Methodology to assess the perception of informal waste pickers on being integrated into the waste management system of the City of Ekurhuleni Municipality, Gauteng Province

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Abstract: In South Africa, informal waste picking forms a vital part of municipalities' waste management system and assist in diverting plastics, paper, and other recyclable materials away from landfills which are already facing a burden of waste going into them. Informal waste pickers work in isolation to the City of Ekurhuleni's waste system and work under harsh conditions and without proper tools. Literature has attempted various ways of formalising and integrating informal waste pickers, but little information is available on how such integration should take place, from the perspective of the actual waste pickers. Therefore, this study will provide such information and knowledge on how best integration can be implemented and then close the gap of lack of literature, which will then assist in informing decision makers and policy makers on how best to integrate informal waste pickers in a South African context, and also to highlight the challenges of informal waste pickers in the recycling sector and how these can be addressed.This study aims to do an assessment of the perception of informal waste pickers on being integrated into the waste management system at City of Ekurhuleni Metropolitan municipality. To achieve this aim, the objectives include to explore various ways of integration and the dentification of challenges that informal waste pickers encounter as they perform their daily activities; to investigate ways by which informal waste pickers may be supported to overcome challenges to improve their recycling efficiencies and to improve their health. This study will be conducted in Germiston and Boksburg in the City of Ekurhuleni. Population of informal waste pickers in Germiston and Boksburg is estimated to be 550, sample size will be (n= 283). Participants in this study will include five (n=5) landfill operators in Rooikraal landfill site in Boksburg and five (n=5) landfill operators in Simmer and Jack landfill located in Germiston, two (n=2) officials from the Department of Environmental Resource and Waste Management, Ekurhuleni municipality, two (n=2) officials from the Department of Environmental Affairs, two (n=2) officials from GDARD. This study will collect primary data by employing quantitative (Semi-structured questionnaires) and qualitative (Interviews) methods of data collection. Literature and official documents compiled for City of Ekurhuleni will be used as secondary source of data collection. STATKON will use Statistical Package for Social Sciences (SPSS), version 27 to analyse collected data. Permission to conduct the study was obtained from Ethics Research committee at the University of Johannesburg, and the City of Ekurhuleni municipality in Gauteng. The outcomes of this study will determine whether or not waste pickers want to be integrated into waste management system. Recommendations to be made will contribute to individual waste pickers 'safety, zero illegal dumping.

Keywords: landfill sites, illegal dumping, recycling, solid waste management, Waste pickers,

Introduction

Recycling of waste items has become an important source of income for recycling companies in most part of the world. These companies receive recyclable waste items from informal waste pickers who sell them for cash. On their daily activities, waste pickers gather waste and sort it out to have what can be recycled. Recyclable waste items include paper, aluminium tins, bottles, and plastics [1]. Unemployment has resulted to rapid urbanization to big cities such as Ekurhuleni in Gauteng, South Africa. Because of population density, municipalities are not able to manage generated waste effectively; heaps of uncollected waste are seen all over the streets of City of Ekurhuleni, thus there are existing informal waste pickers to informally prevent the consequences of inadequate management of waste that lead to environmental degradation [2]. Other consequences of uncollected waste include the attraction of vectors that spread diseases such as cholera and malaria that have claimed lives of millions on a global scale [3]. In line with what [3] states, informal waste pickers are important role players in protecting the health of the public and protecting the environment from water pollution, land pollution and atmospheric pollution [4]. According to [5], municipalities in South Africa are faced with the challenge of integrating informal waste pickers into waste management system to improve the efficiency of recycling and in addition to improve their working conditions and make it possible for them to be accepted by the community members. In this study, we will assess the opinions of informal waste pickers in the City of Ekurhuleni municipality on being integrated into the waste management system. We will further look at the challenges facing the informal waste pickers and how such challenges can be addressed by relevant departments in Gauteng Province to safeguard human health and the environment and to promote economic empowerment.

Literature Review

Informal waste pickers and the necessity to integrate them into solid waste management system

According to [6], people who collect recyclable waste items for cash are referred to as waste reclaimers. Informal waste picking is described as an activity performed by waste reclaimers under unfavorable conditions where people collect small cash for what they have collected, and, under normal circumstances, there are no benefits [7]. Furthermore, [8] concurs with [7] and indicates that informal waste pickers operate under strict conditions of labour-exhaustive characterised by limited or lack of technological methods. Waste pickers in most parts of the world earn a living through their engagement recycling companies some of which pay them little money compared to what they have collected for selling [9]. Informal waste pickers play an important role in waste management because they divert waste from the landfill site, furthermore, municipalities do not have to pay large amounts of money for waste collection because the weight of waste is reduced through picking up recyclable waste item from the waste stream. [5]. The function of moderating the overall costs of waste management and recyclables free of partly free to the municipalities qualifies the waste pickers to be fundamental part of the waste management systems at local level of government in various countries of the world in particular the developing countries in the African continent [10]. In addition, research has shown that waste pickers are largely contributors to local economies. In some developing countries, waste pickers are considered to add value to health and safety of the public, and to environmental sustainability [11]. If both developing and developed countries could all have an integrated solid waste management, informal waste pickers would be motivated and would engage themselves in improving the efficiency in recycling, working conditions and their livelihoods while at the same time improving public health and safeguarding the environment [5].

Perceptions on Integrating Informal Waste Pickers

According to Women in Informal Employment (2014) [12], waste pickers on a global scale request municipalities to recognise and allow them to be formally integrated into waste management systems. Their extended request was based on the efficiency of the municipalities so that they could deal with their waste picking challenges and to alleviate them. Waste pickers in some countries of the world are seldom considered as people who contributes to clean environment and yet their waste picking practice with municipal waste policies and by-laws. Brazil is recorded to be the first European country to integrate waste pickers into the municipal waste management system through their cooperatives and the first country to adopt a National Waste Policy [13]. Waste pickers in Belo Horizonte, Brazil, were integrated to be service providers in municipal source segregation schemes [14] In Canada, waste pickers took a leading role to organise themselves into cooperatives and organisations, they were recognized for the significant role they played in keeping the city clean and handling waste streams and at this juncture, they started to receive support of the city councils [15]. In Colombia waste picking was formalized in March 2013 and the government paid waste pickers (known as recycler), $44 (R630) per ton of recyclable items of waste that they collected and transported to scrap dealers [16]. The positive response of the government of Colombia to formalize

waste picking resulted in incorporating waste pickers into cleaning services of the country. According to [6] the municipality of Pune in India considered the contribution of waste pickers in keeping the environment clean and took an initiative in validating their identity cards and including them in an insurance program. This initiative assisted waste pickers to be identified as workers and service providers who would provide door-to-door waste collection and segregating the waste into dry recyclables and wet waste. [17] indicates that Latin America still does not recognize the contribution of waste pickers to the environment and many municipalities do not support them. According to [18] Morocco seems to be the only country in Africa and the Middle East area with a sound national environmental policy that acknowledges the work of informal waste pickers sector allows them to collect solid waste recyclable items. The waste pickers in Kenya organized themselves to be integrated into formal waste management system, but to date they are still not recognized as workers and their needs not addressed by municipalities [19]. Nzeadibe [20] indicates that Nigeria is at the same level as South Africa in terms of waste picking. Waste picking is still recognised under the informal waste sector and as a result, the informal sector has occupied the role of critical but unrewarding gap filler in the waste recycling system, achieving in the process, low but noteworthy recycling rates. [18] argues that the role of waste management by waste pickers is recognized by Egypt to be a driver of climate change and interrelated social issues, but there is a gap in proper implementation of policies for including the sector in their waste management systems. In their study, [21], indicated that the City Council of Malawi was eager to work with any organization or any group, including cooperatives, which aim at handling municipal solid waste but the Council indicated that it could not facilitate the formation of a municipal solid waste management cooperative since such activities were not within the mandate of the City Council and also the provision of land for recycling activities was not in the mandate of the council.

According to [22], an estimated 60,000 to 90,000 South African waste reclaimers make their living from recycling mainline recyclables, either on the streets or on landfill sites. Like in many countries, these waste pickers still work in isolation or have organised themselves into co-operatives and have not been integrated into South African municipalities. In a study conducted by [23], 73% of waste pickers confirmed that they did not have formal permission or permits from the cities/municipalities to pick recyclable waste items at landfill sites. The dilemma of waste pickers is also intensified by the lack of a sound and clear legislative frameworks, policies, standards, guidelines, and procedures that govern waste picking in South Africa and other developing and developed countries [24]. Informal waste pickers in Sasolburg in the Free States Province, South Africa, organised themselves and formed the *"Ikageng Ditamating Recycling and Waste Management Group."* Like many other informal waste pickers, they were faced with challenges and for them, inclusion into the local waste management system was the most important issue they desired [6]. While Vryburg municipality in North-West Province is at the verge of integrating waste pickers into the waste management system in an organized manner, the Gauteng province is showing a lot of progress towards integrating waste pickers, however, the ever-increasing number of waste pickers serve to be a major challenge concerning the best strategies that should be put in place to enable every waste picker to be integrated into solid waste management system [25]. Simatele, Dlamini & Kubanza (2017), [1] concur with [25] and state that another reason for the Gauteng Government not finding solutions to the present situation is lack or limited knowledge on tangible strategies towards aligning and integrating informal structure into formal one. According to [1] the urban development and planning policy may be considered as some of the possible challenges that could be recorded for contributing towards unattended integration of waste pickers.

Current policies in place to allow for waste picker's integration

In South Africa, the Waste Act of 2008 supports the work of informal waste pickers, however, the Act makes it clear that to acknowledge the existence of waste picking at landfill sites, a waste management license must stipulate the appropriate circumstances in which recovering of waste may be carried out. According to [26], South Africa has a National Waste Strategy, 2011 version, which recognises the significance of waste pickers in the recycling process, however, there are no clear guidelines to municipalities on integrating waste pickers into the formal economy. The Department of Environment, Forestry and Fisheries (DEFF) and the Department of Science and Innovation (DSI) have developed guidelines for municipalities and the solid waste industry on how to improve working conditions of waste-pickers through integrating them into South Africa's waste economy [27].

Factors Affecting the Integration Process

According to [28], It may not be easy for waste pickers who are used to working independently to work as a group. The transition from working as individuals to working in group may not be possible because majority of waste pickers are used to be independent and may not feel comfortable when working in groups. In addition, some waste pickers may not prefer to be monitored but to be accountable of their own work at their own disposal. Not all

waste pickers perform their duty daily, some take a day or two off duty. So, working ingroups may create a serious conflict amongst them when they must get payment for the job well done [29]. This study concludes that the integration of waste pickers may generally be affected by unfair policies that do not include everyone, unhygienic waste collection methods, no evidence to support waste picking functions, and low quality and quantity of secondary resources.

Challenges Faced by Informal Waste Pickers

Dias & Fernandez (2013) [30] state that informal waste pickers go through various challenges related to their work. First, waste pickers are socially and racially discriminated and called names; identified as malodorous people; there is no gender equality in the field of waste picking [30]. Second, waste pickers are exposed to risks of injury from broken glasses, sharp objects like used needles which can expose them to Hepatitis B while performing their duties, especially those operating from t open dumps: waste pickers are at a risk of various accidents where they may be run over by trucks or be victims of landfill slides and fires. Third, waste pickers are at a risk of inhaling excessive amounts of toxic fumes (e.g., carbon dioxide, methane) at the disposal site. According to [31], there is a higher risk of acquiring several diseases especially respiratory and infectious diseases and injuries in informal waste pickers than to the general population. These occur because waste pickers are exposed to cuts (lesions to the skin), toxic substances such as chemicals, contaminated dust, and pathogens such as bacteria and viruses found in medical and other infectious wastes. In many countries, waste pickers find themselves working under unfavourable environmental conditions thus they suffer from respiratory and gastro- intestinal diseases [32]. Fourth, waste pickers cannot afford to pay for decent housing hence, they live or occupy shanties, cemeteries, the coastal edges or near the dumpsites. They have no access to portable water and sanitation [33]. Last, informal waste pickers perform their duties without wearing personal protective clothing such as heavy rubber hand gloves and appropriate shoes. Insufficient income does not allow waste pickers to buy suitable personal protective clothing [33].

Materials and methods

Research/Study Design

This study will employ a descriptive cross-sectional design. Quantitative methods are employed in this study to provide additional evidence and support for the findings and collect more comprehensive data. From this method, data with a wider viewpoint of the research problem will be produce. The quantitative method of data collection will focus on assembling numerical data and simplifying them across groups of people. The use of this method will help describe a phenomenon with the goal of defining the connection between one thing and another within a population [34].

Research Setting

The study areas are Simmer and Jack as well as Rooikraal landfill sites in Germiston and Boksburg towns within the City of Ekurhuleni metropolitan municipality, Gauteng Province. The city of Ekurhuleni Municipality has been identified for this study because it is a large suburban region known to be the transport hub and workshop of the country because of the presence of all transport networks the manufacturing centre of South Africa. The nature of City of Ekurhuleni qualifies it to generate a lot of solid waste, thus attracting many informal waste pickers [35]. Figure 1 is a map of the City of Ekurhuleni.

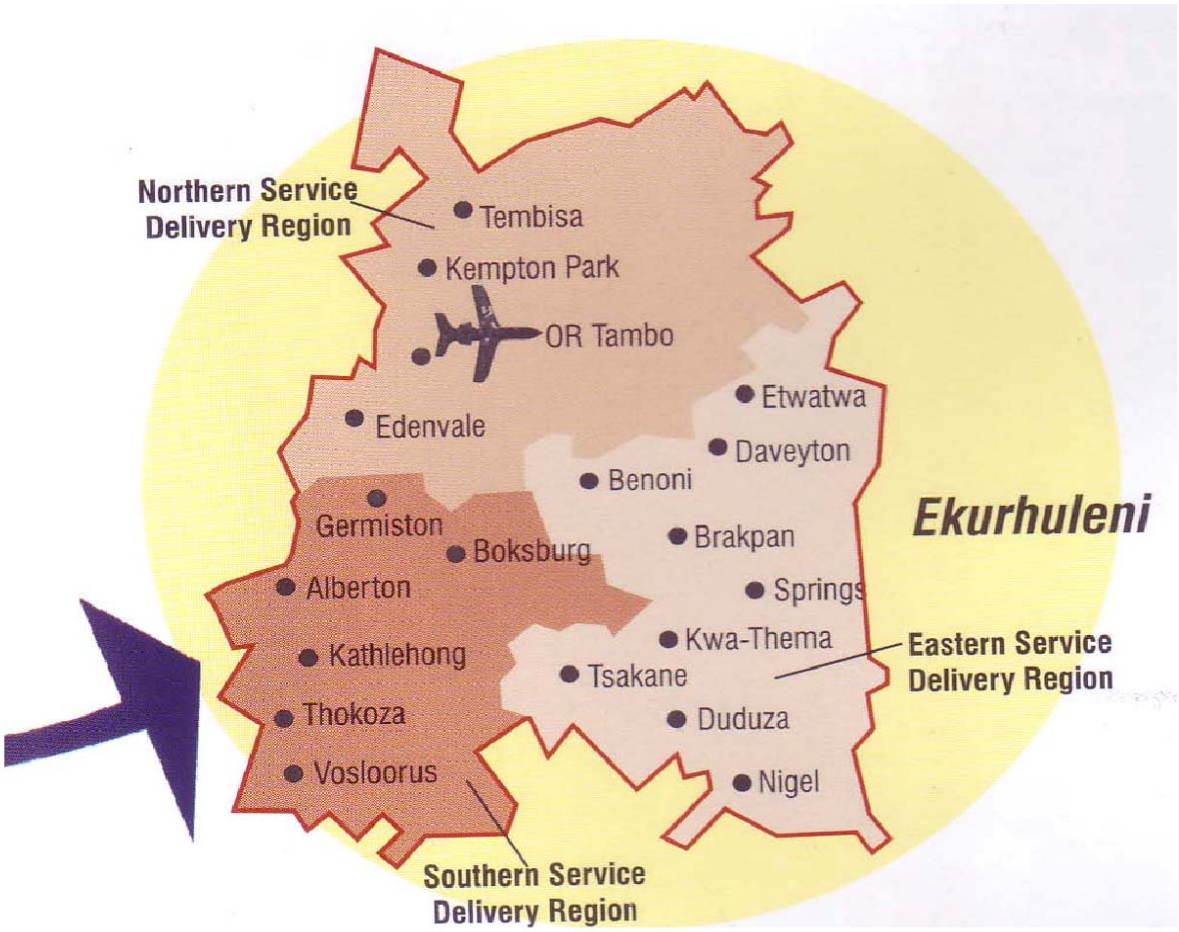

Figure 1: City of Ekurhuleni
Source: [36]

Study Population and Sample

Study population

There will be 300 waste pickers from Germiston and 250 from Boksburg. The total population for this study is thus estimated to 550.

Sample size

Sample size is determined by using the Centre for Disease Control and Prevention (CDC) EPINFO version 7.2, with an estimated population of 550 informal waste pickers in both Germiston and Boksburg towns. The acceptable error margin being 5%, and with 1 cluster the estimated sample size at 95% confidence level = 226. An additional 25% contingency which is 56, 5, therefore, this makes the sample size to be 226 + 56, 5 = 282. Sample size is then 283 (Table 1). Again, each landfill site has about 15 landfill operators and as such, 5 operators will be sampled in each landfill. The study will sample the only 2 officials who work directly with waste pickers in the Department of Environmental Resource and Waste Management, Ekurhuleni municipality. As a result of the small number of officials who are in management positions focusing on waste picking, the study will sample two (n=2) officials from the Department of Forestry, Fisheries, and the Environment (DFFE) and two (n=2) officials from GDARD.

Table 1: Sample estimation Using EPINFO 7.

Population survey or descriptive study
For single random sampling, leave design effect and clusters equal to 1

Population size	550	Confidence level	Cluster size	Total sample
		80%	126	126
Expected frequesncy	50	90%	181	181
Acceptable margin of error	5	95%	226	226
		97%	254	254
Design effect	1.0	99%	301	301
		99.9%	365	365
Clusters	1	99.99%	403	403

Sampling strategy

The choice of study participants will be made by using a non-probability purposeful sampling strategy. This strategy was chosen to help the researchers to gather information from participants in this study other than informal waste pickers who are knowledgeable about or have experience in waste picking, are available and willing to participate, and can share their experiences and opinions with the researchers. Participants in this research study will be selected into the sample based on where they are situated and whether they meet the inclusion criteria. Furthermore, a purposive sampling method will be used to identify landfill operators, officials from the Department of Environmental Resource and Waste Management, Ekurhuleni municipality, officials from the Department of Forestry, Fisheries, and the Environment (DFFE) and officials from GDARD who work directly with informal waste pickers. According to [37], purposive sampling is referred to as sampling to judge and to allow the researchers to use their expertise to hand-pick a sample that is most suitable to the purposes of the research.

Inclusion criteria

The inclusion criteria for this study will be informal waste pickers based in Boksburg and Germiston towns who have been engaged in waste picking for more than I year. Participants waste pickers will all be 18 years of age and above. According to section 28 (3) of the Constitution of the Republic of South Africa, Act 108 of 1996, anyone who is under the age of 18 years is a child, therefore this study will not include participants under the age of 18 because they may not give consent [38]. The study will also include officials who work with informal waste pickers from the city of Ekurhuleni Municipality: Environmental management department, Department of Environmental Affairs, landfill site operators and Gauteng Department of Agriculture and Rural Development.

Exclusion criteria

Any informal waste pickers operating outside Germiston and Boksburg areas and is under 18 years of old will be excluded in this study. Informal waste pickers who are deaf and those who cannot read and write will also be excluded. Because of their impaired hearing, the affected waste pickers may not be able communicate effectively with the researchers, and if they cannot read and write means they will not be able to complete the questionnaire. Officials from the city of Ekurhuleni Municipality: Environmental management department, Department of Environmental Affairs, landfill site operators and Gauteng Department of Agriculture and Rural Development working outside the study areas and have no relationship with waste pickers in terms of their scope of work will also be excluded.

Data Collection Procedure

The data collection tools for this research study will be structured questionnaires comprising of standardized close-ended questions. These tools will help the researchers to obtain information from consented informal waste pickers based in both Germiston and Boksburg towns, City of Ekurhuleni Municipality, landfill operators, officials from the City of Ekurhuleni, GDARD and Department of Environmental Affairs. Data will be collected by using five categories of questions that are aligned to research question and research objectives of this study. These questions will assist the researchers to get insight on the following: demographics, support of the municipality and challenges that include health and safety, financial, pricing of recyclables and social challenges.

The researchers will design the questions and seek assistance of STATKON on their reliability and validity. STATKON is a statistician office at the University of Johannesburg the officials' responsibility is to assist post graduate students and staff members with questionnaires and data analysis. The study will engage two field workers to assist with data collection. Prior to the administration of the questionnaires, researchers and field workers will clarify the purpose and objectives of the study to all participants. The responses will then be coded after all the answers have been obtained, this will be done to facilitate data analysis.

Data Analysis

The questions will be checked for errors and accuracy before being captured and after being captured each variable will be checked for unusual values. The Statistical Package for Social Sciences (SPSS) version 27 software will be used to capture collected data for analysis using the SPSS analysis fields [39]. Data will be categorised and coded. Summarised statistics, frequencies, and measures of central tendency will be included. Analysed data will be presented in graphs and tables. Analysis plan for each objective is as follows:

Objective 1: The distribution of frequency will be applied to determine how informal waste pickers perceive their integration into the City of Ekurhuleni municipality's waste management system. The designed questions allows the participants to tick only one of the Likert scale answers. The chi square test using the crosstab function will also be used and a sample proportion test and univariable analysis will be used. Frequency distributions will also be utilised to explore the various ways of integration of waste pickers.

Objective 2: Frequency distributions will be used to explore the challenges that informal waste pickers encounter as they collect their recyclables to sell at recycling companies. Frequency distributions will also be necessary to help researchers in examining ways in which informal waste pickers can be supported by relevant authorities to deal with challenges they face.

Data Management Plan

Data will be collected using the questionnaires. The questionnaires will be verified for completeness and cleanliness. Data Cleaning will involve a check for missing values and errors in the data set so that they can be eliminated in the analysis. It will also include checking for duplicates and re-coding and re-categorisation of some of the variables for better analysis. All the data will then be entered into the Statistical Package for Social Sciences, version 27.0 for analysis. Questionnaires with collected information will be kept under lock and key for a period of five years after which it will be destroyed. All data collected during the research will be stored securely and only the researcher, supervisor and data analyst will have access to it.

Validity and Reliability

Validity

According to [40], validity is a strategy used by researchers to assess the quality of research project. It is the degree to which findings of the study can measure what they are intended to measure to enable the researcher to have an accurate description of collected data and to be able to provide a description of the phenomenon under investigation. To ensure validity, a pilot study will be conducted in Germiston, and it will include ten (n=10) waste pickers. The same questions that will be used in a pilot study will be the same questions that will be used in the main study. Findings from participants of the pilot study will not form part of the main study, however, responses of participants will be analysed to identify any gaps that may be necessary to be bridged before the main study commences. This study will select a representative sample from the target population of the informal waste pickers in Ekurhuleni municipality.

Reliability

Reliability is an action taken by researchers to conduct the study using same set of questions and when such questions or a study is repeated, the same results are found [41]. To ensure reliability, a pilot study consisting of 10 participants will be conducted to identify potential practical problems or gaps in the data collection tool before the actual research study. The feedback obtained from the pilot study will assist the researchers in revising and improving the designed questions.

Ethical Considerations

This research title for this study was submitted to the Departmental research committee (DRC)-Department of Environmental Health for approval. The research proposal was approved by the following committees at the university of Johannesburg: Departmental research committee; Higher Degrees Committee and Research ethics committee for review and approval. **Informed Consent -**Informed consent is described as a concept that is well recognized both in law and ethics. It is an expression of the human right to autonomy (an integral part of the right to privacy). Participants are informed about aspects of the study which will enable them to decide on whether to participate or not [42] All participants will be informed of the aims and objectives of the study and permission will be requested from all participants by signing of informed consent forms prescribed by the Faculty of Health Sciences at the University of Johannesburg, and through the information letter. Participants will also be informed that they may withdraw their consent prior to submission of data but beyond this point, withdrawal of consent will be not possible. **Right to Anonymity, Privacy and Confidentiality** – According to [43], this refers to provisions delivered to ensure respect for privacy of participants and confidentiality of records in which participants are identified [43] Questionnaires for this study will be completed and participants will be requested not to write their personal details on the questionnaire. This will enable them to express themselves freely. Responses and findings of the study will not be disclosed to other participants, or individuals who are not part of the research team singularly. Manual management of no breach of confidentiality will be done by keeping collected data under lock and key for a period of five years after which it will be destroyed. Electronically, captured data will be managed by storing it in the researcher's and supervisor's laptops with a unique password that will be used by the researcher and the supervisor only. [42]. **Risks and Benefits –** Researchers commit themselves in not exposing any participant to any form of risk or harm. Researchers will explain to participants before the study commences that there are no financial benefits for them in this study. **Gatekeeper Permissions -** Permission to conduct this study will be obtained from the following authorities: Departmental Research Committee, Higher Degree Committee and Ethics Research committee in the Faculty of Health Sciences, University of Johannesburg and the Department of Environmental Resource and Waste Management in the City of Ekurhuleni municipality in Gauteng. **Access to Participants –** The researchers will apply in writing to the Department of Environmental Resource and Waste Management in the City of Ekurhuleni municipality to obtain approval to conduct the study in the City. **Respect for Human Rights –** Participants in this study will be allowed to make decision on whether to participate. Researchers will respect participants rights by not acting in a manner that undermines the participants' self-worth and no participant will be forced or threatened to participate in the study. Researchers will concur with [43] and avoid coercing or influencing participants during the study. **Scientific Integrity –** Researchers will comply will ethical requirements of all relevant authorities before conducting the study. According to [44] Scientific integrity refers to abiding by the relevant research ethics rules or regulations when conducting research. **Right to Freedom of Choice** - An information letter will be used to inform all participants of their right to withdraw from the study at any given time and that they may have access to the information collected during the research.

Possible Outcomes

The outcomes from this study will contribute towards informing decision makers on the opinions and feelings about being incorporated into municipal integrated solid waste management. Furthermore, the City of Ekurhuleni Municipality may decide on improving their recycling efficiencies, safeguarding their health, and saving on landfilling costs and other waste management services. Many other developing countries may also incorporate informal waste pickers into their solid waste management.

Author contribution

Project layout and supervision; M.F.S.; drafting of article, N.P.M., Editing, MFS; Drafting final manuscript, M.F.S and N.P.M. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

This study will be conducted according to the guidelines and approval of the Higher degree committee and Research Ethics Committee of the University of Johannesburg, ethical clearance number: REC 1694-2022 and NHREC Registration: REC 241112-035

Informed Consent Statement

Informed consent will be obtained from all participants involved in the study.

Conflict of interest

The authors declare no conflict of interest.

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