofse, 2017).

Waste pickers can be seen transversing street to street in the busy and bustling city center of Johannesburg along with their trolleys, and with a day's work of paper and cardboard with them (Charlton, 2014). South Africa has a reported up to 90, 000 waste pickers that are working on the streets or within landfills (DEA, 2016). Waste pickers in Johannesburg as well as South Africa in totality, are considered Survivalists of the informal sector as they have no other means of making a decent income and are usually operating in difficult circumstances for survival (Yu *et al.*, 2020). It has been

noted that general society does not have a good outlook towards informal waste pickers, and they are seen as dirty, homeless, and non-compliant with regular waste management systems (Wilson *et al.*,2006). Waste pickers provide environmental, social, and economic benefits however are undervalued and not effectively incorporated within local governmental plans and practices (Morais *et al.,*2021).

Waste picker activities are seen within the bottom spectrum of the waste management value chain (Schenk *et al.*, 2019), however, their challenges in functioning have not been effectively understood given the rise in the waste within areas of the city center of Johannesburg. Waste Management Strategy (2020) has outlined that waste pickers are vulnerable and are to be integrated within plans and policies.

However, the question to be addressed here is what barriers are present within the waste picker community and how the effectiveness of their contributions amongst citizens. Since waste pickers are seen as marginalized and are not effectively included in local governmental policies, their functions are complicated. Development cannot be seen as sustainable if there is no inclusivity and participation by relevant individuals about their livelihoods and survival (Dugarova, 2015).

1.3. Aim and objectives.

The aim of the study is to comprehensively assess the current contributions of the informal waste collectors in Central Johannesburg in effective waste management. This is to understand how best the informal waste sector can be incorporated into local waste management plans and policies. The specific objectives are:

I. To examine the challenges that informal waste collectors in Central Johannesburg experience.
II. To determine how effective waste pickers contributions are from a Central Johannesburg citizen perspective.
III. To examine the existing policy documents for solid waste management in Johannesburg.
IV. To determine the best theoretical framework for the inclusion of informal waste pickers in formal solid waste management strategies in Johannesburg.

1.4. Outline of the research

The research paper is comprised of 7 main chapters and is based on the following outline: Chapter 1 focuses on the introduction to the study including the aims and objectives. Chapter 2 introduces the conceptual and theoretical frameworks central to the research. Chapter 3 comprises the literature review pertaining to global literature on solid waste management and informal waste management. Chapter 4 outlines the research methods utilized to attain the relevant results of the study. Chapter 5 is the research results and analysis which displays the relevant findings of the study. Chapter 6 is the discussion pertaining to the results and analysis of the study. Chapter 7 is the conclusion and recommendations of the study for the future.

Chapter 2: Conceptual and theoretical framework

2.1. Introduction

This chapter investigates the key concepts and theoretical frameworks of the study. This chapter is divided into two main sections namely, the conceptual framework and the theoretical framework and delves deep into concepts within solid waste management and informal waste collection. Within the theoretical framework, ideologies and theories are investigated based on available literature. From this, deductive and inductive reasoning are used to identify and evaluate theoretical frameworks for the inclusion of informal waste pickers into formal solid waste management strategies. Deductive reasoning is based on assessing a hypothesis within science and is used to derive to a conclusion about a premise (Williamson *et al.*, 2002). Inductive reasoning is the approach to which a hypothesis is formed from fieldwork done, observation, and data collection (Williamson *et al.*, 2022).

2.2 Conceptual framework

2.2.1. Solid waste

Solid waste can be defined as tangible items that are disposed of once their use has been completed by a person (Al-Taai, 2021). Furthermore, waste can also be defined as materials that are produced by an organism and discarded due to the completion of the use of the material (Al-Taai, 2021). Taking this into consideration, solid waste in a human context can be seen as products that have been used in daily activities and further have no use, to which it is discarded. Solid waste can be different from country and municipality. Household waste can be of different compositions and is based on the life processes that gave rise to the use of the initial product. Household solid waste can be food waste, wood, garden waste, paper, glass, metals, plastic, and other items such as leather items, rubber, batteries, and inert items (Abdel-Shafy and Mansour, 2018). Household solid waste is also different from commercial solid waste. Commercial solid waste can be classified as organic waste, glass, paper, metal, plastic, special waste, combustible, and non-combustible waste (Medjahed and Brahamia, 2019). Solid waste, whether commercial or household, is classified in similar manners and would require separation for effective management.

2.2.2. Solid waste management

The practice of solid waste management can be elaborated as the process by which solid items or end products are disposed of or further processed (Debrah *et al.*, 2021). This management process is integrated into its nature and is based on reducing, re-using, and recycling to minimize waste disposal at landfills and therefore further minimizing energy used to process the waste (Khan *et al.*, 2023). There are current methods of solid waste management strategies such as landfilling, incineration, reducing, reusing, and recycling as well as the creation of awareness among consumers on their waste disposal methods (Jebaranjitham *et al.*, 2022). Categorising waste is an important measure in waste management which would decide the method of storage and disposal of the waste (Oyebode, 2024). Effective waste management would create a sustainable environment and society.

There are activities associated with solid waste management. Waste quantification entails the measurement of solid waste items generated, collected, transported, and disposed of (Ugwu *et al.*, 2020). Organic waste can be found in all socio-economic areas however, the composition of waste is also determined by the socio-economic activity within the specific area or location and is based on the economic status of those within that specific geographical location (Syafrudin *et al.*, 2022). Quantification of solid waste can be done via methods such as the weight of waste collected and separation and count of each category of waste such as paper, glass, plastic, and others such as sand and stone (Teshome *et al.*, 2022). Waste quantification is a crucial step in decision-making and allows for optimum waste management systems (Syafrudin *et al.*, 2022). Furthermore, the quantification of waste also assists in waste recycling and reduction activities (Seshie *et al.*, 2020). However, gaps in data availability and viability of quantified waste can result in improper decision-making and implementation of waste management practices and policies (Teshome *et al.*, 2022).

2.2.3. Solid waste management in South Africa

South Africa generates up to 54 425 tonnes of waste per day and is seen as the 15th highest generator of waste in the world (World Bank, 2016). In 2011, it was estimated that around 10% of total waste is recycled in South Africa with 90% of waste being disposed of at a landfill (DEA, 2012). In developing countries, the increase in population growth and economic development may place pressure on challenges surrounding solid waste management with waste reaching a high of 516 tonnes per

year by the year 2050 within Sub-Saharan Africa (Kaza *et al.*, 2018). With poor waste management strategies, waste would either be incinerated or placed in a landfill (Tomita *et al.*, 2020). Bearing this, approximately 69% of solid waste ends up in a landfill in Sub-Saharan Africa due to ineffective solid waste management strategies and implementation (Kaza *et al.*, 2018). In South Africa, landfills are becoming depleted of space due to waste being landfilled coupled with over population and rapid economic growth (Schenck *et al.*, 2019). The National Waste Management Strategy was developed in 1998 which outlined that local municipalities would be tasked with the responsibilities of the landfills under the Municipal Systems Act 32 of 2000 (Schenck *et al.*, 2019). Landfilling of waste can pose grave consequences such as the emission of greenhouse gases due to the degradation process of waste, environmental damage such as leakage of leachate, pollution of groundwater and human health risks especially for those residing near a landfill (Vaverkova, 2019; Fazzo *et al.*, 2023).

2.2.4. Solid waste management challenges

Solid waste collection and disposal is an important aspect of a functioning society however, it can be faced with challenges especially within urban constructs. Municipal challenges can be seen particularly within the collection stages as the costs involved in effective solid waste management can be high, creating a lack of service delivery within certain communities (Del Carmen-Nino *et al.*, 2023). The result of this would lead to communities using poor methods of solid waste disposal such as burning, dumping especially along rivers, and burying (Del Carmen-Nino *et al.*, 2023). In South Africa, municipal collection and transportation services are employed and mandated to conduct effective waste management services to communities weekly however, low-income areas may not receive effective services due to a lack of funds (Haywood *et al.*, 2021). Pikitup is the mandated waste management service provider of the City of Johannesburg (Pikitup, 2024). Pikitup ensures services across 1,625 square kilometres in Johannesburg and collects up to 6,000 tons of solid waste daily (Pikitup, 2024). Furthermore, one of the mandates of Pikitup is to ensure households separate at source and practice recycling activities to reduce the amount of waste disposed of at landfills (Pikitup, 2024).

2.2.5. Informal waste management sector

The informal waste management sector can be described as labour-intensive, unregulated, and unrecognised services by informal enterprises or people who collect and sort waste for a living and as a means of survival (Wilson *et al.*, 2006). The informal waste sector has created a relationship between the environmental, social, and economic aspects of society. Unemployed individuals in developing countries have utilized the need for effective waste management strategies in making a wage (Espinosa-Aquino *et al.*, 2023). Furthermore, the sector has also filled a gap where raw material use is reduced due to an increase in recycling initiatives (Espinosa-Aquino *et al.*, 2023). The informal waste sector has also allowed for the upliftment of the poor by creating a source of income and employment. Waste pickers are the first point of the waste recovery processes and often their trade results in waste not being landfilled. The sector has also allowed for a more circular economy thus enhancing the SDG standards (Kala *et al.*, 2022). From this point of view, informal waste pickers have solved a gap in society, especially within urban environments where the population and solid waste are growing exponentially.

Waste pickers can be seen moving along busy streets of residential and commercial areas often pushing along a trolley with items they have sourced to further transport to buy-back centres where they would earn a wage. In South Africa, waste picking is a young male-dominated sector however, there are pickers that are older females (Mlotshwa *et al.*, 2022). Waste pickers often must navigate around traffic and uneven roads but can be met with hostility by drivers on the road (Mlotshwa *et al.*, 2022). Waste reclaiming is an unregulated sector with a lack of financial stability and unsafety (Loots and Ntsala, 2024). There are paradigm shifts in the earning capacity of each waste reclaimer as this can be dependent on geographic locations worked, the recyclable items collected as well as the prices of the items at the buy-back centres at which they sell the recyclable items (Loots and Ntsala, 2024). Waste reclaiming can be a hazardous form of employment with pickers being exposed to occupational injuries and diseases. The damaging effects of constant pulling and pushing of heavy bales, trolleys and white bags can cause muscular disorders (Kistan *et al.*, 2020). The exposure to waste can expose pickers to bacterial and viral infections, respiratory infections, and injuries. The lack of Personal Protective Equipment (PPE) such as

masks and visors exacerbate occupational diseases and injuries especially for waste pickers (Kistan *et al.*, 2020).

Waste pickers can be exposed to chemicals and biological waste when poor waste management practices are present. Often, waste pickers may not seek the appropriate medical care due to social stigma and they may also not have the appropriate access to necessary health care (Made *et al.*, 2020). Due to the nature of waste picking, waste pickers are often seen as a social problem as their work is informal, which leads to stigmatisation. The term “waste picking” already carries a negative labelling and can further suggest that those partaking in waste reclaiming are “scavengers” and are “dirty” due to their work (Porras Bulla *et al.*, 2021). Waste pickers may often face unfair and unequal pricing which is caused by the lack of formalisation of the sector. The rate of pricing may change abruptly, and they may not earn steadily (Juarez-Pastor *et al.*, 2024). In South Africa, the minimum income of a waste picker is below minimum wage and would be in the R4 000 per month range which is, furthermore, not guaranteed to remain at this rate due to the availability of recyclable material and fluctuation in pricing of commodities on a global scale as well as the pricing at buy-back centres (Loots and Ntsala, 2024). Waste pickers often face discrimination and marginalisation from society which may result in disrespect towards their work and devaluation of their contributions towards recycling and waste management efforts.

2.3 Theoretical Framework

2.3.1. Systems Thinking

The Systems Approach in waste management gives importance to aspects and interrelated components. Bearing this, Systems theory can be used to describe solid waste management as involving environmental, social, and economic constructs which is dependent on intra and inter-organisational engagements and further buy-in by the public (Oelofse and Godfrey, 2008). Systems thinking and systems approach have an iterative relationship and should be considered that one defines the other (Marshall and Farahbakhsh, 2013). The Systems Approach is efficient in considering solid waste management in an integrated and holistic and how factual issues can be solved and understood (Marshall and Farahbakhsh, 2013). This approach places significant importance on relationships and interactions between elements of a system

(Chai and Yeo, 2012). The power of systems thinking is within the individual to identify similar behavioural patterns in differing situations (Chai and Yeo, 2012). It is to be noted that systems thinking emphasizes system structure instead of the order of events, as often, the problems are within structural bounds.

The systems approach operates effectively when constituents are in equilibrium however, a second approach is required to understand more complex dynamics such as biological, ecological, economic, and management parameters (Roundy *et al.*, 2018). Socio-environmental systems can be a branch of the systems approach, especially when associating with waste pickers, which would emphasize the integrated social feedback loops and environmental aspects (Zare *et al.*, 2024). Successful systems would include stakeholder engagement, modelling of the system with its intricate constituents, informed decision-making, promotion of scientific advancements and allowing for education and improved communication (Zare *et al.*, 2024). Taking this into consideration, it can be emphasized that the systems approach, requires a two-approach process by which non-equilibrium parts form part of the more stable aspects of a system to become a holistic and integrated system.

The reduction approach refers to breaking down bigger items into smaller and more manageable parts of a process. The assumption, in this regard, is made that all the smaller parts are put together to make a bigger item (Balanay and Halog, 2021). In this way, the reduction approach gives way to a systems approach such that parts of a system are broken down effectively to be analysed and understood from a holistic point of view. In reductionist approaches, non-linear processes are neglected, and complexities are deemed as simple items (Minati, 2023). The systems approach can be complicated and difficult to implement however can have opportunities when combined with reductionism (Balanay and Halog, 2021). This is due to reductionism providing systems thinking with logical flow due to the unravelling of multiple interrelationships and interconnectedness for holistic understanding.

The disadvantage of the Systems Approach is that it may prove to be too vague or ineffective whereas solid waste management issues may be more complex. Furthermore, analysing parts of the system can prove to be problematic as this would create room for controlling the outcome of the system (Marshall and Farahbakhsh, 2013). Systems thinking is not often taught from the ground level and well-equipped

technical practitioners such as scientists and engineers may not fully grasp systems thinking from the ground up. This would often lead to lack of understanding of dynamic systems, and time studies as a wait-and-see approach would be implemented leading to a lack of further analysis (Voulvoulis *et al.*, 2022).

From a sustainability perspective, one which the operations of informal waste pickers are concerned, policymakers may not be trained adequately to evaluate challenges from a holistic and systematic manner which may pose a problem as strategies may be narrow and only constructed from a policymaker perspective (Voulvoulis *et al.*, 2022). The other disadvantage of the systems approach would be the evolution of different frameworks, methodologies and approaches which have their own directions and may not fully be field-specific (Balanay and Halog, 2021). There may be groups of specialists in the field who may choose a specific subtype of systems thinking such as systems dynamics or critical systems thinking and this may lead to further confusion and more questions that cannot be answered (Balanay and Halog, 2021).

The systems approach requires that there be a true understanding of how each part of a system works along with critical thinking, multidisciplinary perspectives, strengths and weaknesses of perspectives and integration of all insights to be able to identify a more comprehensive understanding of fields (Voulvoulis *et al.*, 2022). Systems thinking requires that public participation with scientific specialists and policymakers occur, honestly and transparently for mutual learning to occur. This is so that a world view is taken regarding ideas and knowledge to be able to make the needed changes from a systems level (Voulvoulis *et al.*, 2022).

Systems thinking has many advantages which are noteworthy such that it is thinking holistically regarding dynamic and complex relationships of items in a system. Systems thinking can assist in the development of policies that are based on complex social and environmental issues where cause- and-effect interactions are not obvious across time (Sajjadi *et al.*, 2022). Furthermore, systems thinking encourages and allows for open dialogue amongst all participants and this also further allows for improved decision-making (Voulvoulis *et al.*, 2022). Problem-solving approach by systems thinking can be productive given that the subjective aspects are not ignored (Fartookzadeh *et al.*, 2024).

2.3.2. Collaborative Governance Framework

The Collaborative governance framework entails the different structures and processes within public policy formation that allow for constructive engagement amongst actors from across the public, governmental agencies, and private sectors that allowing for shared decision-making (Grootjans *et al.*, 2022). The framework allows for an integrated approach by ensuring the sharing of knowledge and conceptual ideas from a variety of expertise. A collaborative framework can be seen as a hopeful approach to amending issues faced by the public, however, there may be power struggles, misunderstandings, and undefined goals during the collaborative activities (Grootjans *et al.*, 2022). The benefits of collaborative governance are improved management of activities, improved sourcing, and use of resources, increase in buy-in of people, better conflict resolution strategies, improved knowledge management, increased transparency, and improved policy-related compliance (McNaught, 2024). The need for collaborative governance is based on factors such as the complex interconnectedness of issues that are not easily solvable coupled with inadequate solutions by authorities and the need for knowledge sharing among stakeholders in society (McNaught, 2024). It is worth noting that successful collaboration between actors lies in the forms of incentives for collaboration as well as institutionalization during the collaborative effort (Zambrano-Guiterrez *et al.*, 2023).

Collaborative governance, from a network and partnership perspective, should be carefully governed such that the initiation, support and guidance are done effectively to avoid traditional hierarchical forms of power and control (Nielsen *et al.*, 2024). Public and private actors find collaboration a valuable aspect as all parties is seeking knowledge from each other along with finding solutions to challenges and wicked problems. The actors involved in collaboration ensure that decorum and respect are maintained, even during the sharing of differing views (Nielsen *et al.*,2024). Collaboration is often used in public administration to improve governance strategies and further improve service delivery by sharing resources, information, and goals by creating visions and structures to assist in relationship governance (Wang and Ran, 2023).

The interaction among actors takes place with a self-regulated institutional framework that the actors further acquaint themselves with. The institutional framework assists in

stabilizing the communication amongst actors however, the formulation of own views, ideas and resources adds to learning and further generates ideas and solutions that are different from mainstream ideas (Nielsen *et al.*, 2024). Collaborative governance thrives on trust, diversity and inclusivity of all views and solutions; however, trust is the most imperative quality required when collaborating. Trust is important in the context of environmental policy and management strategies (Goris and Koch, 2024). Engagement amongst actors is heightened when there is mutual understanding, respect, and trust and oftentimes, trust is the key component of maintaining relationships in this regard, for mutual benefit. An important aspect to consider is that effective collaboration, communication, and decision-making all rely on trustworthy relationships formed among actors which have the probability of removing any insecurities during collaborative efforts (Goris and Koch, 2024).

Key components of the collaborative governance framework involve face-to-face communication, trust, commitment towards processes, effective engagement amongst actors, a shared understanding, and transitional outcomes (Abdulai *et al.*, 2024). Solid waste management challenges would be remedied with the use of a collaborative governance framework as the public would be more involved in decision making thus allowing for a shared responsibility. In Africa, collaborative governance is prevalent with the partnership amongst actors such as governmental entities, the private sector, and community-based organizations. The collaboration of these actors has resulted in effective waste collection and a reduction in illegal waste dumping especially in Uganda (Abdulai *et al.*, 2024). In South America, the integration of waste pickers has gained traction and collaborative governance models place importance on the inclusion of waste pickers in formal plans and strategies (Abdulai *et al.*, 2024).

Participation during collaboration can have faults such that it may not be implemented correctly and requires thoughtful and thorough design. Policy learning may pose challenges and often, NGO actors may be forced to learn about policy or strategies. This may not work in an area of considerable risk (Vihma and Toikka, 2019). For collaborative governance to function effectively, trust is needed, and stakeholders are required to be transparent about their influences of power (Grootjans *et al.*, 2022). Furthermore, may lack traction to go beyond administration and can lack cooperation from different actors of the society (Zhang and Zhu, 2022).

2.3.3. Inclusive Governance Framework

An inclusive governance framework allows for all parts of society to be able to make decisions by being included in policy formation and decision-making (Karar and Jacobs- Mata, 2016). This type of governance framework would allow for equal citizen representation, empowerment of marginalized individuals, and responsiveness to certain needs especially to those of marginalized and underrepresented communities. The inclusive governance framework operates on the notion that all parts of society are treated equally and should be empowered in making decisions, including marginalized people (Annahar *et al.*, 2023). Inclusive governance would focus on waste reduction and recovery of resources by promotion of policies, creation of new policies and supporting vulnerable population groups such as waste pickers (Gutberlet *et al.*, 2020).

There are key principles of the inclusive governance framework however the main concepts to understand are participation, fairness, power, decision-making, accountability, and capacity. Public participation is an essential element of inclusion and can assist in the development of equal policies which further emphasises public decision-making strategies (Annahar *et al.*, 2023). Fairness is applied in the context of services received by society by governmental bodies. Justice, in this regard, can be delivered when parts of society are heard equally and accountability is requested from governmental bodies and organizations that provide services to all (Annahar *et al.*, 2023).

Power is shared equally by society as well as local and national governments to avoid power struggles and rebellion (Annahar *et al.*, 2023). Accountability is maintained for decisions taken as a society and creates empowerment during participation (Bell and Reed, 2022). People may be more interested in participation and sharing of information for decisions that concern them (Bell and Reed, 2022). Inclusive governance is partial towards bottom-up decision-making and ensuring that equal rights are given to even the marginalized to be able to make decisions that would affect them (Anahar *et al.*, 2023). However, considering this, decision-makers are to protect their views, promote participation and represent marginalized persons.

Capacity building from an institutional perspective is an important aspect of inclusive governance such that transformative capacity is created which would allow for marginalized individuals to be able to share their views and realities. This would allow for innovative ideas to be implemented and empower different stakeholders to plan and develop different strategies (Anahar *et al.*, 2023). Capacity, in easier words, is the ability to deal with day-to-day issues by having an input from society and by the realization that views and solutions are not limited to authoritative figures (Van Popering-Verkerk *et al.*, 2022).

The disadvantages of inclusive governance lie with the stakeholders and not including relevant stakeholders may limit the valuable and rich information that is required and would further create a loophole downstream in the process when more stakeholders refuse to participate in engagement (Ansell *et al.*, 2020). The inclusion of different actors in the process may increase factors such as costs, and time, may affect deliberation outcomes and further may muddle any views that need consideration (Ansell *et al.*, 2020). Having the inclusion of larger groups of people may create instability in terms of participants who are willing and those who are not, in engagement. Furthermore, groups with a greater number of participants may have individuals who do not want to participate at all, thus skewing deliberations and ideas (Ansell *et al.*, 2020).

Grassroots movements, in terms of waste pickers, assist in building more inclusive waste recycling networks; and marginalized communities such as waste pickers, create more inclusive environmental regimes (Campos *et al.*, 2021). Grassroots movements use collective input, or inclusiveness, to impart change from a local, national, governmental, and international perspective. It can comply with and resist any top-down forms of leadership creating empowered and inspired individuals in a community (Campos *et al.*, 2021).

In this way, grassroots movements challenge governmental bodies as the waste pickers have created their form of urbanism and informal recycling initiatives, which can be learned from to be able to innovate formal policies and strategies. An example here would be the sharing of knowledge along with waste pickers, for a better understanding of day-to-day occurrences such as the effects of the introduction of an incinerator (Campos *et al.*, 2021). This would give the state an understanding of

genuine issues that are experienced firsthand by the waste pickers and further devise strategies to combat these issues. This would also create a sense of empowerment amongst waste pickers and marginalized groups such that their input has been included in decision-making. For waste management practices to be effective, an inclusive approach would focus on the main actors such as waste pickers, citizens, governmental organizations, and NGOs to equally participate in the sharing of new approaches to solid waste management efforts (Gutberlet *et al.*, 2020).

2.4 Conclusion

Solid waste can comprise of different items based on needs and use by people. Considering this, waste can be managed in diverse ways however, the recommended manner to manage waste is by reducing, re-using, and recycling. Waste management can be effective in urban areas, but challenges are present such as lack of funds and mismanagement surrounding service delivery. These aspects have impacts on waste management strategies. Waste pickers form the gap between mandated waste management services and recycling efforts, in which items would be usually disposed of at a landfill.

The systems thinking approach places value on each component of a process and is holistic in a manner to effectively understand complex and wicked problems faced in society. The interconnectedness and interrelationships of each component can allow stakeholders to make improved decisions, empower knowledge and continuous learning and create platforms for better communication (Zare *et al.*, 2024). A collaborative governance framework is important in fostering public and private engagement for decision-making that is based on equal knowledge sharing from people across different expertise. It enhances accountability from all spheres of society and can be the governance framework to better understand and mitigate solid waste management issues due to shared decision-making (Abdulai *et al.*, 2024). An inclusive governance framework is like collaborative governance however the key difference lies within the inclusion of particularly marginalized groups of people. Inclusive governance allows for equity and social justice and ensures that representation of marginalized groups occurs. It thrives on creating empowerment and further listens to the voices of those who are otherwise, not heard by society (Ansell *et al.*, 2020).

The frameworks and theories mentioned have a commonality of creating trust, improving communication, and making more informed decisions in which all parts of society are considered. Systems thinking focuses on the intricacies of complex systems and identifying as well as analysing causes of problems. Collaborative and inclusive governance is more action-oriented and focuses on making decisions instead of analysing the root cause of the problem. Nevertheless, these theories and frameworks can be used to better understand waste picker inclusion into formal plans and strategies considering their functions in solid waste management efforts and marginalized status in society. Given the literature explored in this section, it can be proposed that citizens do not effectively acknowledge waste picker activity would rather dispose of waste in household refuse bins instead of recycling or separating at source. Waste picker challenges are in the form of money and equipment used for reclaiming. Policy documents are available and contain in detail, the valuable insights into waste management from a local, provincial and national level. However, implementation poses an issue. Furthermore, the theoretical framework that would be best for the inclusion of waste pickers into formal policies and strategies is the Inclusive Governance Framework. This is due to the framework including all parts of society in decision-making, particularly solid waste management.

Chapter 3: Literature Review

3.1. Introduction

This chapter is divided into three main sections. It explores the existing literature from the perspectives of developing countries, Sub-Saharan Africa as well as South Africa. Furthermore, the section highlights the challenges experienced by waste pickers and a comparison is drawn between the different countries in terms of how the waste pickers function on a day-to-day basis. Lastly, the chapter discusses the governance system of South Africa from a solid waste management point of view and the relevant policies that exist to govern the sector. In this chapter, waste pickers in developing countries such as Bangladesh, India, Indonesia, Zimbabwe, Chile, Peru, Pakistan, and Ecuador are explored. Waste pickers in Sub-Saharan African countries such as Kenya, Nigeria, Ghana, and Tanzania are discussed. The choice of countries is based on the published evidence of the different dynamics at play within these countries and how waste picker's function.

3.2. Review of existing literature in developing countries

In developing countries, waste pickers form most of the informal waste management sector as these individuals rely on the process of waste sorting for a living (Ferronato and Torretta, 2019). These waste pickers are however subjected to unsanitary environments, and poor working conditions and are excluded from formal waste management systems (Medina, 2010). In a qualitative and literature-based study conducted by Ferronato and Torretta (2019), in developing countries such as Bangladesh, household waste is collected by scavenging through bins for recyclable and reusable items. However, they are exposed to health risks in this manner and would encounter medical-related waste such as used syringes, menstrual pads, blades, and knives (Ferronato and Torretta, 2019).

The marginalized waste pickers of Bangladesh are overlooked by their employers in terms of occupational and health safety. The lack of resources and legislation places a burden on the environment in developing countries such that even informal sectors of waste management cannot effectively navigate waste to landfills as waste is still disposed of at landfills in the end (Ferronato and Torretta, 2019). In Asian counterparts

such as Indonesia, however, Informal waste pickers have contributed significantly to waste management efforts such that there is a reduction of the need for formal waste collection, coordination, and disposal by a third of the total waste (Medina, 2010).

In developing countries, municipalities are battling with mass amounts of solid waste generated due to rapid urbanization and are often challenged with budget constraints for the removal and transportation of solid waste. In Zimbabwe, waste pickers are faced with health hazards, lack of training and knowledge, lack of personal protective gear (PPE) and exposure to harsh weather patterns which can cause ill health (Sverdlik *et al.*, 2024). During warmer months, waste pickers have challenges with water supply for drinking which could hamper their working day. Female waste pickers in Zimbabwe are exposed to unsafe environments in which sexual assault is prevalent (Sverdlik *et al.*, 2024).

Waste pickers are faced with severe discrimination and ostracized by society, which has become prevalent in a culturally diverse country such as India (Juarez-Pastor *et al.*, 2024). Waste pickers collect recyclables from landfills, household bins and the street. These waste pickers sell the recyclable materials to smaller waste dealers who will further sort and sell the recyclable material to bigger waste dealers. Bigger waste dealers sell the recyclable materials to manufacturers who use the material to produce items. Due to this fact, both small and large waste dealers along with processors such as manufacturers are recognized as formal trade (Juarez-Pastor *et al.*, 2024). Waste pickers in India are often from lower caste groups who are seen as dirty and are harassed for their status by other parts of society. Formalization of waste pickers into formal trade has been placed forward within the government of India, however there are challenges such as funds, lack of infrastructure and lack of allocation of duty to the correct actors (Juarez-Pastor *et al.*, 2024).

In a developing country in South America such as Chile, waste picker efforts account for 70% of the waste recycled (Navarrete-Hernandez and Navarrete-Hernandez, 2018). In South American countries such as Peru, waste picking has been legalised since 2000 and the government has retained any intervention in this regard however, this demonstrates neglect from governmental entities towards waste picking (Navarrete-Hernandez and Navarrete-Hernandez, 2018). Other developing countries

such as Pakistan have privatized waste picking however this has led to waste pickers being ostracized from formal waste management (Nawaz *et al.*, 2021).

Waste picking is seen with vast improvement for developing nations where in 2005, a citizens initiative called ReciVeci was initiated for the inclusion of grassroots waste pickers of Ecuador. Ecuador has more than 20,000 people operating as grassroots waste pickers and can be either informal or formal. These waste pickers collect items such as glass, paper, cardboard, metal, paper, and plastic from door-to-door services and have a timetable of the day and time at which they would collect items (Espinos-Aquino *et al.*, 2023). From a household level, waste is separated, and a record is kept of the weight of the items. The items are all added from a neighbourhood perspective to provide feedback to the community of on progress made in terms of collection and recycling and further promote recycling initiatives (Espinos-Aquino *et al.*, 2023). This is all made possible by the creation and implementation of the National Network of Waste Pickers of Ecuador (RENAREC), a grassroots waste pickers affiliation to represent the waste pickers of Ecuador and is made up of more than 50 waste reclaimer organizations. The purpose of RENAREC was to provide social security to waste pickers, to be the voice of reason, to assist waste pickers in receiving payment for their services, to assist with PPE, to instil fair trade practices and to educate society about recycling and its benefits for the environment (Espinos-Aquino *et al.*, 2023).

3.3 Analysing informal waste management in Sub-Saharan Africa

Waste picking at dumpsites is common and the pickers are often found living near to the dumpsite at which they collect recyclable material. Waste pickers in Kenya have higher literacy levels than other waste pickers in surrounding African countries with 58% of youth having a primary school education (Kariuki *et al.*, 2019). The fact that youth have turned to informal occupations such as waste picking reflects youth migration to urban areas where employment is thought to be found, however are met with dumpsites where waste picking can be employed as a source of income. Furthermore, Kenya does not have a class structure in society and hence there is no distinction between waste pickers and those who have formal employment, unlike that of developing countries (Kariuki *et al.*, 2019). In Kenya, there has been a creation of National Waste Picking movements and cooperatives which assist in securing contracts from local municipalities as well as assist with income for waste pickers.

Furthermore, these cooperatives assist in community-based approaches to solid waste management for improved buy-in by citizens and waste management education initiatives (Sibanda *et al.*, 2023). In a county such as Nakuru, citizens in this urban area are waste pickers by employment (Kariuki *et al.*, 2019). In Kenya, the local authorities do not support waste pickers effectively and hence solidarity amongst waste-picking communities is present such that there are self-financing schemes, job creation and medical assistance for health improvements (Kain *et al.*, 2022). There are also training initiatives by NGOs in the form of mentorship programmes for knowledge development and for influence on identity and capacity building (Kain *et al.*, 2022).

Recycling efforts by waste pickers and collection of solid waste are motivated by deep-rooted poverty and the need to make a living, however this form of employment is often seen with much contention and risk as the government does not supply the waste pickers with the required support such as PPE for safety and health (Omosimua *et al.*, 2020). The waste pickers of Lagos, Nigeria work under unhealthy and unsafe conditions in which their health can be impacted. A quantitative research study completed in Nigeria by Anierobi and Efobi (2013) identified that informal sector waste pickers had a 100% buy regarding waste collection and sorting efforts within the urban areas of Nigeria. However, it was also noted that in countries such as Nigeria, waste management sectors are controlled by governmental agencies which results in poor waste management practices (Anierobi and Efobi, 2013).

Ghana relies on the services of landfills and open dumps for disposal of waste. Waste is often not separated at source and is a mixture of wet food waste with dry recyclable items (Kwarteng *et al.*, 2020). Waste management in Ghana is poor with there being a lack of coordination amongst governmental stakeholders, poor waste disposal and management practices as well a lack of acknowledgment of waste picker functions has further created a challenge for recognition and inclusion of waste pickers into formal waste management plans. Waste pickers in Ghana are part of the private sector and are part of 80% of the waste management services with people collecting recyclable waste and waste pickers selling the recyclables to intermediaries who move the items to a recycling plant, after the items have been washed (Kwarteng *et al.*, 2020). Furthermore, waste pickers in Ghana must pay for their own equipment such

as PPE and trolleys which often causes them to not earn a profit but rather incur more of a loss (Bening *et al.*, 2022).

It can be further reiterated that waste pickers in Ghana, provide their services due to shortage of formal employment options. However, via a meta-analysis completed by Adedara *et al.* (2023), Sub-Saharan African countries have bottlenecks in waste collection and management. This is also attributed to the lack of resources and technologies for waste sorting. Waste pickers, in this instance, re-circulate waste to recycling centers and scavenging is a widespread practice at landfill sites in Ghana and Nigeria (Adedara *et al.*,2023). This has further amplified the circular economy in these countries but has created health hazards for waste pickers.

There is a lack of support from both governmental authorities and funds that are used by the waste pickers for equipment from themselves or family members in Tanzania (Kain *et al.*, 2022). This shows the low-capacity building, and certain levels of advice or financial assistance have been provided by international companies within Tanzania. Waste pickers in Tanzania collect metal, paper and plastic which makes them more vulnerable to market changes and price fluctuations (Kain *et al.*, 2022). Waste pickers in Tanzania collect recyclable items from households, business areas and waste storage areas such as dumpsites or collection points with commercial entities sorting the recyclable items for collection (Luvanda *et al.*, 2023). In Tanzania, community-based organizations are present with these organizations being part of institutional arrangements for the informal community. However, these are entrepreneurial organizations with the support of international aid (Kain *et al.*, 2022). Furthermore, since there is inadequate governmental support, waste picker organizations are founded in response to the high unemployment rate among youth. However, over time, these waste pickers organizations become dormant in function. Nevertheless, in Tanzania, since the local government does not support waste picker activities, transportation and other key services are provided by small to medium-sized enterprises (Kain *et al.*, 2022).

3.4. Analysing informal waste management in South Africa

Recycling efforts in South Africa are driven by waste picker activity. Around 60,000 waste pickers are operating on the streets or in landfills to sort, recycle and sell items to make a living (Schenk *et al.*, 2019). It is estimated that the government saves around

R 748 million on space due to recycling conducted by waste pickers in South Africa (Schenk *et al.*, 2019). However, waste picker activity is often overlooked by municipalities. Waste picker activity contributes to recycling efforts in South Africa. However, in Johannesburg, 1. 5 million tons of waste is disposed of in a landfill (Made *et al.*, 2021).

Waste pickers form the basis of recycling and reusing initiatives which is further backed by The National Environmental Management Act: Waste Act no. 59 (2008). They are further recognized by the Waste Act (2008) (Shoroma *et al.*, 2022). A critical qualitative study completed by Mlotshwa *et al.* (2022) provided insight into waste pickers' socio-psychological factors affecting their work as well as how they can best be incorporated into society. This study found that waste pickers in Durban feel ostracized by society due to being stigmatized as "filthy" or "unsafe" (Mlotshwa *et al.*, 2022). This further emphasizes that informal waste pickers do not have of an identity in society even though they provide a service needed in general society. A survey-based study conducted in Cape Town by Yu *et al.* (2020), showed that informal waste pickers do provide a legitimate service by collecting and recycling waste that would typically be landfilled, however, it is also to be noted further that to understand how waste pickers can be included in the formal sector, it is to further understand the working conditions and lives of waste pickers for them to be formalized within policy (Yu *et al.*, 2020).

Conflict among waste management actors is seen as common however, it is more prevalent among waste pickers who are fighting for space and the area in which they operate. When the government has given access to recycling through initiatives, it is often misunderstood as the creation of new separate economies. Given this, waste pickers are excluded by the state and from formalization policies (Makina and Lawhon, 2022). Another fight that exists between waste pickers and the state is the ownership of waste material thus creating problems between the two actors (Makina and Lawhon, 2022). A more pressing issue that exists among waste pickers in South Africa is the ownership of space in which to operate and landfills are subject to violent conflicts among waste pickers due to this. When this has occurred, waste pickers are then prohibited from operating in those landfills but may be accessed through breaking (Makina and Lawhon, 2022).

It was noted that waste pickers experience certain daily challenges. Waste pickers contribute 80% of the recycling efforts. However, they are motivated by earning a living and are exposed to hazardous environments where their health is at risk (Simatele *et al.*, 2017). Further challenges include harassment by citizens as they are often deemed as a nuisance, especially on roads when they transverse the city and must move along busy intersections where road users can become nervous (Simatele *et al.*, 2017). The study also identified means of the inclusion of waste pickers into solid waste management plans which include the creation of co-operatives along with state-controlled separation and recycling initiatives thus improving waste management and waste picker working experience. Waste pickers should be trained by authorities on the advantages and disadvantages of their work on the environment (Simatele *et al.*, 2017).

There has been a realization amongst policymakers around the inclusion and formalization of waste pickers to coincide with the international trend of waste picker integration. The waste pickers integration document was formulated in 2020 however is very much in its infancy and is a guideline document for municipalities to be able to navigate around waste picker activity (Samson *et al.*, 2022). The call for waste picker integration in South Africa is based on factors that have been seen in international countries and need to be met by governmental bodies for waste pickers to be better acknowledged. The integration of waste pickers would include the improvement of access to recyclable material, equal and fair trade with better pay, improved working conditions, education on the public on waste pickers for respectful relationship building and more inclusion of waste pickers in decision making (Samson *et al.*, 2020). Waste pickers are vulnerable when working considering that they can incur injuries and develop diseases due to being exposed to hazardous conditions. They may experience exposure to rotten food, gases, sharp objects, and chemicals which could cause serious and life-threatening injuries and diseases (Schenk *et al.*, 2019).

3.5. Waste Management Governance in South Africa

The National Environmental Management: Waste Act No. 59 of 2008 (Republic of South Africa, 2008) is an act that regulates waste management in South Africa to ensure that human and environmental health is preserved (Republic of South Africa, 2008). The act further states measure for the minimal use of natural resources,

emphasizes the reduction in waste generation, re-use, and recycling of waste as well as the promotion and efficient waste service delivery (Republic of South Africa, 2008). NEMWA states that the municipality is to have executive authority regarding the delivery of waste management services such as waste removal, waste disposal and storage. Most importantly, the act emphasizes that the municipality of the region is to ensure that waste services are extended to all (Republic of South Africa, 2008).

The National Waste Management Strategy of 2020 (Department of Environment, Forestry and Fisheries, 2020) is in place to achieve the objectives stated by the National Environmental Management: Waste Act No. 59 of 2008. The National Waste Management Strategy of 2020 (DEFF, 2020) is a revision of the National Waste Management Strategy of 2011 which was developed to outline strategies for dealing with the backlog with solid waste management services in South Africa and accounts for actors in waste management such as the informal waste sector (DEFF, 2020). The National Waste Management Strategy of 2020 focuses on current-day circular economy strategies and outlines the importance of waste pickers in current waste minimization and management.

The Waste Picker Integration Guideline for South Africa was formulated and documented in 2020 by the Department of Environment, Forestry and Fisheries and the Department of Science and Innovation along with relevant stakeholders within the informal waste collection sector. The document was developed as a guideline for municipalities and industries to employ for effective measurement of the improvement in working conditions of waste pickers (Department of Environment, Forestry and Fisheries and Department of Science and Innovation, 2020). The guideline has outlined key factors such as waste pickers integration being a global best practice as their contributions are of importance especially in developing nations. Waste reclaimer integration advancements allow for government priorities and have created green forms of employment thus contributing to environmental upkeep (DEFF and DST, 2020). The guideline is a basic document that allows for effective participatory processing by all stakeholders and to furthermore implement evidence-based waste reclaimer integration programs and plans.

3.6. Conclusion

Waste pickers assist in main recycling activities around the world and are motivated to do their jobs since it provides an income for them. Most of the waste pickers cannot find informal employment due to factors outside of their control. Waste pickers often face issues such as health risks associated with sorting and recycling waste, lack of resources and lack of buy-in from authoritative bodies such as the government (Kain *et al.*, 2022). Marginalized individuals often resort to waste picking as a form of generating an income. Latin America has made strides in the inclusion of waste pickers and collaborating along with the citizens in recycling activity which further emphasizes the need for collaborative efforts in waste management (Espinos-Aquino *et al.*, 2023). In African countries, youth unemployment has pushed younger individuals to become waste picking as a form of employment. Waste management in Sub-Saharan Africa is poor with a lack of proper buy-in from all stakeholders and a lack of acknowledgment of waste pickers and their activity (Kwarteng *et al.*, 2020). However, waste pickers still play a vital role in the waste management and waste recycling of African countries. Cooperatives provide waste pickers with relevant support and representation and further bridge the gap between waste pickers and other stakeholders. In South Africa, waste picker integration is still in its infancy with the development of The Waste Picker Integration Guideline and is a move in the right direction for the inclusion of waste pickers into formal plans and policies. However, at this moment in time, this document serves as a guideline for municipalities on how to work around waste picker activity (DEFF and DST, 2020). Waste management frameworks in South Africa exist to guide solid waste processing and management at all parts of the lifecycle. The Waste Picker Integration guidelines are a step in the right direction as they serve as the first basis for waste picker inclusion, and it highlight the need for stakeholders to learn more about waste pickers and how to be flexible around them.

Chapter 4: Research Methodology

4.1. Introduction

The chapter comprises two parts: the study area description and the methodology used within the study to answer the research questions. The chapter further gives insight into the people and history of Central Johannesburg and the considerations of the study. The considerations outlined in this chapter reflect the ethical considerations taken to achieve research results and further highlight limitations encountered during the data collection of the study.

The research encompassed a qualitative methodology with aspects of quantitative research, in which data was collected via a two-step process. The first step was the critical analysis of existing knowledge and published data. The second phase of the research was based on data collection via semi-structured interviews of waste pickers, informal waste Non-Profit Organizations (NPOs), informal waste Non-Governmental Organizations (NGO's), local authorities, and citizens within Central Johannesburg.

4.2. Research design

The research encompassed the use of qualitative methodology with aspects of quantitative research in which data was collected via a two-step procedure. Firstly, it is important to note what denotes research design. Research design is a process that is used to identify and further answer research questions (Abosede and Onanuga, 2016). It can further be defined as steps and conditions outlined for the collection of data, which would be analysed to answer research aims and questions in the simplest of forms (Abosede and Onanuga, 2016). Qualitative research methods can be described as the collection of data based on phenomena and are usually devoid of numbers (Busetto *et al.*, 2020).

Furthermore, qualitative research underpins the experiences of people and usually answers pertinent questions such as why and how within research and often adds value to research carried out via quantitative methodology (Tenny *et al.*, 2022).Quantitative research can be described as the methodology used to answer questions of the research using numerical values and provides numbers to questions being posed in a research endeavor (Lim, 2024). The first phase of the research

entailed the critical analysis of existing data and knowledge. The second phase of the research was conducted using semi-structured interviews of key groups of people in the study and study area. The semi-structured interviews were conducted with waste pickers, informal waste NGOs, informal waste NPOs, citizens of the study area and local authoritative figures. Table 1 below is an outline of the research objectives and the relevant instruments that were used to collect the relevant data to answer the research questions.

Table 1: Research design outline based on objectives.

Objective	Technique and instruments
1. To examine the challenges that informal waste collectors in Central Johannesburg experience.	• Comprehensive analysis of available research data was done from a Global, Sub-Saharan African, and South African perspective. This was done by collecting and analysing published journals, peer-reviewed journals, newspaper articles, and books. • Semi-structured interviews were conducted with waste pickers, local authorities, NPOs and NGOs.
2. To determine how effective waste pickers' contributions are from a Central Johannesburg citizen perspective.	• Comprehensive analysis of available research data was conducted from a Global, Sub-Saharan African, and South African perspective. This was done by collecting and analysing published journals, peer-reviewed journals, newspaper articles, and books.

	• Semi structured interviews with citizens within Central Johannesburg was conducted.
3. To examine the existing policy documents for solid waste management in Johannesburg	• Comprehensive analysis was conducted with the use of available policy documents related to waste management from a National, Local and Provincial perspective.
4. To determine the best theoretical framework for the inclusion of informal waste pickers in formal solid waste management strategies in Johannesburg.	• Comprehensive analysis of available research data was conducted from a Global, Sub-Saharan African, and South African perspective. This was done by collecting and analysing published journals, peer-reviewed journals, newspaper articles, and books.

4.3. Description and history of the study area

Central Johannesburg was first formed in 1886 with the discovery of Gold within the Reef in Johannesburg which not long after, gave rise to the cosmopolitan city that now exists (Davie, 2014). Gauteng is the smallest province in South Africa and contributes around 40% to the country's GDP (Davie, 2014). Central Johannesburg is known for its growing city due to the migration of people and square meters of tall buildings housing many companies (Davie, 2014). Central Johannesburg has a very interesting history which dates back to 1886 when word had spread of the discovery of gold in Langlaagte, which gave rise to the formation of settlements of miners and businessmen (Latilla, 2018).Braamfontein was a farming district in 1850 which is located with Westdene in the west, Houghton in the east, Parktown in the north and Parkhurst in the South (Latilla, 2018). There was a piece of the farm that was sold in

1888 which gave way to the formation of a residential area for skilled working-class individuals in 1890 (Latilla, 2018). During the time of 1930-1950, many businesses relocated to Braamfontein, which caused the demolition of houses and churches (Latilla, 2018). This is what is seen in current-day Braamfontein, which is a city center for business and trade.

Mayfair is a bustling residential area found west of Braamfontein and part of the Central Johannesburg location (Nerio and Halley, 2022) Mayfair was formed in 1896 with the purchase of a plot of land after the discovery of gold in Langlaagte (Van Der Waal and Grutter, 1986). Today, Mayfair is a culturally rich suburb with a predominantly Indian Muslim influence, who are descendants of migrant workers and shop owners who operated in the greater Fordsburg and Mayfair from the 1940s through apartheid up until the present (Desai and Vahed, 2019).Today, both the areas of Braamfontein and Mayfair are densely populated as the areas give rise to housing for many people including migrants, furthermore, Braamfontein is populated with students who attend tertiary facilities in the area.

Braamfontein is also a busy city center housing many privately owned companies and businesses that have day-to-day trade (Nerio and Haley, 2022). Central Johannesburg covers 1, 644 km^2 with around 1,962 people per km^2 (City of Johannesburg, 2018). As per the census 2022, over 15 million people living in the Gauteng province, with 957 441 people living in Central Johannesburg (Stats SA, 2024). Over 85% of solid waste is disposed of via the use of municipal authorities once a week. However, 0,2% of waste has other means of disposal within the area (Stats SA, 2024).

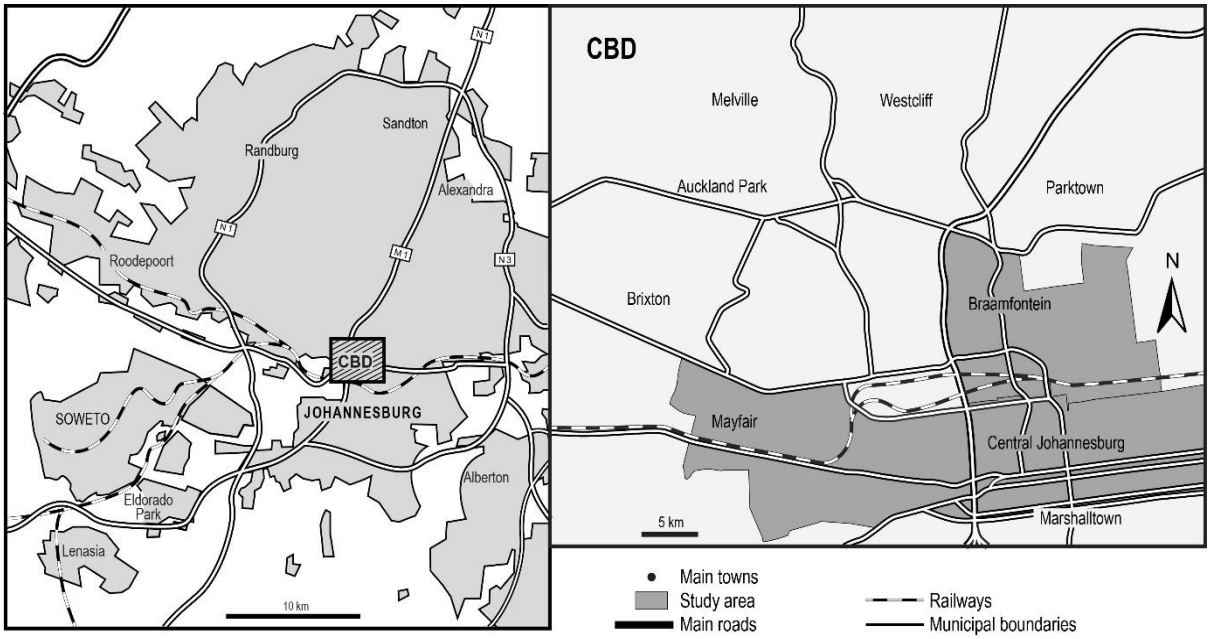


Figure 1: Study area of Central Johannesburg (Wits Cartography unit, 2024).

The choice of study area was based on two main aspects. Firstly, Braamfontein is a bustling city center that also houses residents. Mayfair is a residential area with small businesses established within the area. Secondly, the study area is noted to be overpopulated and urbanized, which makes for an increased waste output (Schoeman and Rampedi, 2022). Considering this, waste picker activity would be prevalent in areas where more waste is created and disposed of (Dias, 2016). The study area was purposively chosen to best understand waste picker challenges in an area that is densely populated, along with the demand for waste collection and disposal. Furthermore, the study area choice was important in understanding the contributions of waste pickers from a citizen perspective, given that proper waste management services are required. Given these two parameters, it was important to choose a study area that best gave an understanding of a particular theoretical framework for the inclusion of waste pickers into formal strategies and plans, and to further analyse waste management policy documents regarding waste picker activity and waste management regulations governing the study area.

4.4. Population description

The demographics of the waste pickers within Johannesburg Central are mostly male and have some form of schooling such as high school education (Schoeman and Ramutanda, 2023). Around 81,6% of waste pickers within Johannesburg are South

African nationals thus 18,4% of waste pickers are of foreign extract (Schoeman and Ramutanda, 2023). Most of the waste pickers within Johannesburg are of South African descent however some of them are from neighbouring African countries such as Zimbabwe, Lesotho, Malawi, Botswana, and Mozambique (Schoeman and Ramutanda, 2023). Waste pickers within Johannesburg are mostly of Black African descent however, there are waste pickers of Coloured, White, and Asian/Indian race groups (Schoeman and Ramutanda, 2023). The study did not focus on race and country of origin as this would not answer the main questions of the study. However, previous studies, such as Schoeman and Ramutanda (2023), have outlined background information on waste pickers in Johannesburg and this is worth noting.

Over 957 441 people are living within Johannesburg Central as per the 2011 census. There are over 92,8% of formal dwellings with 36,5% of households in the area headed by females (Stats SA, 2024). Furthermore, 16,6% of people within the region do not have an income (Stats SA, 2024). Most of the population in Central Johannesburg are between the ages of 15-64 years old (Stats SA, 2024). 96,9% of refuse within Central Johannesburg is removed every week (Stats SA, 2024). Pikitup is the waste collection service within The City of Johannesburg that operates around 1,652 km^2 of the city and disposes of an estimated 1,4 million tons of waste generated by the citizens per year (City of Johannesburg, 2018). Pikitup cleans an estimated 9,000 km's of Johannesburg streets within the seven regions of the city (City of Johannesburg, 2018).

4.4.1. Sampling strategies and procedures

The total population in the study area, according to the Stats SA (2024) is 957 441 people. There are 6,000 waste pickers in Johannesburg (South African Waste Pickers Association, 2024). Due to limited time and costs to conduct the study, a purposive sampling technique was employed. Purposive sampling is a method utilized in qualitative research in which small samples are chosen with purpose, to allow for depth in understanding instead of the scale associated with research (Campbell *et al.*, 2020). For the study, the population study was reduced to 30 citizen participants and 30 waste pickers due to cost implications and time constraints, however an ideal sample size would have been 10% margin of error. Furthermore, the choice of the number of participants is due to the study being qualitative with aspects of quantitative study. The citizens within the study area were purposively chosen as their insight

would have been more specific to the objectives of the study (Campbell *et al.*, 2020). The waste pickers identified were based on purposive and snowball sampling in which a small sample was chosen but identified via snowball sampling with the assistance of NPOs and NGOs, who were also surveyed in the study. Furthermore, the study had used snowball sampling in which participants gave insight into prospective research participants (Ahmed, 2024). For the NGOs, NPOs and local authorities, purposive sampling was used in which specific groups and individuals were identified and surveyed (Ahmed, 2024). In this instance, 4 NGOs and NPOs as well as 3 local authoritative members were proposed for the study. The informal waste NPOs, NGOs and local authorities were chosen based on relevance to the study and their presence within the study area.

4.4.2. Case study of Central Johannesburg

Case study approach is utilized in research to attain an in-depth understanding of complex situations and real-life problems (Crowe *et al.*, 2011). This type of approach is often used in social sciences and is used to give depth of answers to “how,” “what” and “why” questions within research (Crowe *et al.*, 2011). This would allow for the development of theories based on the level of depth research questions are answered within the case study approach and is the best approach for qualitative research studies (Crowe *et al.*, 2011). There are advantages and disadvantages to using the case study approach.

The advantages of using the case study approach include the ability to understand social-related phenomena, it can withstand several types of evidence and its conditions and to provide real-life perspectives and integrated knowledge of the problem (Glette and Wiig, 2022). The disadvantages to the case study approach are lack of rigor especially with guiding researchers, lack of understanding of the study definition and ability to be general (Glette and Wiig, 2022). However, considering this, the case study approach is used when diverse groups are to be interviewed (Glette and Wiig, 2022). Due to this, this study utilizes the case study approach to be able to understand the perspectives of diverse groups within the waste management chain and a specific study area. This would allow for understanding of real-life occurrences and be able to answer questions related to the research.

4.4.3. Qualitative data collection

The first phase of the study was conducted by intensive search, collection, and analysis of existing data via the use of search engines, archival records, news articles and published journals that have emphasized informal waste pickers globally, within Sub-Saharan Africa and South Africa. The second phase of the research was conducted via the semi-structured interviews of 30 waste pickers, 30 citizens, 4 NGOs and NPOs and 3 local authoritative figures within the study area.

The first crucial step of the study was to attend an ethics clearance training session which was provided by the Ethics committee of the University of Witwatersrand. Once the training session and assessment was completed, an ethics application was made to the Ethics committee to grant the conducting of research within groups considered as sensitive. This certificate allowed for research to be conducted and semi-structured questionnaires to be completed by the relevant parties needed for the study. Concurrently to ethics application, semi-structured questionnaires to fulfill the study; were formulated for each group of individuals to be interviewed namely waste pickers, citizens, authoritative figures, informal waste NGOs and informal waste NPOs. The relevant organizations were contacted to request to partake in the study and these documented requests were also sent with the ethics application, to the committee. The organizations were approached in an ethical manner which made them aware of anonymity and the right to decline to partake in the study. Only those who gave written consent were included in this study. Authoritative figures were also approached for consent and only those that provided written consent were included in this study.

The study began with approaching the organizations for aid with identifying waste pickers that operate within the study area namely Braamfontein and Mayfair. The semi-structured questionnaires were printed and site visits to Entity 1 were completed over a one-day period. Entity 4 was visited with the relevant waste pickers being named and semi-structured questionnaires to be completed with the use of very easy-to-understand English. The study with Entity 4 had spanned over two days between two weeks in October 2024. It is imperative to remember that the semi-structured questionnaire was only completed where the relevant individuals gave consent. If no consent was provided, this was respected. The outline and details of the study were explained to each person with the use of basic English so that the persons in question

could decide to partake or decline. The study was also conducted in an isolated manner so that the interviewed waste pickers did not influence each other's responses.

Citizen semi-structured questionnaires were conducted via face-to-face and online methods. Using the Snowballing and purposive methods, individuals residing within the study area were identified and interviewed based on consent given. Semi-structured questionnaires were also posted on social media groups for the study areas such as Braamfontein and Mayfair. Snowball sampling is a commonly used methodology in which one respondent gives insight into another prospective interviewee (Kirchher and Charles, 2018). The Snowball sampling procedure was used to interview the waste pickers, citizens, NPOs, NGOs and local authorities. Snowball methodology allows for one party to give insight into potential individuals who would participate in the study. The purposive methodology involves selecting respondents based on their characteristics and is often used in qualitative studies as the selected groups of individuals have specific views and experiences that are to be examined (Campbell *et al.*, 2020). Purposive sampling was employed to conduct the semi-structured interviews as well as to conduct the comprehensive analysis of published and available data. The collection of data from citizens spanned over three months from October through to December 2024.

Local authoritative figures were approached telephonically and were based on the availability of individuals to conduct consented interviews for the study. The authoritative figures were interviewed during the period of October 2024 due to availability and verbal consent was provided during the telephonic interviews. The data was collected by writing on printed questionnaires. All printed documents were saved according to ethical application requirements and agreements such as being scanned and stored in a password-locked folder for seven years, after which data will be destroyed.

To answer the qualitative aspects of the study, data such as news articles, books and published journals were found via the use of online search engines and online databases. Furthermore, governmental websites were searched to identify and analyse policy-related documents and existing published frameworks for informal waste management and waste pickers within South Africa.

4.5. Data analysis

4.5.1. Semi-structured questionnaires and analysis

The semi-structured questionnaires comprised multiple-choice questions that asked the respondents about the age categories to which they belong. Semi-structured interviews are crucial in understanding people's views and experiences in a more in-depth manner without the study being compromised by stand-alone multiple-choice questions and answers, which may not be the view of the respondent and further identify the perceptions of the individual (Hargreaves and Seale, 1981). The open-ended questions in the questionnaire were analysed individually for each category of persons interviewed and results were tallied based on similar responses given to the questions. Content analysis was the method used to analyse the open-ended questions of the semi-structured questionnaires within the study. Content analysis is a research methodology in which texts can be replicated and inferences can be deduced from texts that have been inputted (Bengtsson, 2016). Usually, content analysis involves identifying frequently used words and terms when analysing large volumes of data and this can further be quantified (Bengtsson, 2016). The multiple-choice questions within the semi-structured questionnaires were analysed by counting each response to each question and placing it on a well-structured Excel sheet to create diagrams such as pie charts for visual interpretations.

4.5.2. Qualitative analysis of existing data

Data such as available published journals, newspaper articles and books were identified using specific terms and references such as "informal waste sector," and "informal waste collectors" to name a few. The data was stored, and specific themes and items were searched for in the data, which was analysed using content analysis. Grounded theory was utilized to analyse the collected data to further identify theories best suited for the objectives of the study. Grounded theory can be defined as a research method used to identify theories of a study based on data that has been collected (Noble and Mitchell, 2016). It is often used to identify relationships in society among actors and their behaviors thereof (Noble and Mitchell, 2016). Furthermore, deductive reasoning was used to come to conclusions about the study based on the

available data from the qualitative research and the aspects of quantitative study based on the semi-structured questionnaires. Deductive reasoning ascertains facts from already-known ideas such as theories, investigations, and observations to arrive at a viable conclusion (Fife and Gossner, 2024).

4.6. Limitations and challenges

The study was conducted over a three-month period in which data was actively collected from the relevant participants required for the study. The limitation in this regard, was the lack of time to collect enough data or gather more individuals to answer the semi-structured interviews. Challenges experienced during the study were during the ethical clearance stage, and the lack of buying-in from certain groups of individuals such as buy-back centers, which had to be omitted from the study due to lack of permission given to conduct research within this group. A major challenge experienced during the study was the citizen input and pushback received from citizens of the study area. Many citizens voiced concerns about the fact that the study is irrelevant as they have issues with electricity supply and water cuts and waste management is already taken care of by the municipal services. Language was a major challenge with the waste pickers being interviewed however, this was mitigated with the questions being easy to understand and taking time to explain the research in the easiest to understand language. Those that did not understand English that well, mostly refused to take the semi-structured interviews and were omitted from the study.

4.7. Delimitations and assumptions

The study areas within Central Johannesburg, namely Mayfair and Braamfontein, consist of a dense population. The choice of population size of each group of participants was based on factors such as lack of time, funds, and the understanding that a quantitative study with aspects of qualitative research does not require a full set of participants to provide results. This delimitation also extended to the aspects being posed in the survey. Factors such as race and gender of participants were not questioned as this was irrelevant to the study. An assumption made is that most of the participants were young and able-bodied however lacked key knowledge around proper waste management within the study area. This assumption also extended to waste pickers, where most are reclaiming waste to make a daily wage.

4.8. Ethical considerations

Ethical clearance for the study commenced with a training session which was guided by the Ethics Committee of the University of Witwatersrand. Once this was completed alongside an assessment, a certificate was issued to allow for research to be conducted. Parallel to this, relevant groups such as NPOs, NGOs and local authorities were approached to request permission to conduct research. All groups, including citizens, were given two documents to understand the study and grant permission to conduct the semi-structured interviews. The participant information sheet (see appendix) displayed the objectives of the study and the need for participant input. The permission sheet (see appendix) was issued to the participants and was either signed, permission selected (as per online questionnaires) or verbal permission was given. The permission sheet had stated that participants are not obligated to take the survey and can decide to leave the interview had they felt uncomfortable. All semi-structured questionnaires were stored based on the ethics application made to the school, such that documents would be scanned and stored in a password-locked laptop. Documents and data would be destroyed after 7 years.

4.9. Conclusion

Central Johannesburg has a rich history of migrants moving in and out for business ventures, however it has transformed into an area overpopulated and urbanized. Overpopulation and urbanization have placed a burden on solid waste management due to this fact. Many challenges were faced during the study and can sometimes give a glimpse into the overall challenges that citizens within Central Johannesburg face on a day-to-day basis. Being overpopulated, the study area is faced with many service delivery issues due to demand. Waste pickers within the Central Johannesburg area assist with the demand for proper waste management and keeping the area clean.

Chapter 5: Research results and analysis

5.1. Introduction

This chapter explores the results from the research conducted via qualitative research with parts of quantitative research. The aim of the study should be kept at the forefront, with that being to comprehensively assess the current contributions of the informal waste collectors in Central Johannesburg. This was to understand how best the informal waste sector can be incorporated into local waste management plans and policies. Given the objectives of the study, this chapter will be broken into sub-sections based on the relevant objectives of the study and the results pertaining to the objectives. Furthermore, the results will be presented via the use of charts as well as in-depth explanations of the semi-structured surveys taken by the relevant groups of individuals. The qualitative aspect of the study in which critical analysis of available data was completed, will be discussed further in the discussion chapter (chapter 6) of the report.

5.2. Demographics of waste pickers in Central Johannesburg

The study required the semi-structured interviews of 30 waste pickers, 4 informal waste NGOs and NPOs, and 3 local authoritative figures within Central Johannesburg. Out of the 30 waste pickers needed for the study, 24 waste pickers were interviewed. The informal waste NGOs and NPOs remained at a total of 4 bodies and only 2 out of 3 local authoritative figures had given consent to partake in the study. Given this, 80% of the outlined number of waste pickers had participated in the study. This displays a good participation rate regarding the waste pickers. A high participation rate is required in research to increase validity among the population group and to further create higher quality (West *et al.*, 2023).

The critical analysis of available data such as books, peer-reviewed journals and news articles was conducted using keywords such as “waste pickers,” and “Challenges with waste pickers.” Using search engines and university online libraries, a total of 25 articles were identified from a Global, Sub-Saharan African, and South African perspective. The identification of these articles was crucial in further identifying the

general challenges faced by the informal waste sector particularly that of waste pickers.

5.2.1. Age demographics of waste pickers in Central Johannesburg

The age of the waste pickers was determined to understand the demographics of those within Central Johannesburg. The age categories of the waste pickers in Central Johannesburg ranged from 18 years, with the highest age being that of 65 years. Figure 5.1 below shows the age ranges from the group of waste pickers identified with the most being in the age category of 18-40 years of age. The waste pickers of the age category of 18-40 years had been 58% of the group interviewed whereas 12,5% of waste pickers interviewed were in the age category of 55-65 years. There were 29% of the waste pickers in the 41-55 years age category. No waste pickers were above the age of 65 years. This shows that many of the waste pickers are young and are working as waste pickers to make an income given the unemployment rate within the country. Secondly, there are waste pickers who are older, above the retirement age, who are also working to make an income as a waste reclaimer within the study area.

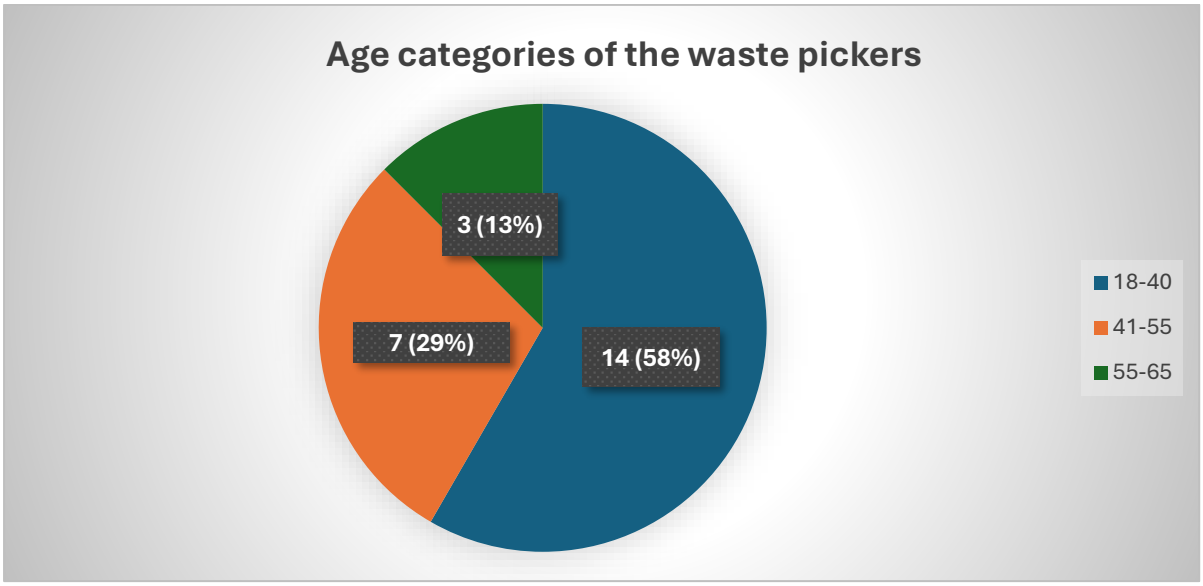


Figure 5.1: The age categories of the waste pickers interviewed in Central Johannesburg (Source: Researcher).

5.2.2. Educational background of waste pickers in Central Johannesburg

Waste picker educational backgrounds were questioned to determine the level of literacy amongst them in Central Johannesburg. The waste pickers interviewed mostly had a high school education. 50% of the total number of waste pickers interviewed had a high school education. 42% of the waste pickers interviewed had a primary school education. Around 8% of the total number of waste pickers interviewed had a higher education such as a diploma or higher certificate. Given the high number of waste pickers with a high school education, it can be identified that these individuals had to find other means of employment to make an income and did not rely on formal forms of employment.

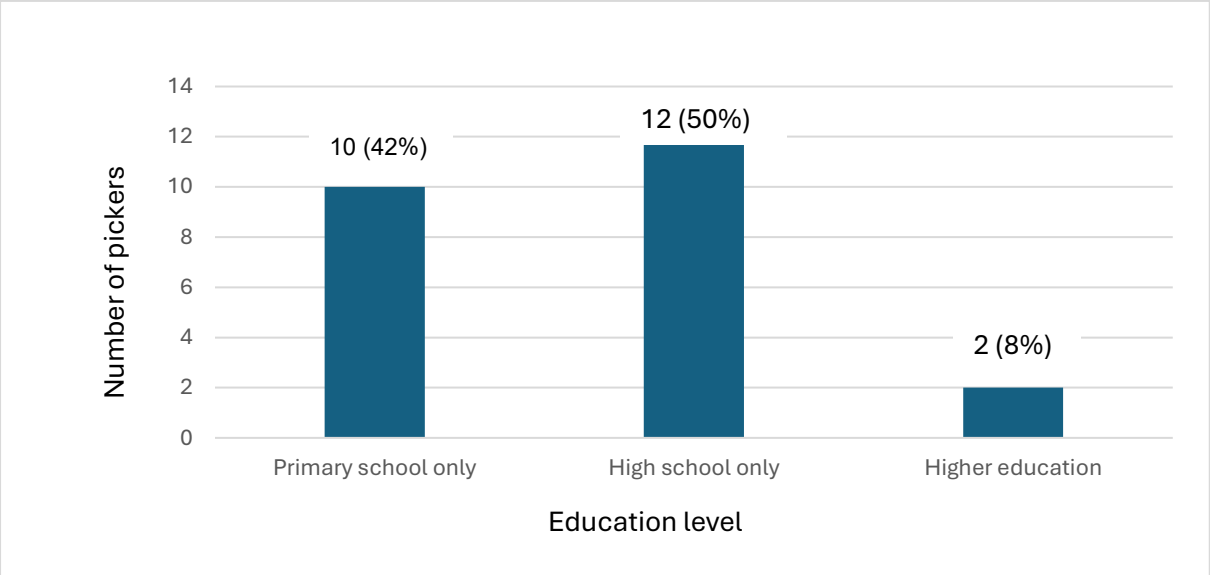


Figure: 5.2 The education levels of the waste pickers interviewed in Central Johannesburg (Source: Researcher).

5.3. Informal waste sector functioning and challenges within Central Johannesburg

Waste pickers were asked if they were affiliated with a union or a group. This was done to determine if waste pickers belonged to a union or group that took care of them and supported their functions within the study area. 54% of waste pickers interviewed had said that they were part of a group. This can be attributed to the waste pickers' affiliation with an NPO or NGO within informal waste management. A total of 48% had stated that they were not part of an organization, group, or union.

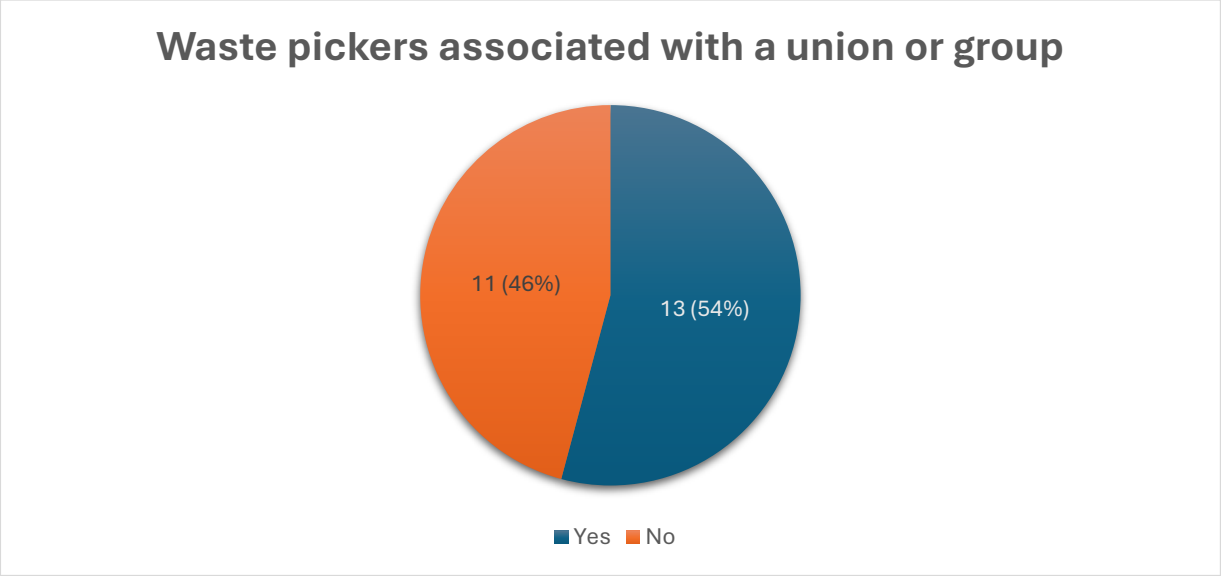


Figure 5.3: Affiliation of the waste pickers in Central Johannesburg with a union or waste group (Source: Researcher).

5.3.1. Years experience of the waste pickers

The purpose of this aspect of the study was to determine how many years the participants were part of the waste picker community. Figure 5.4 below displays the number of years the waste pickers have in the informal waste reclaiming sector. 37% of waste pickers interviewed have 6 to 10 years of experience in the waste reclaiming sector. 2 (8%) waste pickers stated they have over 20 years of experience as waste pickers. According to the results of these individuals, they are within the age category of 55-65 years. Considering this, these individuals have been working as pickers for majority of their adult years. Around 17% of waste pickers interviewed have 11 to 15

years' experience with a further 17% of waste pickers having 16 to 20 years' experience in the sector.

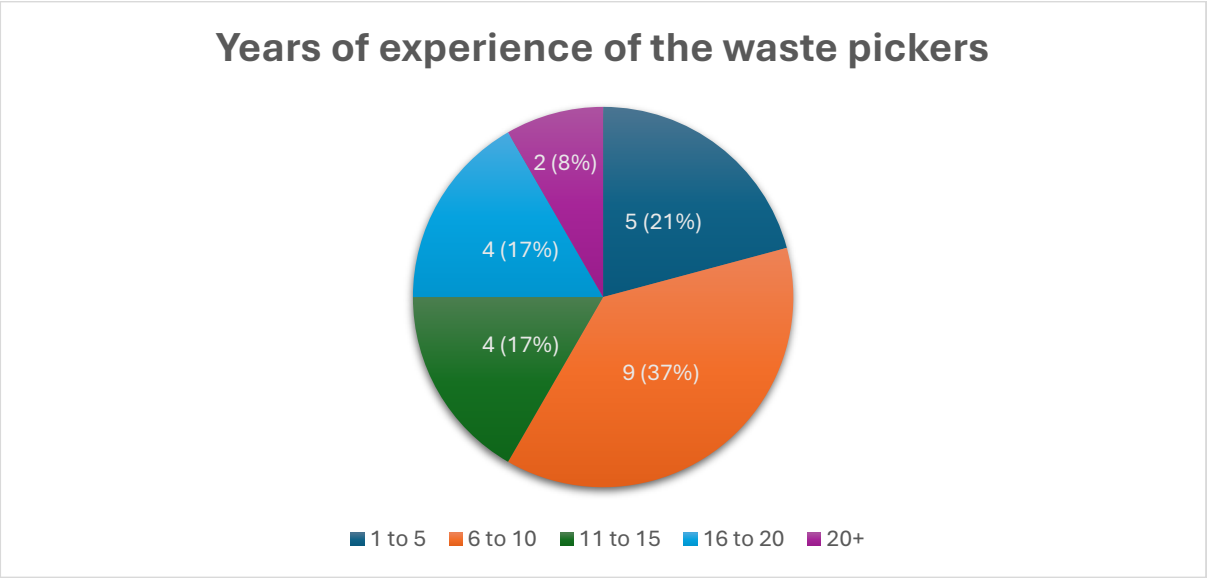


Figure 5.4: Years of experience of waste pickers interviewed (Source: Researcher).

5.3.2. Number of days waste pickers are operational in Central Johannesburg

The number of days a waste picker works was asked to be able to determine if waste pickers worked a normal 5-day work week or more. Waste pickers interviewed mostly collected recyclable items from the study area between 5 to 6 days a week. 38% of waste pickers collected items 5 to 6 days a week with 4% of waste pickers collecting items over a full 7-day week. As per Figure 5.5 above, 8% of waste pickers collect waste over 3 days a week.

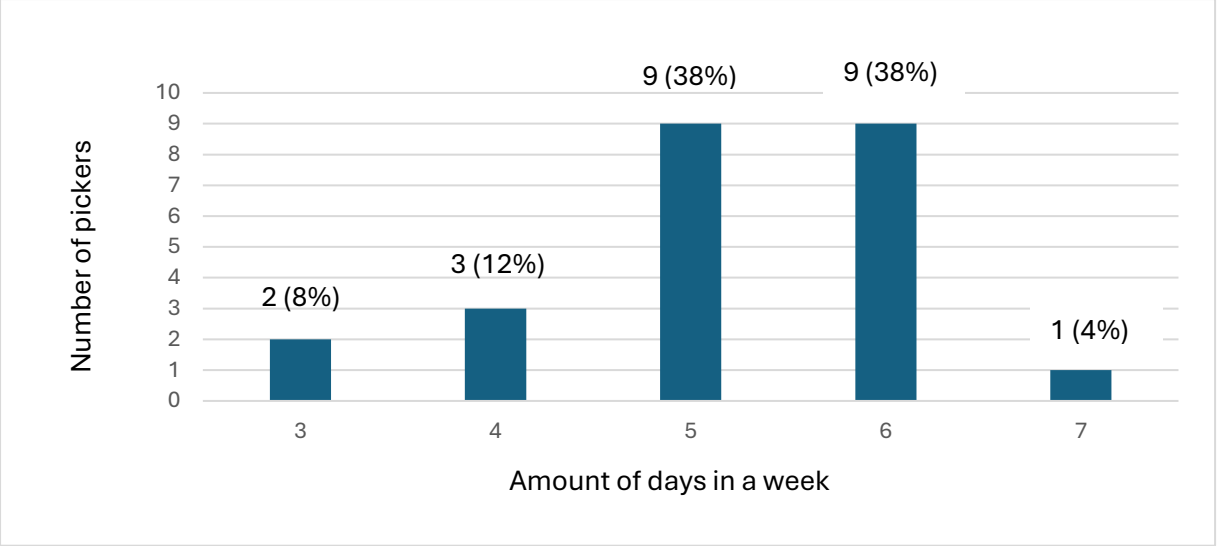


Figure 5.5: The number of days that waste pickers collect recyclables in a week (Source: Researcher).

5.3.3. Waste picker representation

Waste pickers were asked if they were well represented within the informal waste sector. The purpose of this aspect of the questionnaire was to understand the dynamic between waste pickers and the general informal waste sector. As per Figure 5.6 below, 75% of waste pickers who were interviewed feel well represented within the sector. However, 25% of respondents do not feel well represented as a waste reclaimer. As per the interviews and analysis of the responses given by the pickers, almost 77% of the respondents that are part of an informal waste group such as a NPO or NGO, do feel well represented. However, 23% that do belong to an informal waste body do not feel well represented as waste pickers. Out of the 46% that do not belong to a waste reclaimer body/group, only an estimated 17% feel well represented as waste pickers.

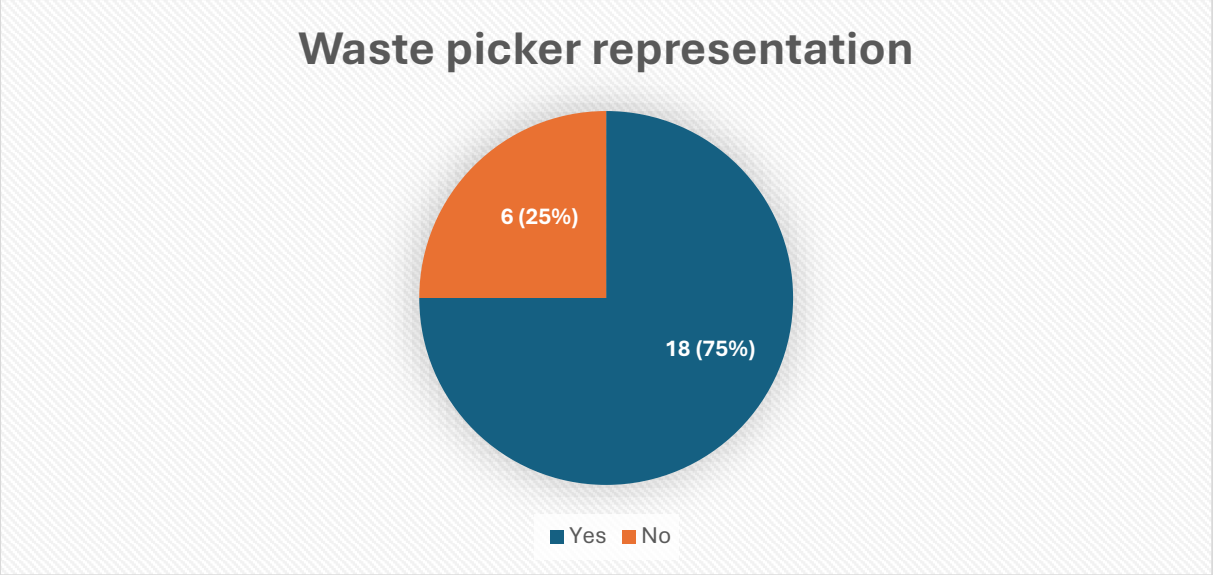


Figure 5.6: Waste reclaimer representation in the sector (Source: Researcher).

5.3.4. Waste picker reception by people

Waste pickers were asked how were treated and received by people within Central Johannesburg. 29% of the pickers were of the view that people well received them. The semi-structured interviews allowed the pickers an opportunity to further divulge how they were treated. The waste pickers who were of the view that they were well received stated that some citizens are even generous to provide them with clothing and assist with the separation of recyclables. 21% of pickers stated that they were not treated well by people and further went on to state that they are often called names on the streets. Majority of the waste pickers that were interviewed stated that they were received in a mixed manner with people treating them well and others treating them badly.

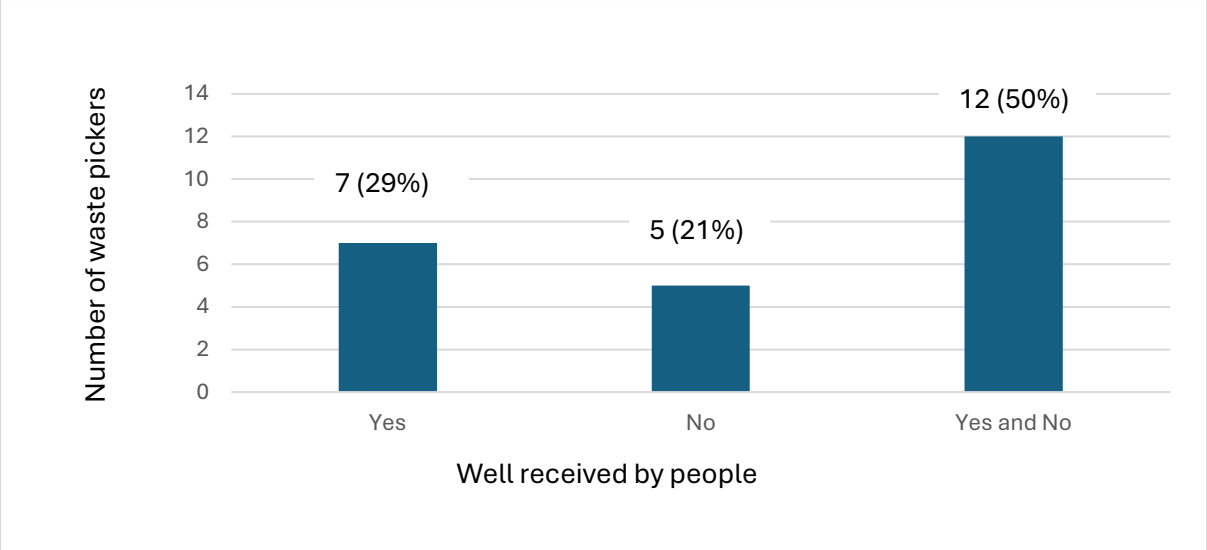


Figure 5.7: Pickers feelings about being received by people (Source: Researcher).

50% of the waste pickers stated that it was dependent on factors such as where they were and what they were doing, for example collecting or travelling, that decided the treatment. These individuals stated that people often insult them and do not treat them as part of society especially those of foreign extract. Furthermore, some of these pickers stated that they do not feel safe and can be attacked. There are also turf wars occurring where different ethnic groups are fighting for spaces to cover in terms of collecting recyclables. However, these 50% middle ground respondents also were of the view that people do treat them well.

5.3.5. Improvement in waste picker operation

The purpose of this aspect of the questionnaire was to gain an understanding from waste pickers, about the various needs required to improve their operations. Figure 5.8 below displays the suggestions that were made by the waste pickers who were interviewed about how their jobs can be improved. 41% of the waste pickers stated that improved coordination and transport are needed to do their job. This entails an improvement to the trolley system which they currently use. To add to this, some have added on to say that this would maximize their travel times and capacity to hold recyclable material. 4% had stated the need for awareness programmes and education of the public on the role of waste pickers. Around 12% of the respondents stated that being acknowledged by society and government would be an important feat which would result in inclusion by society. 8% of waste pickers stated the need for an improvement to rates and pricing of recyclable material when sold to buy-back

centres. Around 17% stated the need for better recyclable sorting spaces which was further stated by 1 respondent that this issue has resulted in harassment by other waste pickers and thus having more space would create less safety issues. 4% stated that formalization is required which would allow for inclusion in society and less in-fighting among other waste pickers. Lastly, 12% of waste pickers have stated that there is a need for improved safety and security for them to work and 1 respondent went on to state that better ablution facilities would be needed.

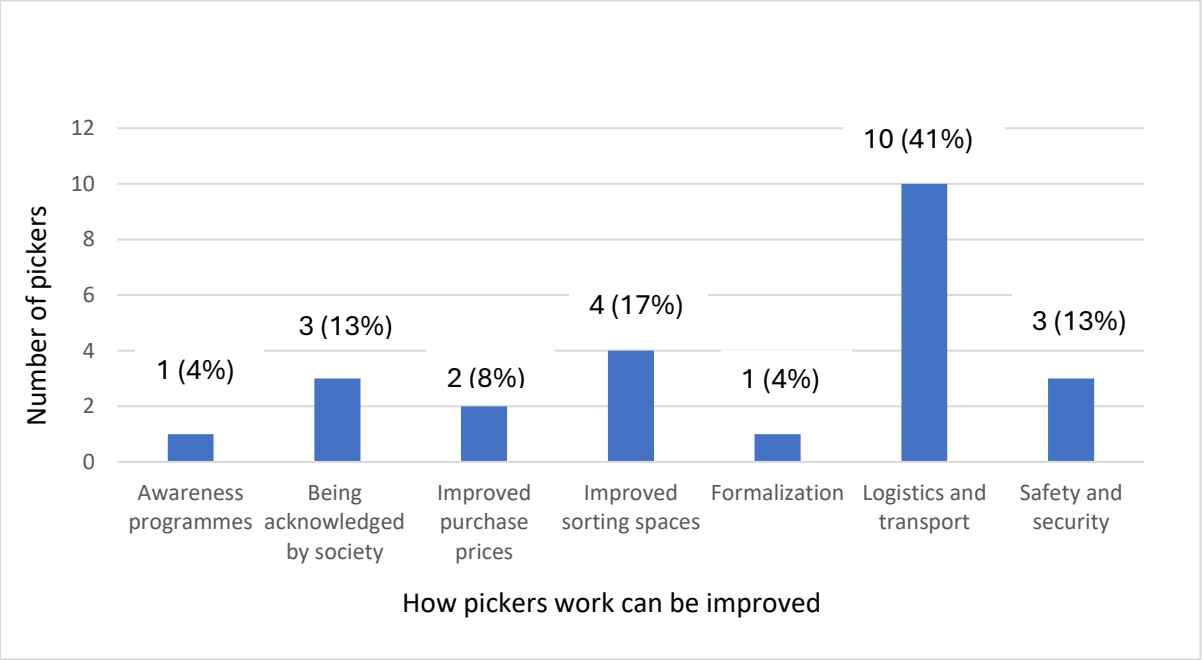


Figure 5.8: Ways that reclaimer function can be improved (Source: Researcher).

5.3.6. Operational benefits for waste pickers

Waste pickers were asked what benefits from their job, they could have or be provided with. In Figure 5.9 below, most of the waste pickers stated that better income is the benefit they would like to have. An estimated 59% of respondents stated that they would like to earn more money. The second highest item to be identified was better pricing for recyclables sold. 13% of waste pickers interviewed highlighted the need for an improvement in the prices attached to recyclable goods when sold to buy-back centres. The third highest-ranked need identified by the waste pickers was improved housing with an estimated 8% of respondents highlighting this. 4% of waste pickers had stated acceptance in society as a benefit they require, 4% identified the need for access to basic healthcare, 4% also stated the need for identification cards and 4%

had stated improved sorting facilities. Referring to Figure 5.8, safety was identified as a requirement to do daily tasks effectively. In Figure 5.9, safety was mentioned again by 4% of the respondents showing that this was a concern to them. Some further added that PPE should be a benefit when speaking about better income as a benefit.

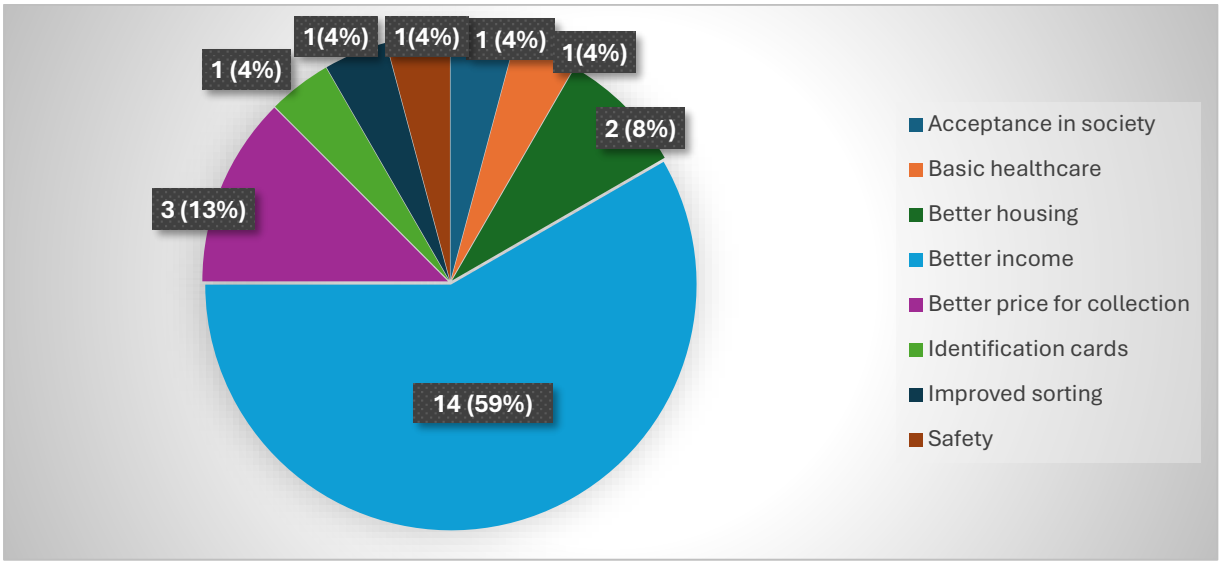


Figure 5.9: Benefits that waste pickers in Central Johannesburg wish to have (Source: Researcher).

5.4. Challenges identified by informal waste NPOs and NGOs

Out of the 4 NPOs and NGOs, all 4 had given consent to partake in the study. Majority of the waste pickers interviewed were part of these organizations. Associated questions that were posed to the waste pickers, were posed to the organizations to gain insight into the operations within the informal waste management sector from their perspectives. In this sub-section, the results of the semi-structured interview may be mixed with some aspects being presented in graphs and others in descriptions.

5.4.1. The number of years the NGOs and NPOs are operational

The NPO/NGOs were asked about the number of years they have been active within the informal waste sector. Figure 5.10 below displays the number of years each organization has been active within the informal waste collection sector particularly dealing with waste pickers, within Central Johannesburg.

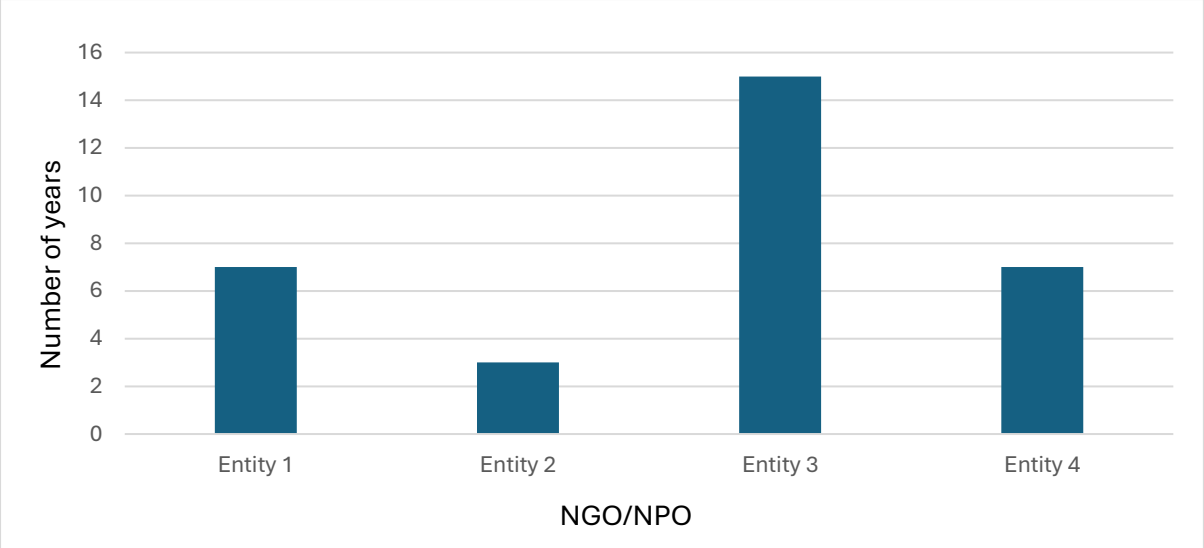


Figure 5.10: The number of years each organization has been active (Source: Researcher).

5.4.2. The number of days NPOs and NGOs deal with waste

The organizations were asked the number of days they dealt with waste collection by waste pickers. Most organizations stated 6 days a week where waste was managed by waste pickers. One organization (Entity 1) stated that they managed waste picking 7 days a week which was collected by waste pickers in the Central Johannesburg area. It was further stated by an organization that women waste pickers collect waste from midnight to 4 a.m. whereas men collect from 3 a.m. late into the night.

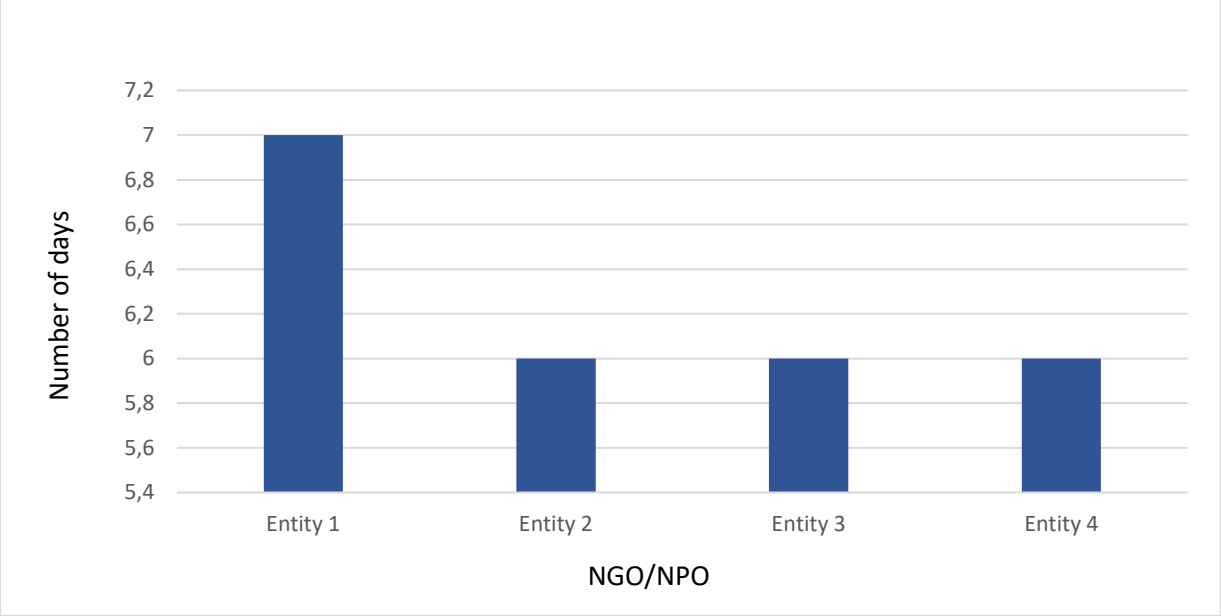


Figure 5.11: The number of days per week when organizations deal with waste collection (Source: Researcher).

5.4.3. NPO and NGO broader representation

The organizations were asked if they were of the view that they were well represented as organizations and 75% of respondents (3 out of 4) stated they were well represented. One organization (25%) that stated they do not, and further stated they are a young organization that still needs acceptance by society and buy-in from community members to be more recognized. The organizations were asked if they were received well by society. The result of this question was mixed. One organization stated that acceptance by people is based on the appearance of waste pickers such as properly marked trolleys and uniforms. One organization stated they are not received well by communities because waste is often sorted on the street and waste pickers are often labelled as street urchins. An organization stated that reception by communities is dependent on the area and organizations need to be more accepted by the government. Furthermore, an organization stated that treatment is based on the people and can be good or bad. The organization stated:

Some people think we are thieves

The organizations were asked how the line of work in the informal waste sector can be improved. It was stated by most that governmental and societal support is required. The integration of waste pickers can assist with resources from the government. Two

organizations stated the need for PPE and the improvement of trolleys. One of these organizations stated that the destigmatization of waste pickers is a need which can be achieved with the involvement of all parts of society such as citizens, government and corporations which could further assist with branding that could encourage waste picker activity and acceptance. One organization identified the need for improved sorting facilities for waste pickers.

The last question posed to the organization was what benefits the waste pickers should be entitled to. Two organizations stated that there needs to be more buy-in from people for waste pickers to do their job effectively. One organization stated that ethical business is required where waste pickers are being paid a fair rate for their recyclables and being recognized for the work done. Two organizations had stated that service charges should be paid by households in which resources such as trolleys, can be funded or even salaries can be paid to the waste pickers. Table 2 below presents the findings.

Table 2: NGO and NPO views on benefits entitled to waste pickers (Source: Researcher)

Benefits	Number of NGOs/NPOs (N)
Buy-in from citizens	2
Ethical business i.e. equal and fair pay	1
Recognition for work done	1
Service charges by households	2

5.5. Challenges identified by local authorities within Central Johannesburg

The purpose of this part of the study was to gain insight from individuals within authority in Central Johannesburg, particularly those that have worked or do work alongside waste pickers. For this aspect of the study to be completed, 3 local authoritative figures were initially found. However, only 2 local authorities had allowed interviews to participate in the study. This sub-section would not use any diagrams but would present results in an explanatory manner. The local authoritative figures were asked six questions related to waste pickers within Central Johannesburg.

The local authorities were asked if they had identified the role of waste pickers within Central Johannesburg. Both local authoritative figures stated that waste pickers have a role within the Central Johannesburg area and the area is populated with waste pickers collecting waste from a household, commercial and industrial level. Furthermore, it was stated by one of the figures that waste pickers form an integral part of waste minimization within Central Johannesburg and reduce municipal expenditure by collecting waste that would be transported and disposed of with the use of municipal funds. It was further stated by one of the authoritative figures that even though they do play a role within Central Johannesburg, there is a challenge in terms of relationships between them and the municipality as well as Pikitup.

The local authorities were asked about the challenges faced with waste collection and management within Central Johannesburg. One authoritative figure had stated that there is not much of a challenge within Braamfontein as Pikitup often collects most of the waste and private entities are always ensuring waste is collected and managed effectively, even though in some cases these organizations are paying to have their waste managed. This creates an issue as rates for the collection of waste are still paid over and above the costs incurred from the management of waste by private entities. The second local authority stated that in Central Johannesburg, particularly in Mayfair and Braamfontein, there are a variety of issues that plague these areas in terms of waste management. Firstly, the city is overpopulated creating an increase in waste generation. The current model for collection is not dealing effectively with the overpopulation issue within the areas and the 240 Litre bins provided are not effective for disposal of most waste due to the influx of waste. The same issue applies to skips that are provided for businesses where it is not effective to cater to the waste being generated. Due to a lack of information surrounding the collection, waste is often illegally dumped on street corners in the area. Businesses are not educated about proper waste management and often mismanage the waste that is to be disposed of.

There are buildings and houses in Mayfair that have been occupied illegally by non-rate-paying individuals, with their waste ending up on the streets due to not having bins. There is an elevated level of “I don’t care” attitude among people in Central Johannesburg which leads to illegal dumping on street corners. There are often service delivery protests within Braamfontein which causes purposeful waste on the streets. This has an impact on the staff and waste pickers to collect waste from the

streets as their schedules would be disturbed due to these occurrences. Lastly, there is a lack of separation at source from business and household perspectives which can create co-disposal of waste in Central Johannesburg. If waste is to be separated at source, minimal efforts and money would be spent by the municipality for collection of waste for disposal.

The local authoritative figures were asked if waste pickers have improved waste management within Central Johannesburg. One authoritative figure stated mixed feelings as most waste pickers do collect recyclables correctly however few of them create a mess on the streets when they unravel bags containing waste. It was further stated by the figure that a timetable of waste pickers should be created whereby they operate alongside property owners for collection. This could eliminate in-fighting among waste pickers that is currently occurring. The second authoritative figure stated that waste pickers have improved Central Johannesburg by collecting waste which would end up at landfills. The figure also stated that waste reclaiming is now widely known by people due to waste picker activity.

The fourth question that was posed was the challenges seen with informal waste collectors in Central Johannesburg. It was stated that formalisation is the major challenge seen with waste pickers as well as insufficient money for the work they do. Furthermore, it was stated that waste pickers are frustrated due to lack of access as compared to Pikitup. Lack of tools such as trolleys, and bags, lack of space for sorting, lack of PPE and no transport were also identified as a challenge. Lastly, waste pickers also deal with soiled items which can be contaminated and a health risk.

The important question of how the informal waste sector is included into formal plans and policies was posed to the two local authoritative figures. It was stated that having a dedicated person within the municipality who is well-versed and educated in waste management would greatly assist as strategies can be developed and implemented alongside any existing strategies. This strategy should allow waste picker intervention whereby waste pickers and organizations such as NPOs, NGOs and mainstream privatised organizations can meet at waste management conferences to openly discuss ways forward. The other point was the registration of waste pickers in a database to identify them. There should be a needs analysis done to identify what the waste pickers are requiring such as trolleys, clothing and training, to name a few.

Lastly, it was stated that private corporations and entities should be partnered with to be able to participate in waste picker integration programmes.

The last question posed to the local authorities was what the challenges are surrounding informal waste picker formalization. From one authority, it was stated that there is a lack of open dialogue among key people such as waste pickers, community members and municipalities, to name a few. Furthermore, there is a lack of expertise around waste management and waste picker integration modalities which could lead to being open to having constant conversations with the waste pickers about their daily functions and challenges. Furthermore, citizens are not effectively educated about waste picker functions and their role in current-day waste management. Education programmes are required to enlighten people about recycling and waste picker activity and how citizens can help. From another local authority it was stated that waste pickers in Central Johannesburg are mainly of foreign extract without any formal documentation. This poses a problem for the identification of individuals and integration into the value chain of the city. Waste pickers also operate individually which makes it difficult to work alongside them, from a governmental perspective. In this way, waste pickers are included in co-operatives. Some waste pickers engage in criminal activities which leads to the importance of labelled PPE and identification cards in which citizens can identify the waste pickers operating in the area. It was further stated that citizens are not versed regarding waste picker activity which makes it non-conducive for waste pickers to operate. The authoritative figure further stated that there is a lack of land for sorting of waste however, the City of Johannesburg along with Pikitup to engage the region to identify sorting grounds for waste pickers to sort recyclables. It was stated that there is also a lack of private sector partnership, though the City of Johannesburg has invited the private sector as part of the empowerment programme for waste pickers.

5.6. Effectiveness of waste picker activity from citizen perspectives within Central Johannesburg

This section of results collection was to understand the dynamic of waste pickers with citizens in Central Johannesburg and if citizens found waste picker activity of value. For this section of the study, a total of 30 citizens of Central Johannesburg were envisioned to partake in the study. However, only 22 citizens gave consent to take part

in this study. Considering this, 73% of the total number of outlined citizens participated in the study which provides a good participation rate.

The outcome of the study further required the analysis of published and available data from a Global, Sub-Saharan African and South African perspective. The topic of citizen perspectives of waste pickers has not been extensively researched before however, 15 articles and journals were found using key terms such as “waste picker and citizen”, and “Waste picker relationship with citizens”. These articles were used to further elaborate on the responses received in the semi-structured surveys with citizens of Central Johannesburg.

5.6.1. Age demographics of citizens of Central Johannesburg

The citizens of Central Johannesburg were asked about the age categories in which they fit. Around 32% of respondents are within the 18-40 age category and a further 32% are also in the age category of 56-65 years of age. 27% of citizens who took part in the study are in the age category of 41-55 while 9% of respondents are 66-75 years of age. Figure 5.12 below displays the age relations among the citizens who took part in the study.

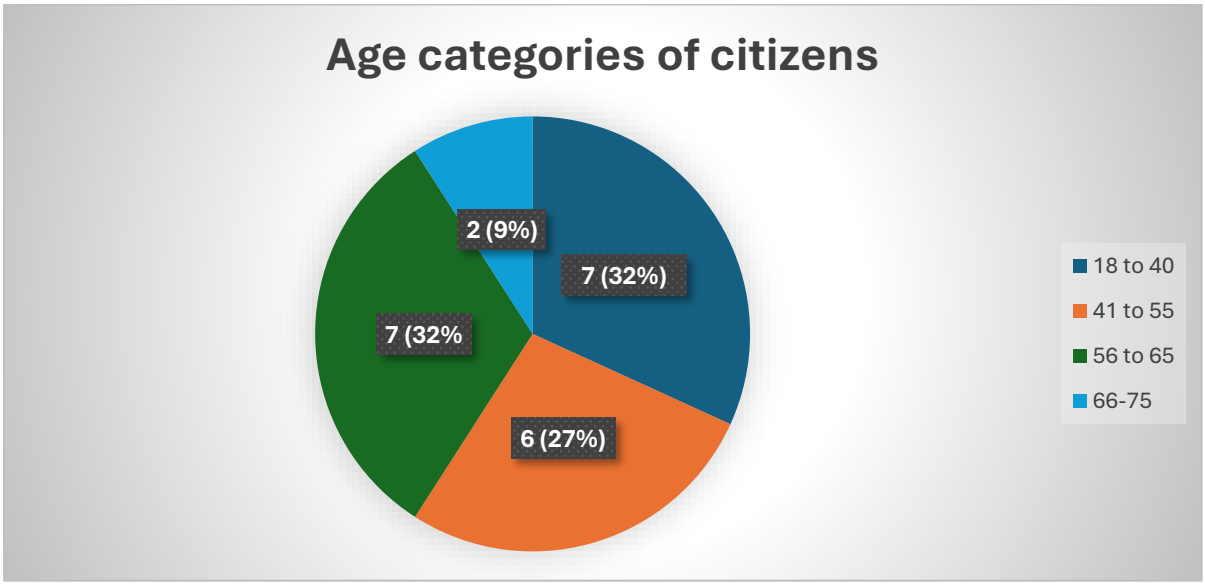


Figure 5.12: The age categories of the citizens of Central Johannesburg (Source: Researcher).

5.6.2. Waste disposal methods of citizens

Citizens of the study area were asked about their methods of waste disposal. Figure 5.13 below displays the various methods employed by citizens for waste disposal. Most of the interviewees stated that they disposed of waste by throwing away in the dustbin. 45% stated that the dustbin was the only choice of disposal. Around 14% of citizens stated that they dispose of waste with the use of the supplied wheelie dustbin and separate it at the source for recycling. A further 9% stated that they dispose of waste in the dustbin as well as dispose of garden waste at the disposal site of the area. A further 14% stated that they disposed of waste with the use of dustbins but also further provided recyclables to waste pickers in the area. 4% of the respondents stated that alongside bin disposal, they also resorted to the burning of waste such as sanitary pads. Around 5% of respondents stated that they composted vegetable peels and used the provided dustbins for waste disposal. One respondent (2%) went on to state that they do not use the provided dustbin service but rather recycle, provide items to waste pickers and discarded waste at the nearest waste disposal site in the area. Along with Figure 5.13 above, respondents also stated that waste pickers collect items such as glass every week.

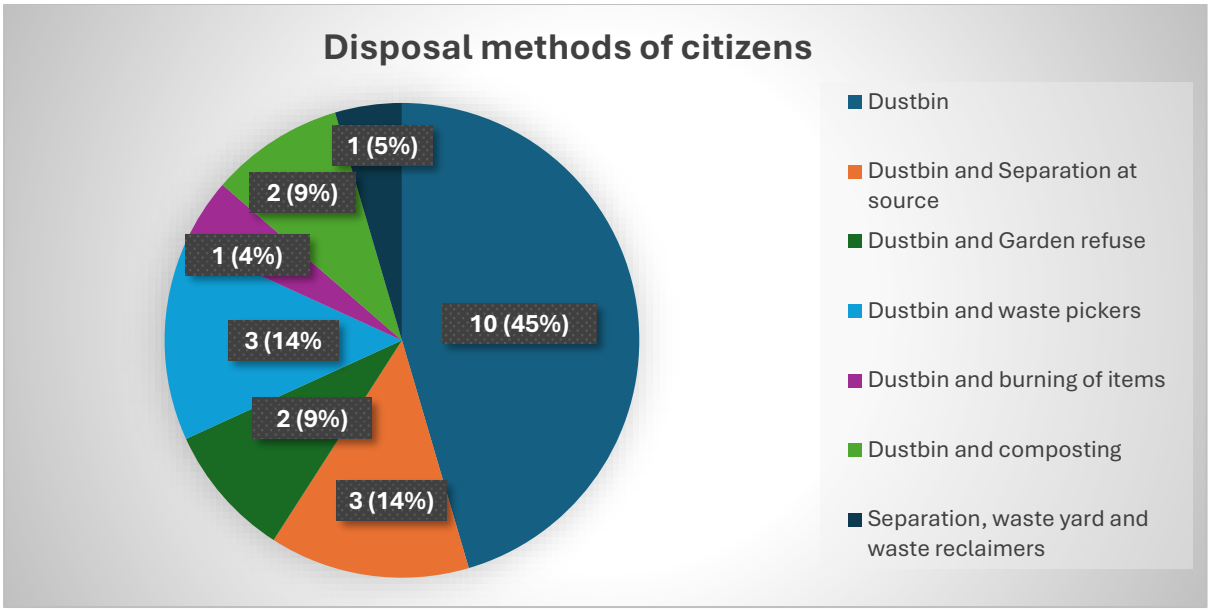


Figure 5.13: The disposal methods of citizens in Central Johannesburg (Source: Researcher)

5.6.3. Citizen use of waste picker services

Citizens were asked if they had their waste collected by waste pickers and if so, the number of times a week. Figure 5.14 below shows the number of citizens who responded to either yes or no. A total of 95% of respondents had stated they had their waste collected by a waste picker before. The respondents further went on to state that they have had waste picker activity in the area once a week, with one respondent stating they had waste picker activity twice a week in the past. One respondent stated that they have not had any waste picker collection before.

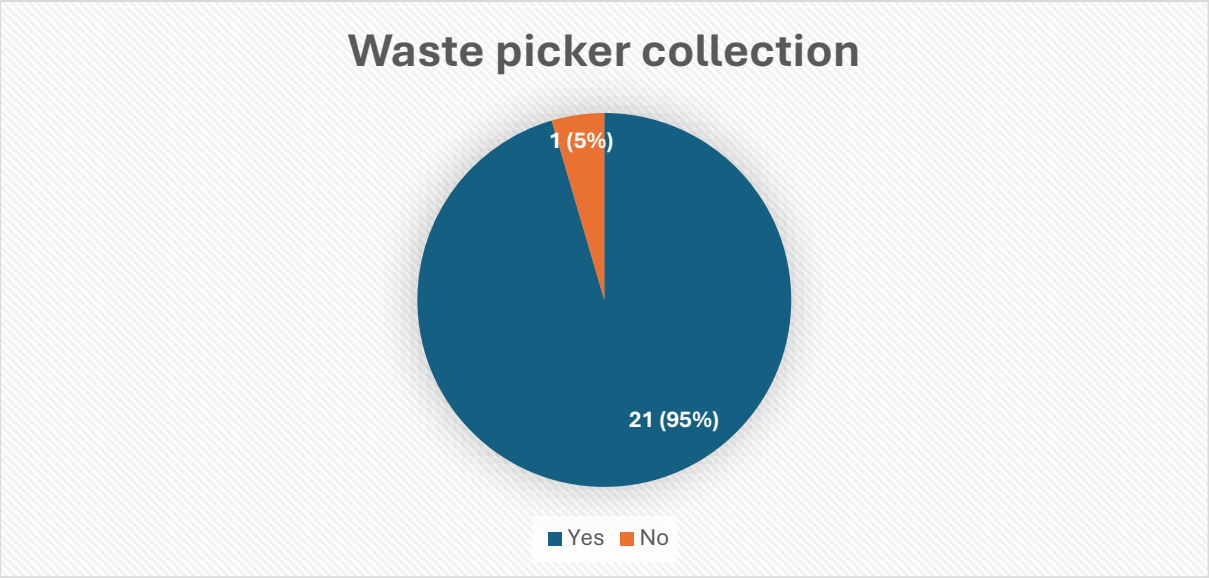


Figure 5.14: Citizen waste collected by waste pickers (Source: Researcher).

5.6.4. Citizen views on waste pickers in Central Johannesburg

The semi-structured survey further asked citizens about their views on waste pickers. The responses were mixed however most of the respondents stated the following presented in Table 3 below. Most of the respondents have stated that waste pickers use reclaiming as a source of income. Some citizens stated that dumping within the area is exacerbated by waste picking activity due to the opening of closed back to search for recyclables and leaving the waste in a pile instead of placing it back into the bags. One respondent stated that waste pickers are often found in parks and have created a living scenario in parks, which have now become breeding grounds for crime. Many respondents also stated that waste pickers assist in keeping the

environment clean however one respondent stated that waste pickers are often used by households to dispose of more waste items and are offered tips. This waste is then disposed of illegally on street corners. One respondent stated they are intimidated by waste pickers and often avoid them for safety reasons.

Table 3: Citizen views on waste pickers within Central Johannesburg (Source: Researcher)

Nature of responses	Number of respondents (n)	Percentage (%)
Making a living	12	55
Cleaning the environment	4	18
Illegal dumping	3	14
Good service for recycling	2	9
Intimidation	1	4
Total	22	100

5.6.5. Citizen views on the benefit of waste picker activity

The citizens were asked what the benefits were of the collection of waste by informal waste collectors such as waste pickers. There were mixed responses and Table 4 below outlines the key points made by the citizens. Most of the respondents stated that waste pickers improve recycling activity within the area with 27% of citizens stating that waste pickers keep the environment clean. Around 22% of citizens stated that waste picking activity has created jobs however, 5% have stated that waste picking has no real benefit as waste is already collected by Pikitup on a weekly basis. Furthermore, 5% of respondents also stated that waste pickers collect cans and bottles which can pose hazards if littered.

Table 4: Benefits outlined by citizens, of waste picker activity (Source: Researcher)

Nature of responses	Number of respondents (n)	Percentage (%)
Improved recycling	9	41
Cleaning the environment	6	27
Job creation	5	22
Reducing causes of hazards such as cans and bottles	1	5
No benefit	1	5
Total	22	100

5.6.6. Citizen view on waste picker activity and waste collection

Citizens were asked if waste pickers play a role in waste collection and to further elaborate. Figure 5.15 below displays the number of respondents who had selected yes against the respondents who had stated no. Most of the interviewees have stated that waste pickers play a role in the waste management of the area. They have further stated that waste pickers reduce the amount of waste disposed of at landfills and further assist with keeping the area clean and assisting with recycling however 18% of citizens stated that waste pickers do not have a role as they litter waste on streets when looking for recyclables in waste. The respondents that stated no, also said that waste picking is more of an employment opportunity, and they are mainly in waste picking to earn a living more than keeping the area clean.

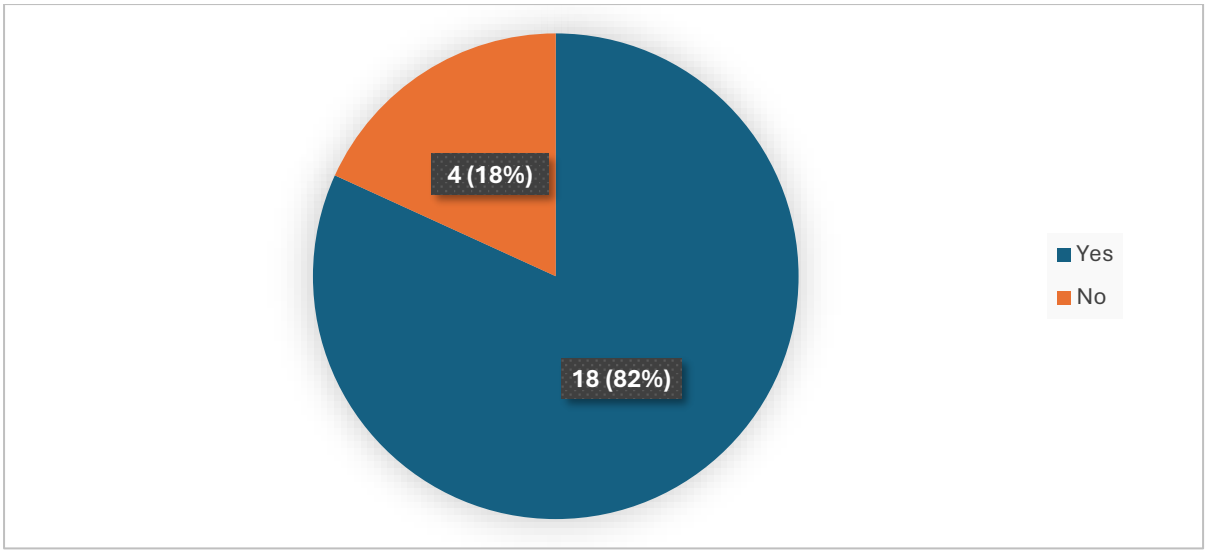


Figure 5.15: Citizens' view on the role of waste picker activity within Central Johannesburg (Source: Researcher).

Bins are tipped over and more dirt is found on streets because of waste pickers.

5.6.7. Citizen views on the improvement of waste picker operations

Citizens were asked about the aspects of waste picker collection that can be improved for better functioning. Figure 5.16 below displays the results of this question. Most of the respondents stated that better equipment such as trolleys, more durable bags and recycling bags are required for waste-picking activity. 18% of respondents stated that formalization and separation at source are required for waste pickers to work efficiently. Around 5% of respondents had stated pick-up points to be placed for waste pickers to collect recyclable material. 9% stated that timetables are needed for waste pickers so that citizens can be better prepared for when they collect waste. There were 14% of the respondents who stated waste pickers require identification cards to be able to effectively work with the community. Furthermore, 9% of citizens had stated formalization of waste pickers so that activity can become more regulated, and citizens can be more convinced to separate at source for waste pickers to collect.

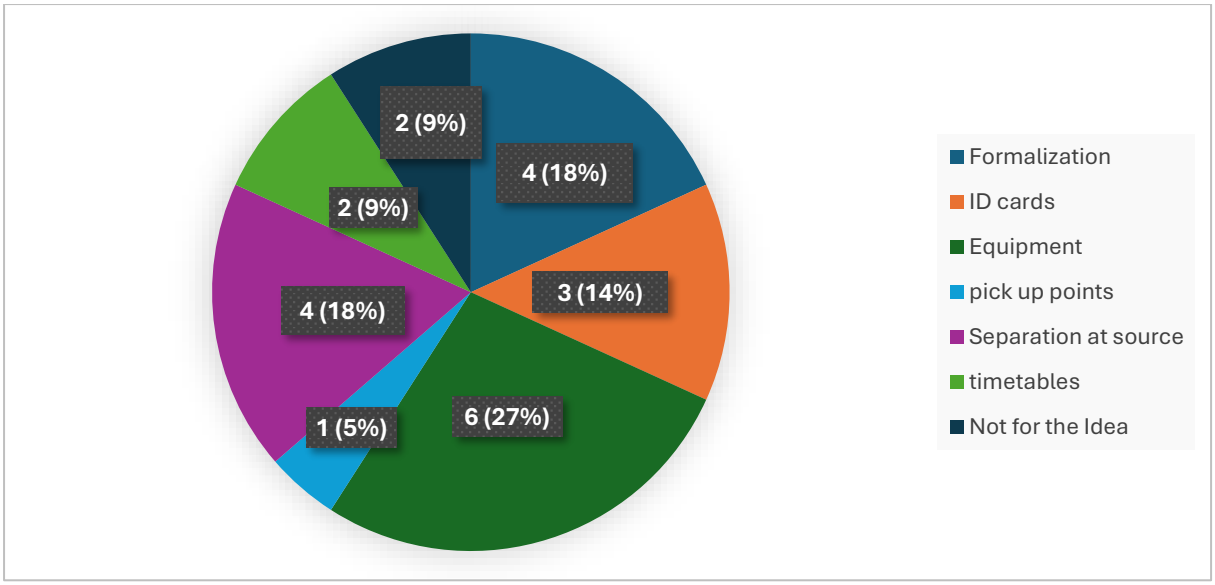


Figure 5.16: Citizen insight on how waste pickers work can be improved (Source: Researcher).

5.6.8. Citizen's view on working alongside waste pickers

The citizens of Central Johannesburg were asked how they could work alongside waste pickers to manage waste collection. Figure 5.17 below shows the four main aspects identified by citizens. 55% of citizens had stated that separation at source would aid waste pickers to operate effectively. This would mean that each household would separate recyclables and provide these items to the waste pickers. There were around 18% of the citizens who had suggested lobbying. This would entail members of the community coming together and assisting waste pickers where they can and having community meetings to discuss how waste pickers can be assisted in their daily operations. 4% of respondents had suggested timetables for households so that everyone knows when waste pickers are in the area for recyclables to be provided to them. Lastly, 23% of respondents did not support the idea of working alongside waste pickers. Someone stated:

Why should we assist waste pickers when we pay for services provided by the government and municipality?

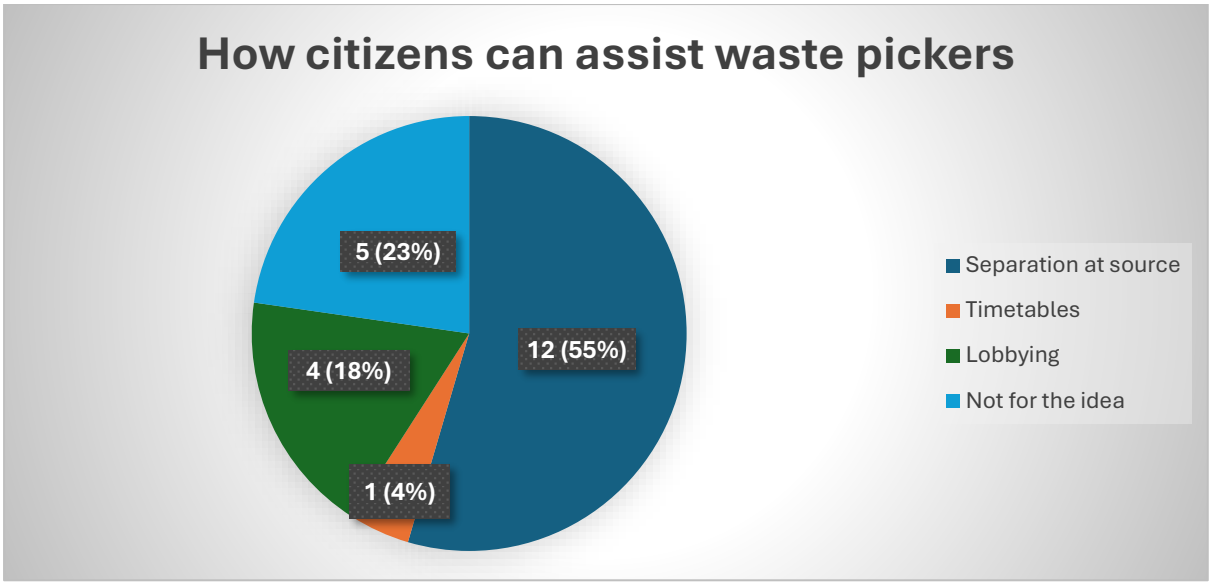


Figure 5.17: The aspects of how citizens can assist waste pickers (Source: Researcher).

5.6.9. The view of citizens on how citizen-waste picker relationships can be built

The last question posed to the citizens in the semi-structured survey was how the relationship between waste pickers and citizens be created or improved. The responses to this question were varied and mixed. Table 5 below describes all the key elements answered as well as the percentage of response towards each element. It is key to note that everyone has varied views towards relationship building and building relationships with waste pickers may be difficult due to their individuality as well as how they navigate the negatives of working on the street daily (Mlotshwa *et al.*, 2022).

Table 5 below explores the elements expressed by the citizens. Waste picker-citizen relationship building refers to waste pickers taking the initiative to foster relationships with citizens. Citizen-waste picker relationship building refers to citizens fostering relationships with waste pickers. 14% stated that waste pickers are to try to build relationships with citizens in the areas in which they work. One respondent stated that this would allow citizens to feel safer with waste pickers. Another respondent stated that waste pickers should avoid damaging the personal property and homes when collecting. This also refers to how waste pickers are perceived based on their interactions with citizens. About 18% stated that citizens should also get to know the waste pickers in the area where they reside. Most respondents stated that awareness

campaigns are required. 32% of respondents said that having awareness campaigns for citizens whereas 9% of respondents stated that timetables are required to understand when waste pickers are to come into the areas and collect. Separation at source and registration of waste pickers are also a factor of importance to the citizens of the study area. Both elements were responded to by 5% equally. Lastly, 18% of the citizens stated that nothing should be done. The citizens that responded with this element had strong words with one stating the following:

Relationship building cannot happen as waste pickers are generally rude and think they are doing everyone a favour.

One respondent who stated no relationship building can take place had the following to state:

These relationships are not relevant. It is the function of the city to manage waste collection/disposal. It is a lucrative industry all over the world and should be handled formally.

Table 5: Ways in which citizens would want to build relationships with waste pickers (Source: Researcher)

Nature of responses	Number of respondents (n)	Percentage (%)
Waste picker-citizen relationship	3	14
Timetables	2	9
Citizen-waste picker relationship	4	18
Awareness campaigns	7	31
Separation at source	1	5
Registration of waste pickers	1	5
None	4	18
Total	22	100

5.7. The examination of existing policy documents on solid waste management in Johannesburg

This aspect of the study was to critically examine the existing policy documents within South Africa, which would be used in Johannesburg, regarding solid waste management. Search engines were used to identify and isolate policy documents using keywords such as “waste management South Africa”, and “Waste Management Policy”. The key policies that exist from a national and provincial level are the National Waste Management Strategy of 2020, the National Environmental Management Act no. 107 of 1998 and the National Waste Management Act no. 59 of 2008. From a Johannesburg perspective, the Waste Management By-law exists to govern waste management activities within the city along with the Gauteng Waste Management By-Law. These documents are important to this study as they give insight into how waste is to be managed and how waste pickers are to be integrated and formalized. For the study, each five of these identified waste management policies were analysed according to current waste management practices as well as the inclusion of waste pickers within those policies, if applicable. The analysis of existing policy documents is further elaborated in the discussion chapter (chapter 6) of this paper.

5.8. The best theoretical framework for the inclusion of informal waste pickers in formal solid waste management strategies.

For this study, three main theoretical frameworks were identified, and further desktop research was conducted based on these frameworks. The three frameworks in question are the Systems Approach, Collaborative Governance Framework, and Inclusive Governance Framework. To answer this outcome of the study, journals were used to critically analyse the differences and key aspects of each theoretical framework, to best identify which framework would best fit the inclusion of waste pickers into formal policies and procedures. Search engines and databases were searched using keywords such as “Frameworks for waste management,” “Systems approach,” and “Waste Governance Frameworks,” to name a few. Through this, 20 journals were identified and isolated to be used in the study. The desktop study was completed to best identify a theoretical framework for the inclusion of waste pickers, considering the responses received from the semi-structured surveys completed by

citizens, waste pickers, Informal waste NGOs, Informal waste NPOs and local authorities within Central Johannesburg. Considering the results of the study, the best theoretical framework for the inclusion of waste pickers into formal plans and strategies is the Inclusive Governance Framework. This framework was chosen due to its ability to include marginalized individuals in decision-making and for its ability to provide equity and justice (Sanchez-Soriano *et al.*, 2024). The choice and use of the inclusive governance framework are further elaborated in the discussion chapter (Chapter 6) of the research paper, along with a diagrammatic representation of the theoretical framework used for the inclusion of waste pickers into formal strategies.

5.9. Conclusion

This chapter presented the key findings to the objectives of the study. From the results in this chapter, waste management is not seen as an important aspect in most households and citizens would rather discard waste in bins instead of separating it at source, though a few citizens do understand the idea of recycling and separation of waste. Communities do not well receive Waste pickers and are already dealing with harsh conflicts among themselves. The results from the semi-structured interviews will be discussed in-depth in Chapter 6 along with the data from the desktop study, to substantiate the results of the study. Furthermore, Chapter 6 will delve deeper into the policy documents for waste management as well as the discussion and identification of the theoretical framework that would underpin the inclusion of waste pickers into formal waste management strategies and policies.

Chapter 6: Discussion

6.1. Introduction

In this chapter, the results presented in Chapter 5 are to be explored and elaborated on. In chapter 5, many aspects were determined which formed valuable to align with the aim and objectives of the study. This chapter will give in-depth insight into the results obtained and to further explain objectives III and IV of the study. Lastly, this chapter is to be elaborated as per each objective stated for the study and desktop study-related data would be presented further in this chapter.

6.2. The challenges experienced by waste pickers in Central Johannesburg

Waste pickers are abundant in a city such as Johannesburg with people migrating to the city centre in the hope of employment opportunities. The same can be said about waste pickers and their fate. The informal sector saw a rise in the number of people in the sector due to high unemployment rates across South Africa, particularly post-1994 (Viljoen *et al.*, 2018). The study envisioned to understand the dynamics confronted by waste pickers followed by the challenges from a top-down approach by interviewing NPOs and NGOs within informal waste management and local authority. In the study, most of the waste pickers interviewed were in the prime age category of 18-40 years of age. In a previous study conducted by Schenck *et al.* (2019), 18 years is the lowest age of a waste picker with the middle most age being 39 years of age within South Africa. This correlates with the results obtained from the study in which majority of the waste pickers interviewed were from the same age category. Schenck *et al.* (2019) also stated the oldest age of a waste picker in South Africa, with that being 71 years of age. According to the results obtained, the oldest age category of waste pickers in Central Johannesburg is 65 years old. Considering the aspect that waste pickers are working well into the age of retirement shows that unemployment rates coupled with lack a of opportunities have unfortunately placed waste pickers in consistent work with no end in sight just for survival (Viljoen *et al.*,2018).

Waste pickers in Central Johannesburg had forms of formal education however, majority of them had a high school education only. There had also been a percentage

of waste pickers with a higher education, but this was very marginal. Low educational levels and lack of formal experience do not allow marginalised individuals the opportunity to gain experience into formal employment markets (Viljoen *et al.*, 2016). In a similar study conducted by Schoeman and Ramutanda (2022), most waste pickers in Johannesburg had completed high school education. Considering this, the result of the study is consistent with similar studies conducted, particularly that in South Africa.

Informal waste management organizations exist within South Africa to assist waste pickers on the streets. These organizations and groups have registered waste pickers onboard and have assisted with the provision of resources and relevant representation within society (Gutberlet, 2023). The results of the study showed that waste pickers are affiliated with a waste management organization, these being the NPOs, and NGOs included in the study. In South Africa, NPOs and NGOs in waste picking are few however, their influence on waste pickers' livelihoods and lives in general is worth consideration. Stronger organizations can assist in navigating disparities such as resources, prices for items, gender-related disparities as well as education and training (Dean and Asen, 2024). Waste picker organizations assist waste pickers to function effectively and earn a good wage (Dias, 2016). These organizations give waste pickers the relevant support required such as access to space, machinery such as forklifts and equipment such as trolleys, PPE, and badges (Rutkowski and Rutkowski, 2015).

Waste pickers within Central Johannesburg were identified to have many years of work experience as waste pickers. In a similar study conducted by Schoeman and Ramutanda (2022), it was established that most waste pickers have between 3-6 years and above 10 years of experience as waste pickers. In the study conducted in Central Johannesburg, minority of individuals have more than 20 years of experience. Further from the results, it was identified that these individuals were part of the 55–65-year age category. As stated previously and further to the data identified, a lack of education and employment opportunities has created a survivalist mindset that has turned perpetual, with waste pickers staying in the informal sector for a long time (Yu *et al.*, 2020). It can further be stated that waste pickers are also, in some cases, breadwinners to their families and working for less than minimum wage is better than poverty (Yu *et al.*, 2020).

The years of experience of waste pickers NGOs and NPOs were identified in the study, to better understand how many years the waste pickers in Central Johannesburg were supported by these organizations. From a global perspective, waste picker organizing is an important aspect of creating effective working conditions and having access to resources such as PPE and trolleys (GAIA, 2021). In South Africa prior to the establishment of the first waste picker association/organization, waste pickers operated in dangerous environments with little resources and the involvement of a middleman, who would determine pricing without the input of the waste picker (GAIA, 2021). Seeing this, the existence of NPOs and NGOs is vital in ensuring that waste pickers are protected and given the support they require.

The waste pickers and waste picker organizations had stated that the greatest number of days worked in collecting waste was 6 days a week. According to a study conducted by Uhunamure *et al.* (2021), waste pickers in Polokwane collected waste mostly 6 days a week. According to a study conducted by Kwarteng *et al.* (2020), waste pickers in Accra, Ghana collected waste mostly 4-7 days a week. The collection days identified in the study of Central Johannesburg correlate with existing published data. The number of collection days can be attributed to the fluctuating prices of recyclables when sold, the demand for certain items and the volume of items collected (Aparcana, 2016). Considering this, waste pickers are constantly aiming to make a liveable income and thus work most days of the week to earn the money for their efforts.

The results obtained in the study of Central Johannesburg, regarding waste picker representation displayed a myriad of sentiments. There were waste pickers who were part of NGOs/ NPOs who did not feel well represented within the waste-picking informal sector. There were also waste pickers who were interviewed, who did not belong to an organization, and who felt a sense of representation. Waste picker and waste picker organisations, such as the NGOs and NPOs interviewed, would identify with representation with the presence of integration (Velis *et al.*, 2020). Integration can be achieved by creating stronger waste picker organizations and integrating waste pickers into the formal waste management system along with the current recycling value-chain (DEFF and DST, 2020). As per the results obtained, one NPOs had expressed not being well represented due to not having years of experience, which describes the possible lack of resources and support available. The Waste Picker Integration Guideline (DEFF and DST, 2020), was developed to recognize the

progress made by waste pickers and recycling efforts, to sit in good standing with global best practices and to further empower those in marginalized groups. Waste picker cooperatives are businesses that assist waste pickers to navigate reclaiming activity and assist with the collection of high volumes of waste, navigate around a middleman and operate directly with the waste recycling industry (Colombijn and Morbidini, 2017). Waste picker cooperatives are found in South American countries such as Colombia and Brazil and would assist waste pickers with legal assistance, social status and loans (Colombijn and Morbidini, 2017).

Waste picker integration is apparent in global developing countries such as Colombia, where waste picker integration is led by the government and the integration of waste picker cooperatives within municipal waste management strategies (Neville and Tovar-Cortes, 2023). The downside to the formalization of waste picking activity and cooperatives within Colombia is the governance-related strain that is placed on waste pickers and cooperatives, which has caused dispossession, indicating that waste pickers are disadvantaged when requiring access and support to resources (Neville and Tovar-Cortes, 2023). Nevertheless, the Waste Picker Integration Guideline of South Africa states that integration should be transformative such that waste pickers' work is altered for the better and they can be included in the plans, designs and implementation of waste-related strategies, and the inclusion of waste pickers from an economic, social, political, environmental and legal perspective (DEFF and DST, 2020).

Waste pickers in Central Johannesburg stated that they are not well received by citizens. This is expressive of the stigma attached to waste picking, which was also identified by one of the organizations interviewed. This was elaborated to the fact that waste pickers are treated as street urchins and are looked down upon due to creating a mess on the street. Waste pickers are part of the marginalized groups of people and are often subjected to mistreatment by citizens and not given the proper support by the government, despite the valuable contributions they make by reducing waste to landfills (Barford and Ahmad, 2021). A desktop study that was conducted by Barford and Ahmad (2021), had highlighted that in Chile, waste pickers have identification cards and uniforms so that the public can recognize them and start to trust them more effectively. According to the Waste Pickers Integration Guideline (2020), waste pickers in South Africa experience a "charity approach" in which people from the public would

provide waste pickers with clothes and food, in forms to help waste pickers. However, there is currently a move away from this approach as it is seen as regressive and disadvantageous to the waste-picking community (DEFF and DST, 2020). Stigma can also be minimized with relationship building such that waste picker organizations have meetings with community members to discuss the contributions of waste pickers as well as to discuss the need to end harassment (DEFF and DST, 2020).

Waste pickers, NGOs and NPOs have identified resources that are required to carry out waste reclaiming. The main item identified was improved trolleys and logistics. The organizations had identified PPE, improved sorting facilities and the need for destigmatization. According to a study conducted in Cape Town by Yu *et al.* (2020), 78% of respondents stated that their work would be improved with the use of bigger and improved trolley systems. These results are like the results obtained from the study of Central Johannesburg. The need for improved coordination such as trolleys is due to the health implications attached to the pulling and pushing of a trolley, especially when done over longer distances (Harfadli *et al.*, 2024). PPE such as gloves, is an important item required for waste picker activity. Waste pickers who did not have gloves often injured themselves by glass and broken bottles, while sorting through waste (Senekane and Mngomezulu, 2024). In India, due to a lack of PPE, waste pickers have contracted infections and diseases due to being exposed to human and animal waste as well as broken items (Singh, 2023). Considering this, the concern for PPE is not only within Central Johannesburg, but also a national and global issue. A waste picker NGO had stated the need for waste sorting space. The NGO can assist with sorting spaces for waste pickers, however government buy-in and assistance are required for this to take place (Dean and Asen, 2024). Having access to sorting spaces, among other items such as water and electricity, is important for waste pickers to function as a collective and should be vital in urban planning in cities (Gutberlet, 2023). As per the Waste Pickers Integration Guidelines (2020), guidelines for the municipality and industries were outlined, in line with sorting space. Municipal and industrial entities should identify and audit available land, to be designated as sorting and storage space (DEFF and DST, 2020).

The waste pickers and the NGO and NPO had stated that a benefit that should be included in waste picking is better income. Waste pickers work a minimum of 9 hours a day collecting large bales worth of waste however, the money they earn does not

substantiate the hours and effort placed on collecting waste (Viljoen *et al.*, 2018). This equates to the pricing of items recycled at waste recycling entities or buy-back centres, which are not steady and depend on fluctuating prices and demand for items (Hidalgo-Crespo, 2023). In a news article written by Samson and Motshweni (2024), Producer Responsibility Organizations (PRO) are mandated by the Extended Producer Responsibility (EPR) regulations, to pay registered waste pickers a service fee for the extraction of waste (Samson and Motshweni, 2024). However, this has not happened and has caused issues with registered waste pickers in South Africa (Samson and Motshweni, 2024). It was further stated that Producer Responsibility Organizations are important in the new waste management strategies in South Africa, as they receive payment from companies that produce recyclable materials such as paper and cardboard, effectively reducing the amount of waste in landfills and promoting recycling (Samson and Motshweni, 2024). An organization that was interviewed in the study stated that households should be billed for informal waste picking. In Pune, India, waste pickers under a cooperative collect a fee from each household that they collect recyclable items from. They are entitled to pay a fee to the cooperative which also goes towards their insurance (Chickarmane, 2012). Furthermore, the waste pickers in India are registered with identification cards and partake in decision-making (Chikarmane, 2012). It was also identified that there is a requirement for governmental and citizen support towards waste pickers and their activities. According to Samson *et al.* (2022), there is a lack of state support within South Africa, however citizens in South Africa do support waste-picking activities by separating at source within their households or even building relationships with waste pickers in their areas.

The local authority that was interviewed shared an interesting insight into waste pickers within Central Johannesburg. The authorities have stated that waste pickers play a critical role in the minimization of waste to landfills and reduce the costs involved in waste transportation and processing, from a municipal perspective. Waste pickers assist in the reduction of costs to the municipality by also providing them with access to landfills for sorting and collecting (Mofokeng *et al.*, 2022). The study also identified that waste pickers do reduce the number of wastes at landfills and promote recycling efforts within Central Johannesburg. Waste pickers promote circular economies with recycling and further promote sustainability (Gutberlet and Carenzo, 2020). Even though waste pickers' roles are identified by the local authority, the relationship

between the parties is challenging. This is due to the lack of state attention towards waste pickers even though there are projects and waste management plans in place along with a commitment from the relevant municipalities (Mofokeng *et al.* 2022).

The lack of municipal attention has created waste pickers that need to be neglected and their activity to be overlooked (Viljoen *et al.*, 2018). The lack of provisions for the needs of waste pickers affects their daily activity. In Braamfontein, waste management in some parts, is taken care of by industries with the assistance of private waste management companies. There is a downside to this as waste pickers would not be able to earn a livelihood due to privately owned waste management companies operating at the request of industries within the area (Buch *et al.*, 2021). This further exacerbates the plight of the waste pickers as the amount of waste collected would determine the days' worth of income. The authority had identified that Central Johannesburg is highly populated thus creating increased amounts of waste coupled with a waste management plan that cannot cater to the number of people within the area. Overpopulation is a worldwide issue but more so prevalent in Johannesburg, and the current waste management strategies need to be revisited (Schoeman and Rampedi, 2022). Waste picker activity has created awareness around informal waste management within Central Johannesburg, from a local authority point of view. However, due to poor management of waste within Central Johannesburg, as stated by the local authority, there is a need for awareness programmes to raise issues around illegal dumping and the importance of recycling. Awareness programmes are to highlight the importance of waste management options and assist with behavioural alterations of citizens towards more sustainable waste management choices (Etim, 2024). The local authority interviewed also stated that an adequately trained and educated individual is to be hired by municipalities, to be able to identify and propose strategies for waste picker integration. According to the Waste Picker Integration Guideline (2020), persons within the capacity of the municipality, who are educated in waste management, should be able to implement waste picker integration effectively (DEFF and DST, 2020).

Local authorities within the study had also identified that waste pickers tend to make a mess on the street. This is due to the waste pickers rummaging through waste, in the hopes to find the item they require for recycling (DEFF and DST, 2020). This could also be avoided if separation at the source were to occur, leaving recyclable material

separated for collection by the waste picker. South Africa there is a waste picker registry, however many pickers are not registered due to not having the correct documentation due to being from neighbouring African countries. There are waste pickers who are also not registered due to the fear of a breach of their information (DEFF and DST, 2020). However, a measure identified by the Waste Picker Integration Guideline was to request the assistance of Home Affairs departments, to effectively provide waste pickers with a form of identification, ensuring effective waste picker registration occurs (DEFF and DST, 2020). This would also eliminate the stigma attached to waste pickers which the public labels as criminals. Waste picker organizations, such as NGOs and NPOs, can enter into agreements with industry to gain access to recycling items and enforce separation at the source for collection (Medina, 2008). This would also allow for the reduction in the use of private waste management companies by industry within Central Johannesburg.

6.3. Effectiveness of waste picker contributions from a Central Johannesburg citizen perspective

Citizens from Central Johannesburg were questioned demographically, to determine which age categories are most concerned with waste management in the area, thus participating in the study. The most difficult aspect of the study was to attain participation from the citizens of Central Johannesburg, as some stated that there are more pressing issues in the area that need attention such as service delivery. Nevertheless, the results described a mix of sentiments and justifications for waste pickers within the area as well as general waste management practices.

According to the results, majority of the respondents were part of two age categories, which being 18-40 years and 55-65 years of age. According to published data, age categories for waste management concerns are mixed. A study conducted in Australia stated that ages between 30-44 years and 44-64 years had the most concern for the environment with ages 18-29 having the least concern related to the environment (Chapman, 2011). However, in another study conducted in Bahrain, younger participants between the ages of 18-30 years were more concerned with waste management (Abbas *et al.*, 2020). The results are still consistent with published data, however, situational influences such as the age categories found present in Central Johannesburg, could be a factor in the results.

Disposal methods for waste at the household level within Central Johannesburg are mostly by disposal bins, which are collected on a weekly basis. Some respondents stated that they also participated in separation at source and providing recyclables to waste pickers in the area. Waste bins are mostly used due to the proximity of the bin and ease of use (Rosenthal and Linder, 2021). Factors such as paying for the services to the municipality and time constraints also determine methods of disposal of waste (Otomayo *et al.*, 2020). Separation at the source and waste picker-related activity both entail recycling behaviour. The basis of recycling behaviour is a deep sense of personal environmental knowledge and the idea that the environment needs to be free of waste (Li *et al.*, 2021).

Most citizens had stated that they had their waste collected by a waste picker. This data correlates with the results of the study, in which most waste pickers stated that they collected waste 6 days a week. With the use of deductive reasoning, it can be stated that waste picker activity is prevalent in Central Johannesburg and most people have their recyclable items collected by a waste picker on a weekly basis. According to the results of the study, citizens mostly identified that the waste pickers in Central Johannesburg are earning a living and keeping the environment clean, however the results on the views displayed some form of stigma.

Globally, waste pickers are being acknowledged for their entrepreneurial gusto and drive to sustainability by enforcing recycling initiatives (Dias, 2016). Even though waste pickers have made strides to earn a living and to keep the environment clean, waste pickers in South Africa are still faced with stigma such as being labelled as intimidating and dirty (Perez, 2019). Within the study, intimidation was identified as a factor. Furthermore, citizens of Central Johannesburg mostly view the benefits of waste pickers as they have expressed that waste pickers improve recycling, clean the environment, and create jobs. This result is consistent with the results on the views the citizens have on waste pickers, in general. Most citizens of the study stated that they do identify the role of waste pickers within Central Johannesburg. From this standpoint, it can be deduced that citizens of Central Johannesburg identify the need and role of waste picker activity and value the environment.

Having a positive outlook and understanding of the environment, particularly waste management, is influenced by planned behaviour such that if there is a positive outlook

on waste management choices, along with the correct acquired knowledge about waste followed by a strong sense to act on the behaviour, would allow a person to make effective choices regarding waste (Smith, 2020). Considering this, citizens of Central Johannesburg have a sense of recycling and waste pickers, though some may not be all for the idea, but the willingness to acquire more knowledge around the topic, for implementation is present. In accordance with the results, citizens understood the many factors required for proper waste-picking activity and highlighted key factors in how they can assist waste pickers. The citizens identified the same requirements as that of waste pickers, NGOs, NPOs and local authorities. Citizens had identified formalization, equipment and separation at source as the key points of how waste pickers' activity can be improved. The formalization of waste pickers is a crucial factor for integration into formal waste management strategies and policies (Rosaldo, 2024). With formalization, waste pickers would be effectively recognized for their efforts, be given the legal rights they deserve and be assisted with the necessary resources required (Rosaldo, 2024). The formalization of waste pickers is an important concept however, it can be a costly exercise with drawbacks such as waste pickers losing their autonomy (Kain *et al.*, 2022). For this instance, the Waste Picker Integration Guideline is a key document and proposal to implement waste pickers into formal plans as well as to be recognized effectively and highlights the importance of waste picker integration (DEFF and DST, 2020).

Separation at source was an item highlighted by the citizens throughout the study, however, they have also mentioned lobbying and timetables as means to assist waste pickers. Lobbying would invite all community members, parts of government as well as waste pickers to discuss relevant issues surrounding waste management and key issues the waste pickers face, so that a resolution can be found. In India, lobbying for waste pickers has influenced their ability to attain benefits such as education, healthcare access and better pricing for recyclables (Samson, 2009). Timetables or schedules are a valuable tool to consider in this study, as citizens and local authorities mentioned it. Schedules of waste pickers for collection are to be in line with the Waste Picker Integration Guideline, such that collection is to happen on specific days at specific times (DEFF and DST, 2020). This is to ensure the public is aware of the time that the waste pickers are collecting waste, for citizen familiarization and household assistance with separation at source efforts.

Building relationships with waste pickers was not completely supported in the study as citizens were of the view that waste pickers are to also be respectful of households and people's property. However, considering this, it was raised that not only should citizens attempt relationship building, but waste pickers should also make the effort. Relationship building amongst actors is possible, however, relationships can be forged over a prolonged period and familiarity (Samson *et al.*, 2022). Awareness programmes can be effective in knowledge sharing around waste management practices from a citizens' point of view and better waste management choices (Sultana *et al.*, 2021). Waste picker awareness could be created by waste pickers and NPOs and NGOs, for the public to better understand the role waste pickers have in society as well as the importance of separation at source and recycling initiatives for a better environment (Gutberlet *et al.,* 2021). The citizens of the study suggested awareness programmes, however, the high volume of waste-picking activity within Central Johannesburg has passively created awareness around the activity.

6.4. Critical analysis of existing policy documents for solid waste management in Johannesburg

The main aim of the critical analysis of existing policy documents was to identify if certain themes existed from a solid waste management perspective revolving around recycling, disposal of waste, waste pickers, reclaiming and citizen responsibility. There are five main policy documents within solid waste management, from a local, provincial, and national perspective. These are the National Environmental Management Act No 107 of 1998, National Waste Management Strategy of 2020, National Environmental Management Waste Act No 59 of 2008, the Gauteng Waste Management By-Law and the City of Johannesburg Waste Management By-Law. Key similarities and differences were noted for each policy document. Within South Africa, policy administration consists of three tiers namely national, local, and provincial governments (Korstanje *et al*, 2024). Waste related systems operate from a top-down management and legislative authority while the national government is the main actor guiding and implementing legislation (Korstanje *et al*, 2024).

The National Waste Management Strategy of 2011 was replaced by the National Waste Management Strategy of 2020. The National Environmental Management Waste Act (59 of 2008) was in use in 2009, to effectively respond to waste pollution in

South Africa (Korstanje *et al*, 2024). A key point in the strategy of 2020 was the inclusion of waste picker activity in waste minimization and the promotion of a circular economy (DEFF, 2020). The strategy states that its successes are dependent on the buy-in from government and private sectors as well as the separation at source initiative by citizens. After the replacement of the National Waste Management Strategy of 2011, there has been an improvement in disposal services however, recycling and separation at source is lacking from a citizen perspective within South Africa (DEFF, 2020). Due to the poor waste management services in cities and towns in the country, there have been poor waste management habits such as illegal dumping and burning of waste (DEFF, 2020). The National Waste Management Strategy of 2020 (DEFF, 2020) has outlined two main strategies for a circular economy such as waste disposal minimization and waste being a resource which relates to product formation from recycling. The National Environmental Management Act no. 107 of 1998, states that waste is to be avoided, minimized or recycled wherever possible (Republic of South Africa, 1998). Environmental management should be integrated such that all decisions that are taken have the environment in mind along with the well-being of people, by selecting the best environmentally viable option (Republic of South Africa, 1998). The National Environmental Management Act no 107 of 1998 considers inclusivity regarding decision-making such that participation of all individuals regarding environmental governance is required along with decision-making which considers the views of interested and affected parties, giving recognition to all forms of knowledge (Republic of South Africa, 1998).

The National Environmental Management Waste Act No. 59 of 2008 is integrated in nature and reforms the law that regulates waste management and allows for effective measures of disposal of waste (Republic of South Africa, 2008). Recycling and separation at source are emphasised along with minimization of waste at source of generation (Republic of South Africa, 2008). Even though there are measures in place for the effective management of waste from a national level, the act is not effectively abided by and is further not emphasised by national and local authorities, which has been noted by the National Waste Management Strategy of 2020. The National Environmental Management Waste Act No.59 of 2008 has provided reasonable measures for effective waste management; however, waste picking or waste pickers have not been mentioned in the National Environmental Management Waste Act No.

59 of 2008 or National Environmental Management Act no.107 of 1998. Waste picker inclusion in waste management acts would allow for effective participation of all involved in the waste management chain, as mentioned by the National Environmental Management Act No. 107 of 1998 (Republic of South Africa, 1998). The National Environmental Management Waste Act no. 59 of 2008 does not mention how diverse types of waste are to be processed, which further emphasises the difficulty in document interpretation and enforcement. Within environmental governance, there are notable issues regarding policy implementation. In national policy formation, implementation of policy is apolitical and from a top-down approach. However, implementation from a local level is problematic with a gap between implementation and policy outcomes are present (Howell, 2015).

The City of Johannesburg By-Law no. 216 of 2013 states that waste is to be reduced, re-used, recycled, or avoided at all costs. The Council is to ensure that waste is collected, transported, and treated in a manner that abides by the by-law. The by-law stipulates that waste management within The City of Johannesburg is to be regulated such that collection, transportation, storage, and processing of waste is done in accordance with the by-law, along with the regulation of delivery of municipal services (City of Johannesburg, 2013). The By-Law no. 216 of 2013 regulates waste recycling activity such that only formal bodies are authorized to reclaim waste using the correct and authorized form of transport (City of Johannesburg, 2013). The Gauteng Provincial Waste Management By-Law of 2021 is the published by-law for Gauteng province and stipulates the way waste is to be managed by all parts of society. The Gauteng Waste Management By-Law states that waste pickers are to be affiliated with a group within the area and should also have an accreditation permit to operate within that jurisdiction (Gauteng Provincial Government, 2021). The by-laws both ensure that waste is avoided, minimised, recovered and disposed of in an environmentally conscious manner. It also ensures that sustainable development and environmental justice are promoted, within the area (Gauteng Provincial Government, 2021). From this, it can be stated that the National Waste Management Acts and the waste management by-laws enforce effective waste management from a city and citizen perspective however, there are gaps in terms of effective waste picker integration into strategies as all aspects of waste management within Johannesburg is regulated. There are also gaps in the enforcement of waste management acts as there is a lack

of proper waste management from a citizen perspective, which was also identified in the study.

6.5. Theoretical framework for the inclusion of informal waste pickers in formal solid waste management strategies in Johannesburg

The study observed the dynamic between citizens and waste pickers, the informal waste sector and daily challenges, and the local authority views of informal waste management within Central Johannesburg. Waste pickers are a marginalized group whose activity is noted within Central Johannesburg, however, they are experiencing current gaps along with waste-picking NGOs and NPOs. The most highlighted challenge that the study identified was that waste pickers lack support from society and are challenged regarding resources that are meant to make their occupation easier.

Waste pickers are often met with difficulty by citizens, which makes co-operation among parties near impossible (Juarez-Pastor *et al.*, 2024). Furthermore, local authorities within Central Johannesburg were found to acknowledge the waste picker's role however, there are challenges with the relationships between waste pickers and local authority. The study identified that citizens of Central Johannesburg have a good perception of recycling and separation at source however find difficulty in implementing household separation. City-mandated waste management services occur weekly and are the first choice of disposal of waste for citizens of Central Johannesburg. Based on the results of the study, a theoretical framework was to be identified to best include waste pickers in formal policies and plans within Johannesburg.

There were three theoretical frameworks discussed in the conceptual framework of this study namely Systems Thinking, Collaborative Governance Framework and Inclusive Governance Framework. Systems thinking is composed of various parts of a system that work together to produce one outcome, however, can translate to complex dynamics (Alarcon-Bernal *et al.*, 2019). This theory can consider issues in an integrally and holistically manner while being solved by experts (Mansoor and Williams, 2024). Systems thinking places all its importance on structures within a

system instead of the events surrounding it (Monat and Gannon, 2023). When systems approach is not linear and complex, it can require the need for secondary systems. This can create structure however may be too difficult to understand (Arnold and Wade, 2015). For systems thinking, many experts are required to share knowledge however this may be problematic as many may have different viewpoints giving rise to different policies and procedures (Balanay and Halog, 2021). Considering these points, the systems approach may prove to be too complex in nature to better describe and assist waste pickers to be included in plans and policies. Furthermore, waste management and waste picking may have dimensions which can require a secondary system, which would prove the activity tedious and difficult for everyone to understand.

Collaborative Governance Framework is important in engagement with all actors of society such as citizens, policymakers, authoritative figures, and private sectors that allow for effective decision-making (Waardenburg *et al.*, 2020). Aspects that are important for effective collaborative governance are trust, communication, commitment to changes, a shared understanding amongst actors and transitional outcomes (Abdulai *et al.*, 2024). However, collaborative governance can have problems associated with top-down authority and building trust among all those involved in decision-making (Rapp, 2020). Decision-making may prove to be slower than expected due to the availability of relevant actors to engage (Aidi *et al.*, 2024). There may be accountability issues where it may be difficult to understand who is accountable for certain actions and decisions (Zia ud din *et al.*, 2023). Collaborative governance may be complex due to the array of stakeholders involved who have different ideas and inputs (Ulibarri *et al.*, 2023). The most important aspect of collaborative governance is the formation of trustworthy relationships among actors. If collaboration cannot be sustained over time, actors may lose trust and hope towards engagement and decision-making (Abdulai *et al.*, 2024). Collaborative governance can be an effective theoretical framework for the inclusion of waste pickers into formal waste policies and plans however, considering the cons stated, it may prove to be problematic when trust is not effectively built coupled with a top-down approach to governance. This may create an imbalance in power amongst actors, thus making waste pickers feel that their views and issues are not heard. NGOs and NPOs associated with the waste pickers in Johannesburg may also have to address the

conflict that may arise due to a lack of decision-making on waste pickers' day-to-day actions and needs.

An Inclusive Governance Framework ensures that all individuals in society have an equal input into decision-making especially regarding policymaking (Hinrichs and Johnston, 2020). All parts of society are urged to have an input into decision-making and foster equal representation of people including marginalized individuals (Aguilar Delgado and Perez-Aleman, 2021). Elements of Inclusive Governance are fairness, justice, power, and equity (Sanchez-Soriano *et al.*, 2024). Public participation is an important aspect of the Inclusive Governance Framework, and all actors should have a say in policy formation (Karar and Jacobs-Mata, 2016). Capacity building in Inclusive Governance allows for the views of marginalized individuals to be acknowledged along with taking accountability for capacity building by the facilitators such as governmental agencies (Hysing, 2022). An Inclusive Governance Framework may have trouble with effective stakeholder engagement such that the relevant groups of people may not participate in engagement sessions, thus creating an imbalance in the results of public participation meetings and which can be costly and time-consuming when too many different actors are involved in deliberations (Ansell *et al.*, 2020).

The study presented aspects from the perspectives of the waste picker, NGOs and NPOs, citizens and local authorities of Central Johannesburg. Due to the results obtained and the three theoretical frameworks explored, the best theoretical framework to be used for the inclusion of waste pickers into formal policies and plans is the Inclusive Governance Framework. A hybrid model between the Collaborative Governance Framework and Inclusive Governance Framework was viable however, the disadvantages between the two theoretical frameworks would have compounded the negatives associated with each theory, thus creating more issues. A simplified and more relevant theoretical framework was required to best understand how waste pickers can be included in formal waste management strategies within Johannesburg. The use of Systems thinking, and Collaborative Governance Framework may not have been viable due to complexities, lack of understanding towards justice-related issues and the lack of trust which may arise or may already be present amongst actors.

The results of the study identified that waste pickers are acknowledged by both citizens and local authorities within Central Johannesburg. However, there was some

form of stigma identified within the study from the citizen's perspective and further also identified by waste picker NGOs and NPOs. An Inclusive Governance Framework would entail the representation of waste pickers within Johannesburg and further allow for justice and equity for individuals who are marginalized (Marello and Helwege, 2014). Engagement sessions from a Johannesburg perspective would be an important milestone for waste picker inclusion into waste management strategies as the relevant stakeholders would be present to deliberate on the matter.

Public participation is a key element of the Inclusive Governance Framework and would allow citizens the ability to provide insight but also be available to understand key findings (Sanchez-Soriano *et al.*, 2024). It was stated during the study that waste pickers should be included during key meetings among relevant stakeholders. This would allow for the inclusion of waste pickers' experiences, allowing them to give insight into their day-to-day operations and what they would require for improvement in waste picking activity. The engagement sessions and participation of all stakeholders would also give insight into pertinent aspects such as resources like trolleys and pricing, further allowing for improvements via joint input (Marello and Helwege, 2014).

Inclusive Governance Framework operates on key elements such as decision-making, capacity building, fairness, transparency, inclusion, empowerment, accountability and participation (Annahar *et al.*, 2023). Decision-making in Inclusive Governance Framework would be based on equal participation from all stakeholders, which can be used to form policies and strategies (Neely *et al.*, 2021). In this case, waste pickers, citizens, local authorities, NGOs, NPOs and private entities would come together in a participatory manner to offer different insights for the betterment of all, particularly waste pickers. Accountability within the Inclusive Governance Framework would entail that each actor involved takes responsibility for their input during participation (Hinrichs and Johnston, 2020). For this instance, citizens, local authorities, agencies, and private entities within Johannesburg would need to ensure that they are being fair in deliberations surrounding waste pickers. Transparency is needed in the Inclusive Governance Framework when creating and implementing policies and decisions as well as the actions taken by governmental agencies (Aguilar Delgado and Perez-Aleman, 2021). Waste pickers would be empowered under the Inclusive Governance Framework as they would be trained and educated about their rights as well as how

to perform their jobs most equitably, further creating feelings of inclusion amongst formal waste management sectors (DeHart-Davis *et al.*, 2023).

Citizens of Central Johannesburg had identified that awareness programmes be created for their understanding of waste picking, with some stating that lobbying be created for better citizen inclusion. Awareness programmes create better-informed citizens and allow them to participate in policy formation (Khatibi *et al.*, 2021). Feedback loops in this instance, are required to understand how the information shared by each actor is used and if the framework is working effectively (Bell and Reed, 2022). From the use of the Inclusive Governance Framework, participation, and collaboration of all parts of the waste management value chain would be included to provide insight for the formation of strategies and policies, further allowing waste pickers inclusion. Figure 6.1 below is a thematic diagram based on the use of the Inclusive Governance Framework for the inclusion of waste pickers into formal strategies.

Figure 6.1 displays the actors involved in the waste management chain that have a relationship alongside waste pickers. The elements of the Inclusive Governance Framework in Figure 6.1, display the relevant dynamics the elements have along with the actors involved. All actors of the chain require transparency, with each actor having decision-making capability. Participation is required by each actor, however elements such as justice and equity are to be enforced by waste picker NGO and NPOs. Waste pickers and NGOs and NPOs require representation for the inclusion of waste pickers. Empowerment occurs between waste pickers and citizens as citizens acquire recycling-related knowledge and understand formalization vs integration, from waste picking activity and waste pickers are empowered when supported by citizens, who can lobby alongside them. Capacity building occurs within governmental agencies, along with accountability between governmental agencies and NGOs and NPOs.

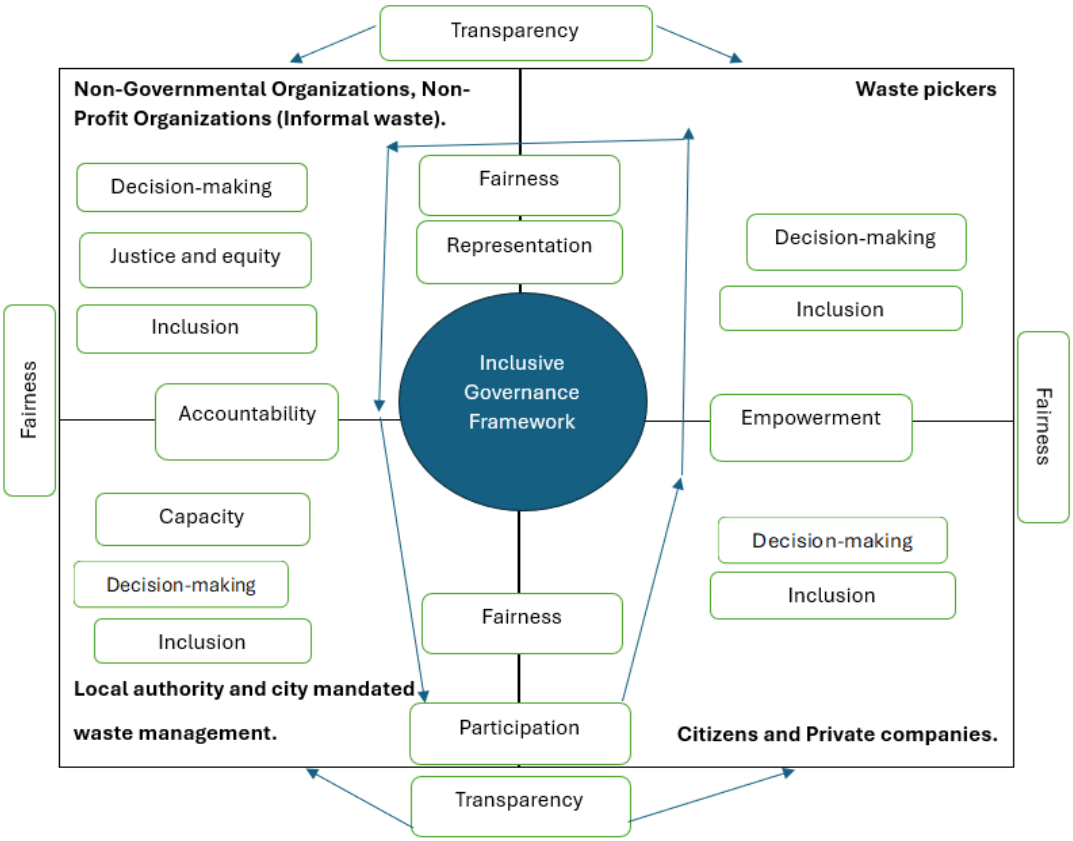


Figure 6.1.: Inclusive Governance Framework for inclusion of waste pickers into formal strategies and plans in Johannesburg.

6.6. Conclusion

The study revealed the dynamics that currently exist amongst citizens, waste pickers and local authorities within Central Johannesburg. Waste picker activity is acknowledged within Central Johannesburg however, there is a need for awareness programmes for citizens to be more involved. The waste management acts, by-laws and strategies that currently exist are regulated and integrated in nature, however there is much to be improved for the effective inclusion of waste pickers into strategies. The Inclusive Governance Framework operates on co-operation and decision-making amongst all parts of society, which are the actors identified and studied within the research. The next and last chapter would outline the recommendations and final concluding remarks of the study.

Chapter 7: Conclusion and recommendations

7.1. Conclusion

The study identified many aspects of informal waste management from a Central Johannesburg perspective. The waste pickers of Central Johannesburg identified variables that affect their daily operations such as lack of workable trolleys, fluctuation in pricing of recyclables and push-back from the public. The citizens of Central Johannesburg, however, identify that waste pickers are very present within the area, and some identified their contributions to ensuring the areas are kept clean. However, there still are some improvements required for citizens to fully accept and work alongside waste pickers. There are also citizens within Central Johannesburg who dispose of waste that ends up at a landfill, though most citizens understand separation at the source and recycling. Local authorities identify waste picker contributions but have identified challenges from many aspects such as poor relationships between waste pickers and authorities, lack of current infrastructure and plans to cater to the overpopulation of Central Johannesburg as well as the lack of input of waste pickers in overall plans and strategies.

The existing policy documents from a local, provincial, and national perspective note that the inclusion of all is required for policy formation, however many waste management activities are highly regulated with aspects of waste-picking activity not being viable, according to by-laws. Effective enforcement of waste management acts is also a challenge. The best theoretical framework for the inclusion of waste pickers into plans and strategies in Johannesburg is the Inclusive Governance Framework. The theoretical framework emphasises inclusive ideas and participation of all parts of society, including marginalized individuals such as waste pickers. The theory would ensure that citizens, waste pickers, local authorities, NGOs, NPOs and private entities in waste management, have engagement sessions to provide context from every aspect of the waste management value chain. It is important to identify the different knowledge and experiences that should be shared for policies to be created and enforced, without having a top-down approach to governance. The study highlighted that there is a need for the integration of waste pickers instead of formalization. This is to ensure that waste pickers retain their autonomy whilst being given the relevant

resources, identity and justice in society. The integration of waste pickers is dependent on the commitment from all parts of society as without the buy-in from the relevant parts of society, waste pickers will be forgotten and lost within the system. There is a need for awareness programmes among the public along with interested and affected parties, to understand informal waste management such as waste picking and to further understand how each role-player can assist waste pickers to operate more effectively and be accepted in society.

7.2. Recommendations

The study had aspects that could be improved or used for further investigation in a different study. Firstly, it was noted that due to the lack of time and costs for the study, more participants could not be interviewed. In a future study, aspects of this study could be investigated with more interviews conducted, to answer separate aims and objectives regarding waste pickers. A longer conducting period would allow for more participants in a study area, Central Johannesburg. For future investigation, a study can be completed based on the Inclusive Governance Framework vs Collaborative Governance Framework, and the identification of which framework citizens would be more aligned to, in terms of household solid waste management strategies. This is due to the theoretical frameworks being very closely related but different in certain aspects. It would be imperative to understand citizen waste management and how waste management can be effectively implemented using a theoretical framework. A study can be conducted on how effective awareness programmes are in waste management practices, as awareness programmes were identified by the citizens of Central Johannesburg as being an important factor in solid waste management education and practices. Lastly, waste picker health and safety-related issues should be investigated either from a Central Johannesburg perspective or a Johannesburg perspective. This is due to the lack of PPE that waste pickers have when working daily and the possible injuries they may be inflicted with.

References

Abbas, S.Y, Kirwan, K., and Lu, D. (2020). Exploring Enablers and Barriers to Municipal Solid Waste (MSW) Management Technologies Adoption in the Kingdom of Bahrain. *Journal of Environmental Protection*, Vol 11, pp. 377-398. https://doi.org/10.4236/jep.2020.115022

Abosede, A.J., and Onanuga, A.T. (2016). Research Design: A Review of Features and Emerging Developments, *European Journal of Business and Management*, Vol 8 (11), pp. 113-118,

Abdel-Shafy, H.I., and Mansour, M.S.M. (2018). Solid waste issue: Sources, composition, disposal, recycling, and valorization, *Egyptian Journal of Petroleum,*27, pp. 1275-1290, https://doi.org/10.1016/j.ejpe.2018.07.003.

Abdulai, I, A., Fuseini, M.N., and File, D.J.M.B. (2024). Making cities clean with collaborative governance of solid waste infrastructure in Ghana, *Cleaner Waste Systems*, Vol 8, 100150, pp. 1-13, https://doi.org/10.1016/j.clwas.2024.100150.

Adedara, M.L., Taiwo, R., and Bork, H.R. (2023). Municipal Solid Waste Collection and Coverage Rates in Sub-Saharan African Countries: A Comprehensive Systematic Review and Meta-Analysis, *Waste*, Vol 1, pp. 389-413, https://doi.org/10.3390/waste1020024.

Aguilar Delgado, N., and Perez-Aleman, P. (2021). Inclusion in Global Environmental Governance: Sustained Access, Engagement and Influence in Decisive Spaces, *Sustainability,* Vol 13, 10052, pp.1-23, https://doi.org/10.3390/su131810052.

Ahmed, S.K. (2024). How to choose a sampling technique and determine sample size for research: A simplified guide for researchers, *Oral Oncology Reports*, Vol 12, pp. 1-7, https://doi.org/10.1016/j.oor.2024.100662.

Aidi, A., Avianti, I., Koeswayo, P.S., Poulus, S., and Mariam, S. (2024). The effect of an inclusive approach to collaborative governance and its impact on digitizing the quality of public services, *Cogent Business & Management,* Vol 11(1), 2392324, pp.1-16, DOI: 10.1080/23311975.2024.2392324.

Alarcon-Bernal, Z., Aceves-Garcia, R., and Fuentes-Zenon, A. (2019). Systems Approach to Develop a Conceptual Model of the Service Enterprise, *Journal of Service*

Science and Management, Vol 2, pp. 697-713, https://doi.org/10.4236/jssm.2019.126048.

Al-Taai, S.H.H. (2021). Solid Waste: A Study of its concept, management methods, and environmental impacts, *IOP Conf. Series: Earth and Environmental Science*, 1002. doi:10.1088/1755-1315/1002/1/012007.

Anierobi, C., and Efobi, C. (2013). Waste Pickers and Urban Solid Waste Management System in Nigerian cities: Between Sustainable Policy gap and Survivalist Strategy, *Developing Countries Studies*, Vol 3 (8), pp. 184-188.

Annahar, N., Widianingsih, I., Paskarina, C., and Muhtar, E.A. (2023). A bibliometric review of inclusive governance concept, *Cogent Social Sciences,* Vol 9 (1), 2168839, pp. 1-23, https://doi.org/10.1080/23311886.2023.2168839.

Ansell, C., Doberstein, C., Henderson, H., Siddiki, S., and t'Hart, P. (2020). Understanding inclusion in collaborative governance: a mixed methods approach, *Policy and Society*, Vol 39(4), pp. 570-591, DOI: 10.1080/14494035.2020.1785726

Aparcana, S. (2017). Approaches to formalization of the informal waste sector into municipal solid waste management systems in low- and middle-income countries: Review of barriers and success factors, *Waste Management*, Vol 61, pp. 593-607, https://doi.org/10.1016/j.wasman.2016.12.028.

Arnold, R.D., and Wade, J.P. (2015). A Definition of Systems Thinking: A Systems Approach, *Procedia Computer Science*, Vol 44, pp. 669-678, https://doi.org/10.1016/j.procs.2015.03.050.

Balanay, R., and Halog, A. (2021). A Review of Reductionist versus Systems Perspectives towards 'Doing the Right Strategies Right' for Circular Economy Implementation*, Systems*, Vol 9(38), pp. 1-13, https://doi.org/10.3390/systems9020038.

Barford, A., and Ahmad, S.R. (2021). A Call for a Socially Restorative Circular Economy: Waste Pickers in the Recycled Plastics Supply Chain, *Circular Economy and Sustainability*, Vol 1, pp. 761-782, https://doi.org/10.1007/s43615-021-00056-7.

Bell, K., and Reed, M. (2022). The tree of participation: a new model for inclusive decision-making, *Community Development Journal*, Vol 57 (4), pp. 595-614, https://doi.org/10.1093/cdj/bsab018.

Bengtsson, M. (2016). How to plan and perform a qualitative study using content analysis, *NursingPlus Open*, Vol 2, pp. 8-14, https://doi.org/10.1016/j.npls.2016.01.001.

Bening, C.R., Kahlert, S., and Asiedu, E. (2022). The true cost of solving the plastic waste challenge in developing countries: The case of Ghana, *Journal of Cleaner Production*, Vol 330, 129649, pp. 1-14, https://doi.org/10.1016/j.jclepro.2021.129649.

Buch, R., Marseille, A., Williams, M., Aggarwal, R., and Sharma, A. (2021). From Waste Pickers to Producers: An Inclusive Circular Economy Solution through Development of Cooperatives in Waste Management. *Sustainability*, 13, 8925, pp. 1-9, https://doi.org/10.3390/su13168925,1 9.

Buscetto, L., Wick, W., and Gumbinger, C. (2016). How to use and assess qualitative research methods, *Neurological Research and Practice*, 2:14, pp. 1-10, https://doi.org/10.1186/s42466-020-00059-z.

Campbell, S., Greenwood, M., Prior, S., Shearer, T., Walkem, K., Young, S., Bywaters, D., and Walker, K. (2020). Purposive sampling: complex or simple? Research case examples, J Res Nurs, 25(8), pp. 652-661, doi: 10.1177/1744987120927206.

Campos, M.J.Z., Carenzo, S., Kain, J.H., Oloko, M., Reynosa, J.P., and Zapata, P. (2021). Inclusive recycling movements: a green deep democracy from below, *Environment and Urbanization*, Vol 33(2), pp. 579-598, DOI: 10.1177/0956247820967621.

Chai, K. and Yeo, C. (2012). Overcoming energy efficiency barriers through systems approach—A conceptual framework, *Energy Policy*, Vol 46, pp. 460-472, http://dx.doi.org/10.1016/j.enpol.2012.04.012.

Chapman, J. (2011). *Who Does What? The Pro-Environmental Behaviours of Australian Workers*; Centre for Work + Life, University of South Australia: Adelaide, Australia.

Charlton, S. (2014). *Waste Pickers/ Informal Recyclers*, Changing Space, Changing City. Wits University Press.pp. 539-545.

City of Johannesburg (2018), Pikitup, https://joburg.org.za/departments_/Pages/MOEs/Pikitup.aspx, Accessed: 11 June 2024.

Chikarmane, P. (2012). Integrating waste pickers into municipal solid waste management in Pune, India. WIEGO Policy Brief (Urban Policies) No. 8 (Cambridge, MA, WIEGO). http://www.wiego.org/sites/default/, Accessed:9 February 2025.

City of Johannesburg. (2013). Waste Management By-Laws no. 216, Local Authority Notice no. 1012, https://joburg.org.za/documents_/Documents/By-Laws/waste%20management%20by-law.pdf, Accessed: 15 February 2025.

Crowe, S., Cresswell, K., Robertson, A., Huby, G., Avery, A., and Sheikh, A. (2011). The case study approach, *Medical Research Methodology,* 11:100, pp. 1-9, http://www.biomedcentral.com/1471-2288/11/100.

DEA (Department of Environmental Affairs). National Waste Information Baseline Report; DEA: Pretoria, South Africa, 2012. Available online: http://sawic.environment.gov.za/documents/1880.pdf (Accessed on 2 March 2024).

DEA (Department of Environmental Affairs). Status of waste landfill sites in South Africa, 2016. Presentation to the Portfolio Committee. 2016. Available online: http://pmg-assets.s3-website-eu-west 1.amazonaws.com/160915presentation.pdf (Accessed on 20 March 2024).

Dean, M.R.U., and Asen, M.C. (2024). The contribution of global waste picker organizations in responding to the plastic pollution crisis, *Cambridge Prisms: Plastics*, Vol 2, e29, pp. 1-9, http://doi.org/10.1017/plc.2024.24.

Debrah, J.K., Vidal, D.G., and Dinis, M.A.P. (2021). Raising Awareness on Solid Waste Management through Formal Education for Sustainability: A Developing Countries Evidence Review. *Recycling*, 6(6), pp.1-21, https://doi.org/10.3390/ recycling6010006.

DeHart-Davis, L., Dickerson, K., and Jiang, Z. (2023). Does Bureaucracy Diminish Inclusion? Evidence from a County Government, *Public Personnel Management*, Vol 52 (4), pp. 498-520, DOI: 10.1177/00910260231187538.

Department of Environment, Forestry and Fisheries. (2020). National Waste Management Strategy 2020, Government Notice 56, Government Gazette 44116 of 28 January 2021, https://www.gov.za/sites/default/files/gcis_document/202101/44116gon56.pdf, Accessed: 19 October 2024.

Department of Environment, Forestry and Fisheries and Department of Science and Innovation (2020). Waste picker integration guideline for South Africa: Building the Recycling Economy and Improving Livelihoods through Integration of the Informal Sector. DEFF and DST: Pretoria.

Department of Statistics South Africa (2024). Stats SA, Republic of South Africa, https://www.statssa.gov.za/?page_id=993&id=city-of-johannesburg-municipality, Accessed: 23 March 2024.

Del Carmen-Niño, V., Herrera-Navarrete, R., Juárez-López, A.L., Sampedro-Rosas, M.L., and Reyes- Umaña, M. (2023). Municipal Solid Waste Collection: Challenges, Strategies and Perspectives in the Optimization of a Municipal Route in a Southern Mexican Town. *Sustainability*, 15, 1083, pp.1-15, https://doi.org/10.3390/su15021083.

Desai, A., and Vahed, G. (2019). *A History of the Present: A Biography of Indian South Africans*, 1990–2019. India: OUP India.

Dias, S.M. (2016). Waste pickers and cities, *Environment & Urbanization,* Vol 28(2), pp. 375–390, https://doi.org/10.1177/0956247816657302.

Dugarova, E. (2015). Social inclusion, poverty eradication and the 2030 agenda for sustainable development. United National Research Institute for Social Development, (UNRISD), Geneva, Switzerland.

Espinosa-Aquino, B., Gabarrell Durany, X., and Quirós Vargas, R. (2023). The Role of Informal Waste Management in Urban Metabolism: A Review of Eight Latin American Countries. *Sustainability*, 15, 1826, pp. 1-19, https://doi.org/10.3390/su15031826.

Etim, E. (2024). Leveraging public awareness and behavioural change for entrepreneurial waste management, *Heliyon,* Vol 10 (21), e40063, pp. 1-11, DOI: 10.1016/j.heliyon. 2024.e40063.

Fartookzadeh, H.R., Fartookzadeh, M., and Mokhtarianpour, M. (2024). Enrichment of systems thinking for problem solving in engineering systems using the hermeneutic loop: Case studies for designers in the field of remote communication, *Malaysian Management Journal*, Vol 28, pp. 67-98, https://doi.org/10.32890/mmj2024.28.3.

Fazzo L., Manno V., Iavarone I., Minelli G., De Santis M., Beccaloni E., Scaini F., Miotto E., Airoma D., and Comba P. (2023). The health impact of hazardous waste landfills and illegal dumps contaminated sites: An epidemiological study at ecological level in Italian Region. *Front. Public Health* 11:996960, pp. 1-18, doi: 10.3389/fpubh.2023.996960.

Ferronato, N., and Torretta, V. (2019). Waste Mismanagement in Developing Countries: A Review of Global Issues, *Int. J. Environ. Res. Public Health*, Vol 16, 1060, pp. 1-28, doi:10.3390/ijerph16061060.

Fife, S.T., and Gossner, J.D. (2024). Deductive Qualitative Analysis: Evaluating, Expanding, and Refining Theory, *International Journal of Qualitative Methods,* Vol 23, pp. 1-12, DOI: 10.1177/16094069241244856.

Gauteng Provincial Department. (2021). Waste Management By-Law, Provincial Gazette no. 349, https://openbylaws.org.za/akn/za-jhb/act/by-law/2021/waste-management/eng@2021-10-13, Accessed: 15 February 2025.

Glette, M.K., and Wiig, S. (2022). The Headaches of Case Study Research: A Discussion of Emerging Challenges and Possible Ways Out of the Pain, *The Qualitative report*, Vol 27(5), pp. 1377-1393, https://doi.org/10.46743/2160-3715/2022.5246.

Global Alliance for Incinerator Alternatives. (2021). Strengthening Waste Picker Organising in Africa: “United We Are Strong, Divided We Fall”, www.no-burn.org/Strengthening-Waste-Picker-Organising-in-Africa, Accessed: 05 February 2025.

Godfrey, L., and Oelofse, S. (2017). Historical Review of Waste Management and Recycling in South Africa, *Resources*,6 (4), 57, pp. 1-11, https://doi.org/10.3390/resources6040057

Godfrey, L. (2021). Quantifying economic activity in the informal recycling sector of South Africa, *Research Article for CSIR,* Vol 117 (9/10), pp. 1-7, https://doi.org/10.17159/sajs.2021/8921

Gorris, P., and Koch, L. (2024). Building trust in environmental co-management: Social embeddedness in a contested German biodiversity conservation governance process, *Environmental Science and Policy*, Vol 154, 103695, pp. 1-8, https://doi.org/10.1016/j.envsci.2024.103695.

Grootjans, S. J., Stijnen, M.M.N., Kroese, M.E.A.L., Ruwaard, D., and Jansen, M.W.J. (2022). Collaborative governance at the start of an integrated community approach: a case study, *BMC Public Health*, Vol 22: 1013, pp. 1-11, https://doi.org/10.1186/s12889-022-13354-y.

Gutberlet J., and Carenzo, S. (2020). Waste Pickers at the Heart of the Circular Economy: A Perspective of Inclusive Recycling from the Global South. Worldwide Waste, *Journal of Interdisciplinary Studies*; 3(1):6, pp. 1-14, https://doi.org/10.1371/journal.pone.0265889.

Gutberlet, J., Sorroche, S., Baeder, A.M., Zapata, P., Zapata Campos, M.J. (2021). Waste Pickers and Their Practices of Insurgency and Environmental Stewardship, *The Journal of Environmental & Development*, Vol 30 (4), pp. 369-394, https://doi.org/10.1177/10704965211055328.

Gutberlet, J. (2023). Global plastic pollution and informal waste pickers, *Cambridge Prisms: Plastics*, Vol 1: e9, pp.1-6, https://doi.org/10.1017/plc.2023.10.

Harfadli, M.M., Ramadan, B.S., Rachman, I., and Matsumoto, T. (2024). Challenges and characteristics of the informal waste sector in developing countries: an overview, *Journal of Material Cycles and Waste Management*, Vol 26, pp. 1294-1309, https://doi.org/10.1007/s10163-024-01929-3.

Haregu, T.N., Ziraba, A.K., Aboderin, I., Amugsi, D., Muindi, K., and Mberu, B. (2017). An assessment of the evolution of Kenya's solid waste management policies and their implementation in Nairobi and Mombasa: analysis of policies and practices, *Environment & Urbanization*, Vol 29 (2), pp. 515-532, https://doi.org/10.1177/0956247817700294.

Hargreaves, J., and Seale, C. (1981). The Use of a Semi-Structured Questionnaire to Reveal Participants' Perceptions of an In-Service Masters Course in Biological Education, *Journal of In-Service Education*, Vol 7:2, pp. 118-124, DOI: 10.1080/0305763810070206

Haywood, L.K., Kapwata, T., Oelofse, S., Breetzke, G., and Wright, C.Y. (2021). Waste Disposal Practices in Low-Income Settlements of South Africa. *Int. J. Environ. Res. Public Health*, 18, 8176, pp. 1-12, https://doi.org/10.3390/ijerph18158176.

Hidalgo-Crespo, J., Amaya-Rivas, J.L., Ribeiro, I., Soto, M., Riel, A., and Zwolinski, P., (2023). Informal waste pickers in guayaquil: Recycling rates, environmental benefits, main barriers, and troubles, *Heliyon,* Vol 9 (9), e19775, https://doi.org/10.1016/j.heliyon.2023.e19775.

Hinrichs, M.M., and Johnston, E.W. (2020). The creation of inclusive governance infrastructures through participatory agenda-setting, *European Journal of Futures Research,* Vol 8 (10), pp. 1-15, https://doi.org/10.1186/s40309-020-00169-6.

Howell, J.P. (2015). 'Modes of governing' and solid waste management in Maui, Hawaii, USA, *Environment and Planning A,* 47(10), pp. 2153–2169. https://doi.org/10.1177/0308518X15599286

Hysing, E. (2022). Designing collaborative governance that is fit for purpose: theorising policy support and voluntary action for road safety in Sweden, *Journal of Public Policy*, Vol 42, pp. 201-223, doi:10.1017/S0143814X2000029X.

Jebaranjitham, J.N., Chrityraj, J.D.S., Prasannan, A., Rajagopalan, K., Chelladurai, K.S., and Gnanaraja, K.J.S. (2022). Current scenario of solid waste management techniques and challenges in Covid-19: A review, *Heliyon*, 8, pp. 1-19, https://doi.org/10.1016/j.heliyon.2022.e09855.

Juarez-Pastor, L., Subramanian, V., Cucurachi, S., and Ghorbani, A. (2024). Caste, mistrust, and municipal inaction: The interwoven barriers for the integration of waste pickers in India, Journal of Environmental Management, Vol 356, 120513, pp. 1-24, https://doi.org/10.1016/j.jenvman.2024.120513.

Kain, J.H., Zapata, P., Mantovani Martiniano de Azevedo, A., Carenzo, S., Charles, G., Gutberlet, J., Oloko, M., Reynosa, J.P., and Zapata Campos, M.J. (2022).

Characteristics, challenges, and innovations of waste picker organizations: A comparative perspective between Latin American and East African countries. *PLoS ONE*, Vol 17(7), e0265889. https://doi.org/10.1371/journal.pone.0265889.

Khatibi, F.S., Dedekorkut-Howes, A., Howes, M., and Torabi, E. (2021). Can public awareness, knowledge and engagement improve climate change adaptation policies? *Discov Sustain*, Vol 2 (18), pp.1-24, https://doi.org/10.1007/s43621-021-00024-z.

Kala, K., and Bolia, N.B. (2024). Empowering the informal sector in urban waste management: Towards a comprehensive waste management policy for India, *Environmental Development*, Vol 49, 100968, pp. 1-16, https://doi.org/10.1016/j.envdev.2024.100968.

Karar, E., and Jacobs-Mata, I. (2016). Inclusive governance: the role of knowledge in fulfilling the obligations of citizens, *Aquatic Procedia*, Vol 6, pp. 15-22, doi: 10.1016/j.aqpro.2016.06.003.

Kariuki, J.M., Bates, M., and Magana, A. (2019). Characteristics of Waste Pickers in Nakuru and Thika Municipal Dumpsites in Kenya, *Current Journal of Applied Science and Technology*, Vol 37 (1), pp. 1-11. https://doi.org/10.9734/cjast/2019/v37i130272.

Kaza, S., Yao, L., Bhada-Tata, P., and van Woerden, F. (2018). What a waste 2.0. A global snapshot of solid waste management to 2050. With assistance of Kremena Ionkova, John Morton, Renan Alberto Poveda, Maria Sarraf, Fuad Malkawi, A. S. Harinath *et al.* Washington, DC (Urban development series). https://elibrary.worldbank.org/doi/abs/10.1596/978-1-4648-1329-0.

Khan, N.H., Naz, N., Nafees, M., Gul, N., and Saeed, T. (2023). Solid Waste Management. Solid Waste Management - Recent Advances, New Trends and Applications. *IntechOpen*, pp.1-158, http://dx.doi.org/10.5772/intechopen.1001980.

Kirchher, J., and Charles, K. (2018). Enhancing the sample diversity of snowball samples: Recommendations from a research project on anti-dam movements in Southeast Asia, PLoS ONE ,13 (8): e0201710. https://doi.org/10.1371/journal.pone.0201710.

Kistan, J., Ntlebi, V., Made, F., Kootbodien, T., Wilson, K., Tlotleng, N., Kgalamono, S., Mathee, A., and Naicker, N. (2020). Health care access of informal waste recyclers in

Johannesburg, South Africa, *PLoS ONE,* Vol 15 (7): e0235173, pp 1-12, https://doi.org/10.1371/journal.pone.0235173.

Korstanje, R., Janusz, K., Van Rompaey, A., and Roos, C. (2024). Barriers to municipal solid waste management policy implementation. A case study in KwaZulu-Natal, South Africa, *South African Geographical Journal*, Vol 106 (3), pp. 323-339, DOI:10.1080/03736245.2024.2315944

Kwarteng, I.K., Kontic, D., Bizjak, T., and Kontic, B. (2020). Assessing the Role of Waste Pickers in the Recycling Industry in Accra Metropolis, *Journal of Geoscience and Environment Protection*, Vol 8, pp. 73-87, https://doi.org/10.4236/gep.2020.810005.

Latilla, M. (2018). *Johannesburg Then and Now. South Africa*, Penguin Random House South Africa.

Li, Y., Yang, D., Sun, Y., and Wang, Y. (2021). Motivating recycling behavior-Which incentives work, and why? *Psychol Mark,* Vol 38, pp. 1525-1537, DOI: 10.1002/mar.21518.

Lim, W. M. (2024), What Is Quantitative Research? An Overview and Guidelines. *Australasian Marketing Journal*, 0(0). https://doi.org/10.1177/14413582241264622

Loots O., and Ntsala, P.G. (2024). Resisting disposability: Survivalist entrepreneurs in South Africa's informal recycling sector. J. transdiscipl. res. S. Afr, Vol 20(1), pp. 1-10, a1455.https://doi.org/10.4102/td. v20i1.1455.

Luvanda, F., Sweya, L.N., and Mwageni, N. (2023). Health and Safety Risk Among Informal Solid Waste Pickers in Kinondoni Municipality, Dar Es Salaam Region, Tanzania, *Journal of Solid Waste Technology and Management*, Vol 49 (4), pp. 365-375, http://doi.org/10.5276/jswtm/iswmaw/494/2023.365.

Made, F., Nonterah, E.A., Tloteng, N., Ntlebi,V., and Naicker, N. (2021). Ten-year risk of fatal cardiovascular disease and its association with metabolic risk factors among waste pickers in South Africa, *BMC Cardiovasc Disord*, 21:336, pp. 1-8, https://doi.org/10.1186/s12872-021-02150-y.

Makina, A., and Lawhon, M. (2022). Permission to appropriate: Waste pickers' 'guidelines' for contesting and consolidating claims to waste on the streets of Tshwane,

South Africa, *Geoforum*, Vol 137, pp. 52-60, https://doi.org/10.1016/j.geoforum.2022.10.003.

Mansoor, Z., and Williams, M.J. (2024). Systems approaches to public service delivery: methods and frameworks, *Journal of Public Policy*, Vol 44, pp. 258-283, doi:10.1017/S0143814X23000405.

Marshall, R.E., and Farajbakhsh, K. (2013). Systems approaches to integrated solid waste management in developing countries, *Waste Management*, Vol 33, pp. 988-1003, http://dx.doi.org/10.1016/j.wasman.2012.12.023.

McNaught, R. (2024). The application of collaborative governance in local level climate and disaster resilient development – A global review, *Environmental Science and Policy,* Vol 151, 103627, pp. 1-15, https://doi.org/10.1016/j.envsci.2023.103627.

Medina, M. (2008). *The informal recycling sector in developing countries: Organizing waste pickers to enhance their impact*, World Bank, Washington, DC.

Medina, M. (2010). Scrap and Trade: Scavenging Myths, United Nations University. Accessed November 20, 2024. https://ourworld.unu.edu/en/scavenging-from-waste.

Medjahid, H., and Brahamia, K. (2019). Characterization of solid waste from commercial activities and services in the municipality of Annaba, Algeria, *Journal of the Air and Waste Management Association,* Vol 69(11), pp. 1293-1303, https://doi.org/10.1080/10962247.2019.1655112,

Mendis, K., Thayaparan, M., Kaluarachi, Y., and Pathirage, C. (2023). Challenges Faced by Marginalized Communities in a Post-Disaster Context: A Systematic Review of the Literature. *Sustainability*, 15, 10754, pp. 1-22, https://doi.org/10.3390/su151410754.

Marello, M., and Helwege, A. (2018). Solid Waste Management and Social Inclusion of Waste pickers: Opportunities and Challenges. *Latin American Perspectives*, Vol 45(1) pp.108-129. https://doi.org/10.1177/0094582X17726083.

Minati, G. (2024). Theoretical Reflections on Reductionism and Systemic Research Issues: Dark Systems and Systemic Domains, *Systems*, Vol 12 (2), pp. 1-18, https://doi.org/10.3390/systems12010002.

Mlotshwa, N., Dayaram, T., Khanyile, A., Sibanda, P.A., Erwin, K., and Fleetwood, T. (2022). Working with Waste: Hazards and Mitigation Strategies Used by Waste Pickers in the Inner City of Durban. *Int. J. Environ. Res.Public Health*, Vol 19, 12986, pp. 1-12, https://doi.org/10.3390/ijerph192012986.

Monat, J.P., and Gannon, T.F. (2023). The Meaning of "Structure" in Systems Thinking, *Systems*, Vol 11 (2), 92, pp. 1-17, https://doi.org/10.3390/systems11020092.

Morais, J., Corder, G., Golev, A., Lawson, L., and Ali, S. (2022). Global review of human waste picking and its contribution to poverty alleviation and a circular economy, *Environ Res Lett,* 17, pp. 1-32, https://doi.org/10.1088/1748-9326/ac6b49.

Muheirwe, F., Kombe, W.J., and Kihila, J.M. (2023). Solid waste collection in the informal settlements of African cities: A regulatory dilemma for actors of participation and collaboration in Kampala, *Urban Forum*. Vol 35, pp. 1-22, https://doi.org/10.1007/s12132-023-09482-2.

Navarrete-Hernandez, P., and Navarrete-Hernandez, N. (2018). Unleashing Waste-Pickers' Potential: Supporting Recycling Cooperatives in Santiago de Chile, *World Development*, Vol 101, pp. 293-310, https://doi.org/10.1016/j.worlddev.2017.08.016.

Nawaz, M., Yousafzai, M.T., Khan, S., Ahmad, W., Salman, M., Han, H., Ariza-Montes, A., and Vega-Munoz, A. (2021). Assessing the Formal and Informal Waste Recycling Business Processes through a Stakeholders Lens in Pakistan, *Sustainability*, Vol 13, 11717, pp. 1-16, https://doi.org/10.3390/su132111717.

Neely, C.L., Bourne, M., Chesterman, S., Vagen, T.G., Lekaram, V., Winowiecki, L.A., and Prabhu, R. (2021). Inclusive, Cross-Sectoral and Evidence-Based Decision-Making for Resilience Planning and Decision-Making in a Devolved Context, *The European Journal of Development Research*, Vol 33, pp. 1115-1140, https://doi.org/10.1057/s41287-021-00410-3.

Nerio, R., and Halley, J. (2022). The Roads to Hillbrow: *Making Life in South Africa's Community of Migrants*. United Kingdom: Fordham University Press.

Neville, L., and Tovar Cortés, L.F. (2023). Waste Pickers' Formalisation from Bogotá to Cartagena de Indias: Dispossession and Socio-Economic Enclosures in Two

Colombian Cities, *Sustainability*, Vol 15, 9047, pp. 1-17, https:// doi.org/10.3390/su15119047.

Nielsen, R.O., Sorensen, E., and Torfing, J. (2024). Drivers of collaborative governance for the green transition, *Public Management Review*, Vol 26(12), pp. 3715-3740, DOI: 10.1080/14719037.2024.2358321.

Noble, H., and Mitchell, G. (2016). What is Grounded Theory, *Evid Based Nurs*, Vol 19 (2), pp. 34-35, https://doi.org/10.1136/eb-2016-102306.

Oelofse, S.H.H., and Godfrey, L. (2008). Defining waste in South Africa: moving beyond the age of 'waste'. *S. Afr. j. sci*, vol.104, n.7-8, pp.242-246.

Ogando, A.C., and Roever, S. (2017). Gender and informal livelihoods: Coping strategies and perceptions of waste pickers in Sub-Saharan Africa and Latin America, *International Journal of Sociology and Social Policy*, Vol 37(78), pp. 435-451, DOI 10.1108/IJSSP-06-2016-0077.

Omosimua, I.J., Oluranti, O.I., Obindah, G., and Busayo, A. (2020). Working Conditions and Career Aspirations ofWaste Pickers in Lagos State. Recycling 2020, Vol 6(1), pp. 1-13. https:// doi.org/10.3390/recycling6010001.

Otomayo, A.O., Omotoso, A.B., Daud, A.S., Ogunniyi, A.I., and Olagunju, K. O. (2020). What Drives Households' Payment for Waste Disposal and Recycling Behaviours? Empirical Evidence from South Africa's General Household Survey, *International Journal of Environmental Research and Public Health*, Vol 17, 7188, pp.1-22, doi:10.3390/ijerph17197188.

Oyebode, O.J. (2024). Promoting Integrated and Sustainable Solid Waste Management System in A Developing City for Public Health and Cleaner Environment, Journal of Harbin Engineering University, Vol 45(1), pp. 201-216.

Perez, T. (2019). How Stigma Constrains Policies: Waste Pickers in South Africa, Global Dialogue 9.2, https://globaldialogue.isa-sociology.org/articles/how-stigma-constrains-policies-waste-pickers-in-south-africa, Accessed: 9 February 2025.

Pikitup (2024). *About*, City of Johannesburg, https://pikitup.co.za/about/. Accessed: 14 November 2024.

Porras Bulla, J., Rendon, M., and Espluga Trenc, J. (2021). Policing the stigma in our waste: what we know about informal waste pickers in the global north, *Local Environment*, Vol 26(10), pp. 1299–1312. doi: 10.1080/13549839.2021.1974368.

Rapp, C. (2020). Hypothesis and Theory: Collaborative Governance, Natural Resource Management, and the Trust Environment, *Front. Commun*, Vol 5(28), pp. 1-12, doi: 10.3389/fcomm.2020.00028.

Rasmeni, Z.Z., and Madyira, D.M. (2019). A review of the current municipal solid waste management practices in Johannesburg City townships, *Procedia Manufacturing*, 35, pp. 1025-1031. https://doi.org/10.1016/j.promfg.2019.06.052.

Republic of South Africa. (1998). National Environmental Management Act No 107 (NEMA), Government Notice 1540, Government Gazette 19519 of 27 November 1998, https://www.gov.za/sites/default/files/gcis_document/201409/a107-98.pdf, Accessed: 15 February 2025.

Republic of South Africa (2008). National Environmental Management: Waste Act No 59 (NEMWA), Government Notice 278, Government Gazette 32000 of 10 March 2009, https://www.gov.za/sites/default/files/gcis_document/201409/32000278.pdf, Accessed: 20 November 2024.

Rosaldo, M. (2023). Top-Down and Bottom-Up Formalization: Waste Pickers' Struggles for Labor Rights in São Paulo and Bogotá, *Sage Journals,* Vol 77 (1), pp. 32-61, https://doi.org/10.1177/00197939231205515.

Roundy, P.T., Bradshaw, M., and Brockman, B.K. (2018). The emergence of entrepreneurial ecosystems: A complex adaptive systems approach, *Journal of Business Research*, Vol 86, pp. 1-10, venturehttps://doi.org/10.1016/j.jbusres.2018.01.032.

Rutkowski, J.E., and Rutkowski, E.W. (2015), Expanding worldwide urban solidwaste recycling: The Brazilian social technology in waste pickers inclusion, *Waste Management & Research*, Vol 33(12), pp. 1084–1093, https://doi.org/10.1177/0734242X15607424.

Sajjadi, P., Bagher, M. M., Myrick, J.G., Guerriero, J.G., White, T. S., Klippel, A., and Swim, J.K. (2022). Promoting systems thinking and pro-environmental policy support

through serious games. *Front. Environ. Sci*, Vol 10:957204, pp. 1-16, doi: 10.3389/fenvs.2022.957204.

Salvia, G., Zimmerman, N., Willan, C., Hale, J., Gitau, H., Muindi, K., Gichana, E., and Davies, M. (2021). The wicked problem of waste management: An attention-based analysis of stakeholder behaviours, *Journal of Cleaner Production*, 326, pp. 1-18, https://doi.org/10.1016/j.jclepro.2021.129200.

Samson, M. (2009). Refusing to be Cast Aside: Waste Pickers Organizing Around the World. https://www.wiego.org/wp-content/uploads/2019/09/Samson-Refusing-to-be-Cast-Aside-Wastepickers-Wiego-publication-English.pdf, Accessed: 9 February 2025.

Samson, M., Kadyamadare, G., Ndlovu, L., and Kalina, M. (2022). Wasters, agnostics, enforcers, competitors, and community integrators': Reclaimers, S@S, and the five types of residents in Johannesburg, South Africa, *World Development*, Vol 150: 105733, pp. 1-7, https://doi.org/10.1016/j.worlddev.2021.105733.

Samson, M., and Motshweni, T. (2024). The betrayal of waste pickers: Few are receiving payments to which they are legally entitled, TimesLive, https://www.timeslive.co.za/ideas/2024-10-16-the-betrayal-of-waste-pickers/, Accessed: 8 February 2025.

Sanchez-Soriano, M., Arango-Ramirez, P.M., Perez-Lopez, E.I., and Garcia-Montalvo, I.A. (2024). Inclusive governance: empowering communities and promoting social justice, *Front. Polit, Sci*, Vol 6: 1478126, pp. 1-6, doi: 10.3389/fpos.2024.1478126

Schenck, C. J., and Blaauw, P. F. (2010). Living on what others throw away: a preliminary exploration into the socio-economic circumstances of people collecting and selling recyclable waste. Paper presented at a feedback session on interesting research conducted in the inner-city and Sunnyside, Pretoria as part of UNISA's The Bright Site Project - 12 November 2010, UNISA Pretoria.

Schenk, C.J., Blaauw, P.F., Swart, E.C., Viljoen, J.M.M., and Mudavanhu, N. (2019). The management of South Africa's landfills and waste pickers on them: Impacting lives and livelihoods, *Development Southern Africa*, Vol 36, pp. 80-98,10.1080/0376835X.2018.1483822.

Schoeman, D, C., and Rampedi, I, T. (2022). Household recycling and Millennials: A case study of the city of Johannesburg, South Africa, *Development Southern Africa*, Vol 39 (6), pp. 813-829, https://doi.org/10.1080/0376835X.2021.1900789.

Schoeman, T., and Ramutanda, D.M. (2023). Waste pickers and e-waste: A case study in the greater Johannesburg area, *WasteCon 2022*, Gauteng.

Senekane, M.F., and Mngomezulu, N.P. (2024). An investigation of the work challenges faced by solid waste pickers in the City of Ekurhuleni Metropolitan Municipality, Gauteng South Africa, *OIDA International Journal of Sustainable Development,* Vol 17 (2), pp.11-24,https://ssrn.com/abstract=4793470.

Seshie, V. I., Obiri-Danso, K., and Miezah, K. (2020). "Municipal Solid Waste Characterization and Quantification as a Measure towards Effective Waste Management in the Takoradi Sub-Metro", Ghana Mining Journal, Vol 20 (2), pp. 86-98., https://dx.doi.org/10.4314/gm.v20i2.10.

Sibanda, P., Sibanda, M., and Phesa, M. (2023). Health and Socioeconomic Analysis of Waste Picking Activities in Ethekwini Municipality, KwaZulu-Natal, Durban, *International Journal of Environmental, Sustainability, and Social Science*, Vol 4 (5), pp. 1481 – 1496, 10.38142/ijesss. v4i5.802.

Simatele, D. M., Dlamini, S., and Kubanza, N. S. (2017). From informality to formality: Perspectives on the challenges of integrating solid waste management into the urban development and planning policy in Johannesburg, South Africa. *Habitat International*, Vol 63, pp. 122–130, https://doi.org/10.1016/j.habitatint.2017.03.018.

Singh, R. (2023). High time to address occupational hazards of waste pickers, https://www.downtoearth.org.in/waste/high-time-to-address-occupational-hazards-of-wastepickers88043#:~:text=Poor%20living%20and%20working%20conditions&text=Their%20living%20quarters%20are%20frequently,sun%20or%20in%20torrential%20rain. Accessed: 6 February 2025.

Smith, E.E. (2020). Attitudes and Practices of Households toward Waste Management and Recycling in Nelson Mandela Bay, *Journal of Contemporary Management*, Vol 17 (2), pp. 573-600, https://doi.org/10.35683/jcm20020.91.

Solaja, O.M., Osifo, O.K., and Amoo, O.F. (2024). Empowering informal plastic recyclers: addressing socio-economic challenges and human rights awareness in Ogun State, Nigeria, *BMC Environmental Science*, Vol 1 (10), pp.1-17, https://doi.org/10.1186/s44329-024-00011-5.

South African Waste Pickers Association (2023) Number of waste pickers in Central Johannesburg, https://wastepickers.org.za/about/, Accessed: 2 June 2024.

Syafrudin, S., Masjhoer, J.M., and Maryono, M. (2023). Characterization and quantification of solid waste in rural regions, *Global Journal of Environmental Science and Management*, 9(2), pp. 337-352., DOI: 10.22034/gjesm.2023.02.12.

Sverdlik, A., Kothiwal, K., Kadungure, A., Agarwal, S., Machemedze, R., Verma, S., and Loewenson, R. (2024). Understanding the interplay of occupational, public health, and climate-related risks for informal workers: A new framework with findings from Zimbabwe and India, *Social Science and Medicine*, Vol 348, 116750, pp. 1-12, https://doi.org/10.1016/j.socscimed.2024.116750.

Tenny S., Brannan J.M., and Brannan G. D. (2022). Qualitative Study In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK470395/, Accessed: 26 December 2024.

Teshome, Y.M., Habtu, N.G., Molla, M.B.,and Ulsido, M.D. (2023). Municipal solid wastes quantification and model forecasting, *Global Journal of Environmental Science and Management,* 9 (2), pp. 227-240, DOI: 10.22034/gjesm.2023.02.04.

Tomita, A., Cuadros, D.F., Burns, J.K., Tanser, F., and Slotow, R. (2020). Exposure to waste sites and their impact on health: a panel and geospatial analysis of nationally representative data from South Africa, 2008–2015, *Lancet Planet Health*, Vol 4, pp. 223-234., doi: 10.1016/S2542-5196(20)30101-7.

Ugwu, C.O., Ozoegwu, C.G., and Ozor, P.A. (2020). Solid waste quantification and characterization in university of Nigeria, Nsukka campus, and recommendations for sustainable management, *Heliyon*, 6(6), pp. 1-9, https://doi.org/10.1016/j.heliyon.2020.e04255.1-9.

Ulibarri, N., Imperial, M.T., Sidikki, S.,and Henderson, H. (2023). Drivers and Dynamics of Collaborative Governance in Environmental Management,

Environmental Management, Vol 71, pp. 495-504, https://doi.org/10.1007/s00267-022-01769-7.

Van Der Waal, G.M., and Grutter, W. (1986). *Early Johannesburg, Its building and Its People*, Human & Rousseau, South Africa.

Van Popering-Verkerk, J., Molenveld, A., Duijn, M., Van Leeuwen, C.,and Van Buuren, A. (2022). A Framework for Governance Capacity: A Broad Perspective on Steering Efforts in Society, *Administration and Society*, Vol 54(9), pp. 1767-1794, DOI: 10.1177/00953997211069932.

Vaverkova, M.D. (2019). Landfill Impacts on the Environment-Review, *Geosciences*, Vol 9 (431), doi:10.3390/geosciences9100431.

Velis, C.A., Hardesty, B.D., Cottom, J.W., and Wilcox, C. (2022). Enabling the informal recycling sector to prevent plastic pollution and deliver an inclusive circular economy, *Environmental Science and Policy*, Vol 138, pp. 20-25, https://doi.org/10.1016/j.envsci.2022.09.008.

Vihma, P., and Toikka, A. (2021). The limits of collaborative governance: The role of inter-group learning and trust in the case of the Estonian “Forest War”, *Env Pol Gov,* Vol 31, pp. 403-416, DOI: 10.1002/eet.1952.

Viljoen, K., Blaauw, P., and Schenck, R. (2016). I would rather have a decent job: Potential barriers preventing street-waste pickers from improving their socio-economic conditions. South African Journal of Economic and Management Sciences, Vol 19(2), pp. 175-191. doi: https://doi.org/10.4102/sajems.v19i2.1258.

Viljoen, K., Blaauw, D., and Schenck, R. (2018). Sometimes you don’t make enough to buy food: An analysis of South African street waste pickers’ income, *Journal of Economic and Financial Sciences,* Vol 11(1), pp.1-13, doi:https://doi.org/10.4102/jef.v11i1.186

Viswanathan, R., and Telukdarie, A. (2022). The role of 4IR technologies in waste management practices- a bibliographical analysis, *Procedia Computer Science*, 200, pp. 247-256, https://doi.org/10.1016/j.procs.2022.01.223.

Voulvoulis, N., Giakoumis, T., Kioupi, V., Petrou, N., Souliotis, I., Vaghela, W.I.H., and Rosely, B. W. (2022). Systems thinking as a paradigm shift for sustainability

transformation, *Global Environmental Change*, Vol 75, 102544, pp. 1-7, https://doi.org/10.1016/j.gloenvcha.2022.102544.

Waardenburg, M., Groenlaar, M., de Jong, J., and Keijser, B. (2020). Paradoxes of collaborative governance: investigating the real-life dynamics of multi-agency collaborations using a quasi-experimental action-research approach, *Public Management Review,* Vol 22 (3), pp. 386-407, DOI: 10.1080/14719037.2019.1599056.

Wang, H., and Ran, B. (2023). Network governance and collaborative governance: a thematic analysis on their similarities, differences, and entanglements, *Public Management Review*, Vol 25(6), pp. 1187-1211, DOI: 10.1080/14719037.2021.2011389.

West, B.T., Zhang, S., Wagner, J., Gatward, R., Saw, H.W., and Axinn, W.G. (2023). Methods for improving participation rates in national self-administered web/mail surveys: Evidence from the United States, *PLoS One,* Vol 8(18): e0289695, https://doi.org/10.1371/journal.pone.0289695

Williamson, K., Bow, A., Burstein, F., Darke, P., Harvey, R., Johanson, G., McKemmish, S., Oosthuizen, M., Saule, S., Schauder, D., Shanks, G., and Tanner, K. (2002*). In Topics in Australasian Library and Information Studies: Research methods for students, academics and professionals*, 2nd ed, Chandos Publishing. pp. 25-47.

Wilson, D.C., Velis, C., and Cheeseman, C. (2006). Role of informal sector recycling in waste management in developing countries. *Habitat International*, 30(4), pp. 797-808, https://doi.org/10.1016/j.habitatint.2005.09.005.

World Bank (2016). *Waste not, want not – solid waste at the heart of sustainable development*. http://www.worldbank.org/en/news/feature/2016/03/03/waste-not-want-not---solid-waste-atthe-heart-of-sustainable-development Accessed 13 November 2024.

World Bank (2022), Available online: https://www.worldbank.org/en/topic/urbandevelopment/brief/solid-wastemanagement (accessed on 02 March 2024).

Yu, D., Blaauw, D., and Schenk, R. (2020). Waste pickers in informal self-employment: Over-worked and on the breadline, *Development Southern Africa*, Vol 37, pp. 971-996. https://doi.org/10.1080/0376835X.2020.1770578

Zambrano-Gutirrez, J.C., Valente de Macedo, L.S., Picavet, M.E.B, and de Oliveira, J.A.P. (2022). Individuals in Collaborative Governance for Environmental Management, *Environmental Management*, Vol 71, pp. 566-586, https://doi.org/10.1007/s00267-022-01693-w.

Zare, F., Jakeman, A.J., Elsawah, S., and Guillaume, J, H, A. (2024). Bridging practice and science in socio-environmental systems research and modelling: A design science approach, *Ecological Modelling,* Vol 492, 110719, pp. 1-12, https://doi.org/10.1016/j.ecolmodel.2024.110719.

Zhang, J., and Zhu, M. (2022). Collaborative governance of municipal solid waste in urban agglomerations: The case of Yangtze River Delta, *Front. Environ. Sci*, Vol 10, 999120, pp. 1-8. doi: 10.3389/fenvs.2022.999120.

Zia ud din, M., Yuan, X.Y., Khan, N.U., and Han, H. (2023). Linking local collaborative governance and public service delivery: mediating role of institutional capacity building. *Humanit Soc Sci Commun*, Vol 10, 906, pp. 1-10, https://doi.org/10.1057/s41599-023-02421-3.

Zondi, N., Qwetekana, Z., and Dube, S. (2023). Modernisation of Rural communities: Solid waste management implication. *African Journal of Inter/ Multidisciplinary Studies*, 5 (S1), pp. 1-11, DOI: https://doi.org/10.51415/ajims.v5i1.1149.

Appendices

Appendix 1: Waste Picker and NGO/NPO survey questionnaire with consent forms.



Consent form: Informal waste collectors.

Title of project: Comprehensive contributions of the informal sectors in Solid waste management Systems: A case study of Central Johannesburg.

Name of Researcher: Takshita Pursooth

I..... agree to participate in this research project.

I agree to the following:

(Please circle the relevant options below)

The research study was explained to me properly. I understand what this study is about	Yes	No
I understand that I can volunteer to take part in the study, and I am not forced to participate if I am not comfortable.	Yes	No
I agree that direct quotations from my semi-structured interview/survey may be used by the researcher in their research report.	Yes	No
I agree that my participation will remain anonymous (name or other identifying data will not be used by the researcher in their research report.	Yes	No
I agree that other researchers may use the information I provide in my semi structured interviews/ surveys (depending on their own ethics clearance being obtained) but my name and any personal information will not be used or passed on by others at any time.	Yes	No

.....(Signature)

..... (Name of participant)

..... (Date)

..... (Signature)

..... (Name of researcher/person seeking consent)

.....(Date)

Informal waste collector survey

1) Please select your age category below, if applicable:

18-40 ☐

41-55 ☐

55-65 ☐

66-75 ☐

76-84 ☐

Above 84 ☐

2) What is your education level, if possible. Please select the below option

Primary school only ☐

High school only ☐

Higher education (university, college) ☐

No formal education ☐

3) Are you affiliated with a union or waste management group?

Yes ☐

No ☐

4) How many years' worth of experience, do you have in the industry?

5) How many times do you collect waste in a week?

6) Do you feel you are well represented as a waste collector within the industry?

7) How do you feel you are received by society in which you work in? Do people treat you well or not?

8) How do you feel your line of work can be improved?

9) What benefits do you feel you would like to have from your job as a waste collector?

Appendix 2: Citizen of Central Johannesburg survey questions with consent forms.



Consent form: Citizens of Central Johannesburg

Title of project: Comprehensive contributions of the informal sectors in Solid waste management Systems: A case study of Central Johannesburg.

Name of Researcher: Takshita Pursooth

I..... agree to participate in this research project.

I agree to the following stated below:

(Please circle the relevant options below)

The research study was explained to me properly. I understand what this study is about	Yes	No
I understand that I can volunteer to take part in the study, and I am not forced to participate if I am not comfortable.	Yes	No
I agree that direct quotations from my semi-structured interview/survey may be used by the researcher in their research report.	Yes	No

I agree that my participation will remain anonymous (name or other identifying data will not be used by the researcher in their research report.	Yes	No
I agree that other researchers may use the information I provide in my semi structured interviews/ surveys (depending on their own ethics clearance being obtained) but my name and any personal information will not be used or passed on by others at any time.	Yes	No

.....(Signature)

..... (Name of participant)

..... (Date)

..... (Signature)

..... (Name of researcher/person seeking consent)

.....(Date)

Central Johannesburg citizen survey

Please select your age category below:

18-40 ☐

41-55 ☐

55-65 ☐

66-75 ☐

76-84 ☐

Above 84 ☐

1) What are your methods of disposal of waste?

2) Has your solid waste been collected by an informal waste collector before? If yes, how many times in a week has there been collection by them?

3) What is your view on informal waste collectors?

4) What are the benefits of the collection of waste by the informal waste collectors, from your perspective?

5) Do you, from a citizen perspective, feel that the informal waste collectors play a role in waste collection and if so, how?

6) What aspects of the informal waste collectors can be improved for waste collection?

7) How can you, as a citizen, work alongside the informal waste collectors to manage solid waste collection?

8) How can the relationship between citizens and waste collectors be created or improved?

Appendix 3: Local authorities of Central Johannesburg survey questions with consent forms.



Consent form: Local Authorities

Title of project: Comprehensive contributions of the informal sectors in Solid waste management Systems: A case study of Central Johannesburg.

Name of Researcher: Takshita Pursooth

I..... agree to participate in this research project.

I agree to the following:

(Please circle the relevant options below)

The research study was explained to me properly. I understand what this study is about	Yes	No
I understand that I can volunteer to take part in the study, and I am not forced to participate if I am not comfortable	Yes	No
I agree that direct quotations from my semi-structured interview/survey may be used by the researcher in their research report.	Yes	No
I agree that my participation will remain anonymous (name or other identifying data will not be used by the researcher in their research report.	Yes	No
I agree that other researchers may use the information I provide in my semi structured interviews/ surveys (depending on their own ethics clearance being obtained) but my name and any personal information will not be used or passed on to by other at any time.	Yes	No

.....(Signature)

..... (Name of participant)

..... (Date)

..... (Signature)

..... (Name of researcher/person seeking consent)

.....(Date)

1) Do you identify the role of the informal waste collectors in Central Johannesburg? Elaborate.

2) What challenges have you identified with waste collection and management in Central Johannesburg?

3) Have the informal waste collectors improved waste management in Central Johannesburg? How?

4) What are the challenges seen with the informal waste collectors in Central Johannesburg?

5) How can the informal waste sector be included into formal plans and policies?

6) What are the challenges with formalization of the informal waste sector in Central Johannesburg?

Appendix 4: Participation information sheet- Waste Pickers and NGO/NPO.



Dear Sir/Madam

My name is Takshita Pursooth. I am a Masters student in Environmental Science at the University of Witwatersrand, Johannesburg. My supervisor is Dr Nzalalemba Serge Kubanza. I am conducting a research study about solid waste management in Central Johannesburg. The title of the study is Comprehensive contributions of the informal sectors in Solid waste management Systems: A case study of Central Johannesburg.

I humbly invite you to participate in a semi structured interview/survey. If you do choose to participate in the study, the duration of the study would be 20 minutes. The semi-structured interview/survey would take place in person/online during working hours. Provided your permission, the answers from the interview would be used in the final research report. Information from the interview/survey would be securely stored in a password protected file and laptop for 7 years and will be deleted after 7 years. Only the researcher will have access to this data during this time.

This research would require me to ask about your experiences as an informal waste collector within Central Johannesburg and the challenges you face. The semi-structured interview will be confidential, and your identity will be kept anonymous. When the results of the interview/survey will be shared, your name or anything else used to identify you, will not be shared. With your permission, other researchers may use the data collected from this research study, but your name and any personal information will be kept confidential and will not be passed onto others.

If you do decide to participate in the study, it would be based on you wanting to volunteer. You do not have to take part if you do not feel comfortable. You can stop being in the study at any time. You do not have to answer any questions if you do not want to. You will not get any benefits if you participate. You will not lose any services, benefits, or rights you would currently have if you decided not to participate. Taking part of the study will not cost you anything and you will not be paid to participate in the study.

The risks for this study are not more than what occurs daily in everyday life and the questions are not designed to upset or hurt you. This research study will be written in a final report. A summary of the report will be made available, and should you require it, I will gladly share it with you.

If you have any questions during or after the interview/survey, kindly feel free to contact me or my supervisor on the details below. If you have any concerns or complaints regarding the ethical procedures of this research study, please contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408 or alternatively you can send an email to hrecnon-medical@wits.ac.za.

Yours sincerely,

Takshita Pursooth

Researcher:

Name: Takshita Pursooth

Emails: 551358@students.wits.ac.za

Telephone: 081 776 2084.

Supervisor:

Name: Dr Nzalalemba Serge Kubanza

Emails: serge.kubanza@wits.ac.za

Telephone: 011 717 6515

Appendix 5: Participation information sheet- Citizens of Central Johannesburg.



Dear Sir/Madam

My name is Takshita Pursooth. I am a Masters student in Environmental Science at the University of Witwatersrand, Johannesburg. My supervisor is Dr Nzalalemba Serge Kubanza. I am conducting a research study about solid waste management in Central Johannesburg. The title of the study is Comprehensive contributions of the informal sectors in Solid waste management Systems: A case study of Central Johannesburg.

I humbly invite you to participate in a semi structured interview/survey. If you do choose to participate in the study, the duration of the study would be 20 minutes. The semi-structured interview/survey would take place online/ in-person during working hours. Provided your permission, the answers from the interview would be used in the final research report. Information from the interview/survey would be securely stored in a password protected file and laptop for 7 years and will be deleted after 7 years. Only the researcher will have access to this data during this time.

This research would require me to ask about the effectiveness of informal waste pickers within Central Johannesburg. The semi-structured interview will be confidential, and your identity will be kept anonymous. When the results of the interview/survey will be shared, your name or anything else used to identify you, will not be shared. With your permission, other researchers may use the data collected from this research study, but your name and any personal information will be kept confidential and will not be passed onto others.

If you do decide to participate in the study, it would be based on you wanting to volunteer. You do not have to take part if you do not feel comfortable. You can stop being in the study at any time. You do not have to answer any questions if you do not want to. You will not get any benefits if you participate. You will not lose any services, benefits, or rights you would currently have if you decided not to participate. Taking part of the study will not cost you anything and you will not be paid to participate in the study.

The risks for this study are not more than what occurs daily in everyday life and the questions are not designed to upset or hurt you. This research study will be written in a final report. A summary of the report will be made available, and should you require it, I will gladly share it with you.

If you have any questions during or after the interview/survey, kindly feel free to contact me or my supervisor on the details below. If you have any concerns or complaints regarding the ethical procedures of this research study, please contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408 or alternatively you can send an email to hrecnon-medical@wits.ac.za.

Yours sincerely,

Takshita Pursooth

Researcher:

Name: Takshita Pursooth

Emails: 551358@students.wits.ac.za

Telephone: 081 776 2084.

Supervisor:

Name: Dr Nzalalemba Serge Kubanza

Emails: serge.kubanza@wits.ac.za

Telephone: 011 717 6515

Appendix 6: Participation information sheet- Local authorities of Central Johannesburg.



Dear Sir/Madam

My name is Takshita Pursooth. I am a Masters student in Environmental Science at the University of Witwatersrand, Johannesburg. My supervisor is Dr Nzalalemba Serge Kubanza. I am conducting a research study about solid waste management in Central Johannesburg. The title of the study is Comprehensive contributions of the informal sectors in Solid waste management Systems: A case study of Central Johannesburg.

I humbly invite you to participate in a semi structured interview/survey. If you do choose to participate in the study, the duration of the study would be 20 minutes. The semi-structured interview/survey would take place online/email during working hours. Provided your permission, the answers from the interview would be used in the final research report. Information from the interview/survey would be securely stored in a password protected file and laptop for 7 years and will be deleted after 7 years. Only the researcher will have access to this data during this time.

This research would require me to ask about the experiences with informal waste collector within Central Johannesburg and how they can be formalised into policy and plans. The semi-structured interview will be confidential, and your identity will be kept anonymous. When the results of the interview/survey will be shared, your name or anything else used to identify you, will not be shared. With your permission, other researchers may use the data collected from this research study, but your name and any personal information will be kept confidential and will not be passed onto others.

If you do decide to participate in the study, it would be based on you wanting to volunteer. You do not have to take part if you do not feel comfortable. You can stop being in the study at any time. You do not have to answer any questions if you do not want to. You will not get any benefits if you participate. You will not lose any services, benefits, or rights you would currently have if you decided not to participate. Taking part of the study will not cost you anything and you will not be paid to participate in the study.

The risks for this study are not more than what occurs daily in everyday life and the questions are not designed to upset or hurt you. This research study will be written in a final report. A summary of the report will be made available, and should you require it, I will gladly share it with you.

If you have any questions during or after the interview/survey, kindly feel free to contact me or my supervisor on the details below. If you have any concerns or complaints regarding the ethical procedures of this research study, please contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408 or alternatively you can send an email to hrecnon-medical@wits.ac.za.

Yours sincerely,

Takshita Pursooth

Researcher:

Name: Takshita Pursooth

Emails: 551358@students.wits.ac.za

Telephone: 081 776 2084.

Supervisor:

Name: Dr Nzalalemba Serge Kubanza

Emails: serge.kubanza@wits.ac.za

Telephone: 011 717 6515

Appendix 7: Signed ethics clearance certificate.

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

SCHOOL OF GAES ETHICS COMMITTEE
CONSTITUTED UNDER THE UNIVERSITY HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)

CLEARANCE CERTIFICATE PROTOCOL NUMBER: WGAES-2024-90

PROJECT TITLE Comprehensive contributions of the informal sectors in Solid waste management Systems: A case study of Central Johannesburg.

INVESTIGATOR Takshita Pursooth

SCHOOL/DEPARTMENT OF INVESTIGATOR Geography, Archaeology and Environmental Studies **DATE**

CONSIDERED 27 September 2024

DECISION OF THE COMMITTEE Approved unconditionally

RISK LEVEL MINIMAL RISK

EXPIRY DATE Date of submission of the Research Report

ISSUE DATE OF CERTIFICATE: 01 October 2024 **CHAIRPERSON** (Dr M Mvimi)

cc: Supervisor: Dr Nzalalemba Serge Kubanza

DECLARATION OF INVESTIGATOR

To be completed in duplicate and **ONE COPY** returned to the Chairperson of the School/Department ethics committee.

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 be contemplated from the research procedure as approved, I/we undertake to submit an amendment of the protocol to the Committee.

__ **2024 / 10 / 01 Signature Date**