

# Merafong City and Randfontein Municipalities Community Perspectives on Waste Management

Bongekile Ginindza, Mansoor Mollagee, Edison Muzenda, and Jefrey Pilusa

**Abstract**—Solid waste management (SWM) in Merafong City and Randfontein local municipalities in South Africa is a challenge that manifests itself in illegal dumpsites and unhealthy environment. In this study we set to address the Merafong City and Randfontein municipalities' community participation and perspectives on waste management, minimization and utilization. The study objectives were achieved by using a triangulation method. This procedure included personal interviews, questionnaires and document analysis. The study also looks at households and community partnerships such as waste buy-back centers. These community partnerships promote and support the emergence of small, medium and micro recycling enterprises [1]. These partnerships also focus on sustainable waste management such as reduction of scavenging at landfill sites as well as promoting collaboration between the public and private sector. This study encourages communication among all stakeholders and integration for effective solid waste management in low-income communities.

**Keywords**—Community participation, illegal dumping, low income, scavenging, solid waste management

## I. INTRODUCTION

WASTE minimization and recycling are an integral part of the South African Merafong and Randfontein municipalities' strategies to reduce costs and improve waste management efficiency. These offer huge opportunities for small and micro enterprises (SMMs) to participate in waste business initiatives. This can help to create sustainable businesses with potential for income generation and job creation while simultaneously reducing service costs and creating better waste management [1]. Establishment of buy-back recycling centers and waste to energy initiatives address a number of key issues. This combines job creation in rural and urban areas by stimulating downstream waste

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management enterprises thus contributing to poverty alleviation in local municipalities [2].

Rapidly growing, low-income informal settlements present a challenge to Municipal Solid Waste Management (MSWM). Beside the physical constraints of dense, low-income settlement, lack of infrastructural services such as roads, drains and sanitary facilities often exacerbate waste management problems. Collection vehicles face difficulties to access these communities. Existing drains are often clogged with waste. These conditions lead to a proliferation of vermin and disease vectors, thus increasing environmental health risks. The National Environmental Management Act (2008, 2009) guides all environmental management activities and states that "environmental justice must be pursued so that adverse environmental impacts shall not be distributed unfairly". The same act further states that "the participation of all interested and affected parties in environmental governance must be promoted and participation by vulnerable and disadvantaged people must be ensured by recognizing all forms of knowledge, including traditional and ordinary knowledge".

The co-operation and participation of residents in Merafong and Randfontein local municipalities on waste management, creates opportunities for all participants to actively contribute and influence to the development process and as well as equitable sharing of proceeds. Community participation can be in the form of organized meetings towards improved waste management strategies; negotiations with municipal authorities for better involvement in decision-making; getting involved in waste projects; and drain cleaning and awareness raising campaigns. In this respect, the South African Municipal Systems Act (South Africa, 2000) places much emphasis on the local authority's responsibility to ensure that community participation is promoted and implemented

## II. DATA GATHERING

A triangulation procedure was used to gather data presented in this paper. The objectives of this work were achieved through interviews, questionnaires and documents analysis. Municipalities' employees were interviewed with the aim of gathering waste management information such as waste volume, waste management services, job creation opportunities, waste to energy initiatives, the green economy, employees' qualifications and training, recycling initiatives and waste minimization studies. Two questionnaires were developed to gather information on waste management education and awareness as well as recycling. The waste management education and awareness

focused on support for waste minimization, waste collection initiatives, promotion of home composting bins, support for recycling, waste management facilities, landfill waste disposal minimization and the West Rand District Municipality 2016 vision for green economy. The recycling questionnaire focused on paper, glass bottles, plastic bags and cans recycling as well as the composting of garden and kitchen waste. Fifty participants from each local municipality were randomly selected and a 90 % response level was achieved. The data gathered from the questionnaires is presented in Figs. 1, 4, 6, 7 and 8. The Integrated Waste Management Plans for the two municipalities were also analyzed.

### III. COMMUNITY PARTICIPATION

Fig. 1 shows that 83% of Merafong and Randfontein communities strongly support and participate in waste management. Communities and individuals have a responsibility to support government recycling initiatives.

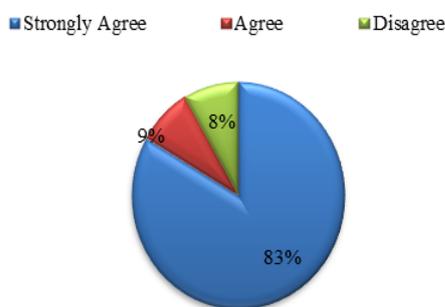


Fig. 1 Community participation in waste management

Municipalities often perceive the collection of recyclables separate from general waste as an extra burden to their managerial skills and operational costs. Transportation is an expensive component in the waste management cycle due to high fuel prices and vehicle wear and tear. The Municipal Systems Act (2000) requires municipalities to “encourage community’s participation in strategic decisions relating to the provision of municipal services”. While government is striving for cleanliness, it is the responsibility of every citizen to ensure that their surroundings are clean. Municipalities generally have limited resources to ensure that all areas prone to illegal dumping are cleaned-up and kept clean at all times. Municipalities must introduce innovative ways of attracting the involvement of other stakeholders such as school children and businesses. Incentives encourage community participation. However, the focus should be on preventing littering and not incentivizing cleaning after littering as this may encourage wrong behavior [1].

Campaigns conducted by the local municipalities and industries on the importance of recycling influence communities. This increases public awareness on recycling as an effective tool for waste management and natural resources protection. Recycling promotes the collection of waste and value adding such as the utilization of plastic bags by women cooperatives to make hats and rugs, tin crafts produced from recycled cans and stationary products from

recycled paper pulp. Formal recycling initiatives are focused mainly on paper, glass and tin cans.

Recyclable wastes should be separated as near to source as possible. This reduces the costs of labour and machinery associated with sorting after collection and prevents the soiling of recyclables such as paper. Once paper or cardboard is soiled, it cannot be recycled. Separating recyclables increases their value to the processors [3]. The recycling industry requires support to improve of the quality of the products. Recycling industries support communities through (i) Providing suitable storage bins or facilities for waste, Fig. 2. (ii) Training on the use of these facilities (iii) Providing an efficient and affordable refuse collection system with waste separation and recycling options (iv) Initiating and supporting the development of recycling centers and transfer stations (v) Selecting sites for landfills and Materials Recovery Facilities (MRF’s), Fig. 3. Municipal employees should have the capacity and knowledge to undertake the support and planning of waste minimization and recycling schemes.



Fig. 2 Storage bins for different types of waste [4]



Fig. 3 Material recovery facility, paper baling machine [4]

Communities and individuals have the responsibility to support government initiatives for recycling. Government must be fully consulted before the start of any project to ensure that it will receive support. Municipal employees are required to put people first. When consulting the public, the following procedure should be followed (i) Estimate community literacy level (ii) Find out their preferred language of communication (iii) Select team members from the area to be surveyed and make them known to the community to build trust and facilitate accurate responses (iv) Select a sample (v) Participants may be selected from local shopping centers (vi) Personal surveys are encouraged to ensure a good response rate (vii) Ongoing surveys should be conducted once the project has started, and throughout its duration once or twice a year to ensure continuous support

of the chosen recycling scheme (viii) Survey results will alert the team to any problems and facilitate pro-active trouble shooting.

Fig. 4 shows that 96% of Merafong and Randfontein communities strongly support energy recovery from waste as a sustainable waste management policy. This is because it creates jobs for unskilled laborers, addresses waste management issues and reduces greenhouse gas emissions.

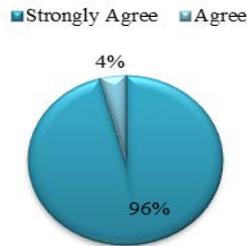


Fig. 4. Recovery of energy from waste

Waste to energy projects create jobs in the separation and collection of waste and supply energy to small municipalities as well as rural and small farming areas [5]. Waste to energy initiatives reduces landfill waste disposal as well as the release of methane into the atmosphere. Waste to energy technologies has energy generation and green gases reduction potential [6]. The most sustainable way to deal with waste is to eliminate it entirely. Reducing the amount of waste generated, reusing discarded items, recycling and composting are fundamental principles in achieving zero waste. When organic waste decomposes in the absence of oxygen, anaerobic fermentation slowly produces landfill gas. Landfill gas contains 40-60% methane, with the remainder being mostly carbon dioxide. Methane is 23 times more potent than carbon dioxide with high air pollution costs. Landfill gas can be captured and converted into electricity, Fig. 5. It can also be used directly for cooking and heating. After cleaning, concentration and compression, it can be used as motor vehicle fuel.



Fig. 5 Recovery of energy from landfill gas [6]

With waste-to-energy initiatives, waste will no longer be disposed at landfill sites but processed and converted into useful energy through pyrolysis, gasification, incineration

and anaerobic digestion. Thermal treatment is the most widely used option with the ability to convert one ton of biomass into one barrel of diesel and 0.5MWh of electricity per day. This is also significantly reduces the amount of waste to be disposed at landfill sites and also prolongs the lifespan of the landfill sites.

#### IV. LANDFILL SITE DISPOSAL

98% of the participants from Merafong and Randfontein communities strongly support the minimization of waste disposed at landfills, Fig. 6.

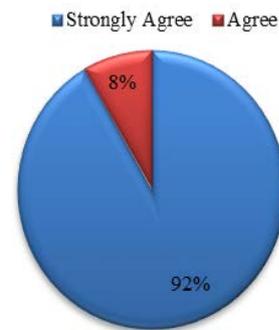


Fig. 6 Minimisation of landfill disposal

Scavengers make a living from landfills in Merafong (Roipoort landfill site) and Randfontein (Uitvaalfontein landfill site). This is undesirable due to health and safety risks which are increased by the use of heavy machinery. Roipoort and Uitvaalfontein landfill sites are under a lot of pressure as they are nearing the end of their life spans. Competition for land is high with housing taking up most of the available land, thus making it difficult for municipalities to acquire land for new landfills. Recycling and other waste utilization options should be explored.

Organic waste (garden, food & sewerage) constitutes up to 40 percent of the waste disposed at Uitvaalfontein and Roipoort landfills. If this portion of the waste stream is recovered and processed through composting or anaerobic digestion, it may reduce the adverse impacts of landfills. The benefits of reducing waste disposed at landfill are that these sites will occupy less space, last longer and produce less leachate. In addition, surface and ground water contamination, health and physical threats to scavengers and employees and as well as methane emissions would be reduced. Proper design and operation of landfills require high technical capacity.

Income can be generated from waste for example recyclables, heat and bio energy, plus the potential for Merafong and Randfontein local municipalities to earn carbon credits. Local municipalities need private partners who can bring the technical expertise and capital for waste utilization projects. There is also a potential for 400 – 600 and 80 recycling and technical jobs respectively. These initiatives have a strong local component with regards to labour, resources and skills transfer. There is also a huge potential to reduce pressure on the landfills in Merafong and Randfontein local municipalities [7]. Waste to energy initiatives are hampered by the capital investment required and the low cost of the energy produced.

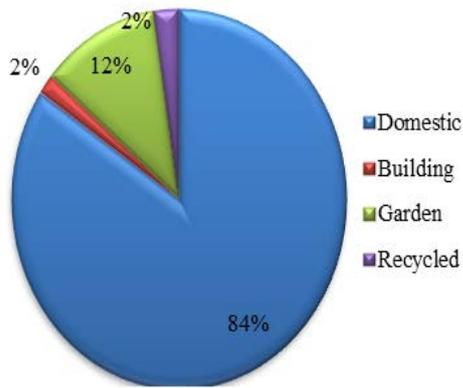


Fig. 7 Waste stream analyses at Roipoort and Uitvaalfontein landfill sites

### V. PAYING FOR MUNICIPAL SERVICES

Fig. 8 shows that 75% of Merafong and Randfontein communities are not willing to pay for waste services. This is mainly because they live in poverty and are unemployed.

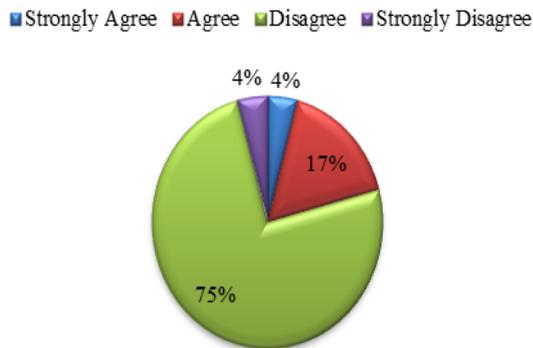


Fig. 8 Paying for waste related services

A lot of support in the management of waste is required for waste management in informal settlements, Fig. 9. Municipalities need to support the establishment of private initiatives and community awareness programs in low income areas to embark on recycling initiatives. Increased public awareness and education can increase the willingness to pay for waste services. Refuse removal service is ineffective, mainly due to old trucks and equipment, and these require rejuvenation.

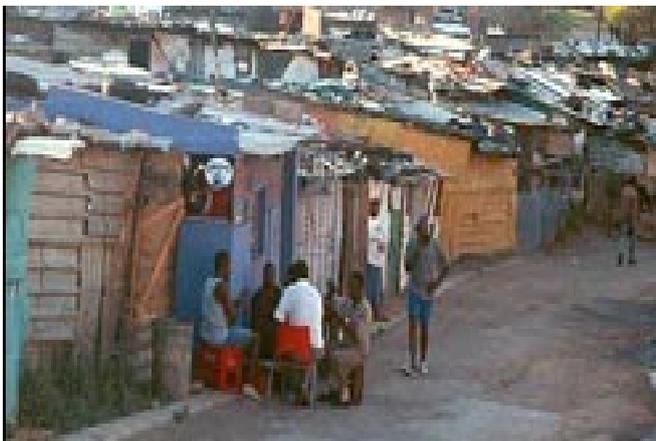


Fig. 9 Informal settlements [1]

Waste facilities such as the storage bin in Fig. 10 should be provided to all communities especially poor ones. The absence of these facilities encourages littering and illegal dumping. Poor waste management practices in dense low-income communities are manifested in the form of ubiquitous illegal waste dumps, waste material in small water ponds, stationary wastewater and irregular or/and non-existent waste collection.



Fig. 10. 240l wheelie waste storage bin [4]

Employment and income of Merafong communities are directly related to their ability to pay for waste services. Randfontein has a higher unemployment rate compared to Merafong. It is estimated that approximately 36% of the Randfontein population live below the poverty datum line [8]. Utilization of personnel in the two municipalities is a challenge. For example the organizational structure for Merafong City Local Municipality allows for a total of 241 personnel within the Waste Management Department but there are 109 vacancies [9]. Financial resources are under utilized in the two municipalities. For example in the 2009 / 2010 financial year, R132 836, 00 was not utilized for street cleansing services as planned [10].

### VI. CONCLUSION

This study has shown that (i) Waste is a resource for both Merafong and Randfontein local municipalities (ii) There is great potential for SMMEs creation and growth (iii) There is minimum support for community participation and awareness campaigns from the local municipalities (iv) Waste to energy initiatives can contribute to the green economy in particular job creation (v) Unemployment is high in the two local municipalities (vi) High density, low income households and informal settlements receive no or minimal municipal waste services. For example Statistics SA (2001) highlights that 2% of households (1 886) within the Merafong CLM have no disposal of any kind, and 20% of households (19 226) make use of their own refuse dumps.

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