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Exploring Barriers to the Effective Implementation of Integrated Waste Management Plans in Developing Economies: Lessons Learned from South African Municipalities

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Abstract: Solid waste management poses a significant challenge globally, especially in developing economies, where increasing waste generation and ineffective management measures are common. Municipalities, responsible for managing waste, often struggle to provide efficient services. To address this, local governments implement policy tools like the Integrated Waste Management Plans (IWMPs), which aim to improve waste management. Despite the existence of such policies, waste pollution continues to rise in countries like South Africa. The purpose of this study is to explore the barriers to the effective implementation of IWMPs, focusing on the Makhado Local Municipality (MLM) in South Africa. Using a qualitative approach, interviews, document reviews, and observations were conducted with stakeholders, targeting 23 participants, of which 15 contributed. Our findings highlight several key barriers, including lack of monitoring, political interference, corruption, insufficient budgeting, poor infrastructure maintenance, lack of skilled personnel, and inadequate community education. These challenges hinder the successful implementation of IWMPs in the MLM. Our study further identified several opportunities at the MLM and general strengths and threats using a SWOT (strengths, weaknesses, opportunities, threats) analysis.

Keywords: barriers; integrated waste management plan (IWMP); solid waste management; implementation; policy instrument; developing economies



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1. Introduction

Increasing municipal solid waste (MSW) generation is a major concern worldwide, with least-developed African economies such as South Africa, Egypt, and Nigeria particularly affected due to ineffective waste management practices [1,2]. These practices include littering, illegal dumping, poor waste management, outdated measures, escalating management costs, decreasing landfill space, and limited land availability for new landfills [1,2]. It is anticipated that Africa is headed for a major social and economic transformation in this century, with its population expected to reach 2.4 billion by 2050 [3]. Urbanisation and changing consumer purchasing habits will lead to exponential growth in waste generation [3].

Africa generated 125 million tonnes of MSW in 2012, with 81 million tonnes coming from sub-Saharan Africa [4]. This is expected to increase to 244 million tonnes per year by 2025 [5]. In 2011, South Africa generated approximately 108 million tonnes of waste, which increased to 121 million tonnes in 2017 [1,6,7]. Like other developing economies, South Africa faces significant challenges due to poor waste management practices, primarily driven by issues at the local government level [8,9]. Contributing factors include poor organisational structures, lack of capacity and appropriate skills, inadequate budgeting, ineffective legislation and enforcement, low public awareness, conflicts, and corruption [5].

The Constitution of the Republic of South Africa assigns responsibility for waste management services to local municipalities. Local governments are the backbone of waste

management services and are expected to provide efficient and quality waste collection and disposal services. Local authorities are also mandated by the Constitution to protect the environment and manage solid waste [10,11].

Legally, South Africa has evolved from a fragmented legislative framework, which made it challenging for the public and private sectors to comply. This evolution began with the recognition of the right of all citizens to an environment that is not harmful to their health and well-being. Key pieces of legislation include the Environmental Conservation Act (Act 73 of 1989) (repealed), which focused on permitting, controlling, and managing waste disposal sites, and the National Environmental Management Act (Act 107 of 1998), which introduced several guiding principles to environmental legislation, such as the lifecycle approach to waste management, the precautionary principle, and the polluter pays principle [12].

Furthermore, according to Godfrey and Oelofse (2017) [12], waste legislation was initiated with the publication of the White Paper on Integrated Pollution and Waste Management (WPIP&WM) in 2000, preceded by the adoption of the first National Waste Management Strategy (NWMS) in 1999. Eight years after the WPIP&WM, the Waste Act 59 of 2008 was promulgated, providing for the management of every aspect of waste in South Africa. The principle behind Waste Act 59 of 2008 is based on the waste management hierarchy. Following the Act, several regulations, norms, and standards were introduced [7,12].

South Africa has transitioned from waste management practices focused mainly on waste disposal to the adoption of the internationally recognised waste management hierarchy. This hierarchy emphasises waste prevention and minimisation, followed by reducing, reusing, recycling, and finally, disposing as the least preferred option [13].

Governments have been developing policy instruments to mitigate solid waste impacts, with management practices varying greatly across regions, countries, and even within countries. Modern waste management approaches, such as the waste management hierarchy, advocate for reducing waste generation, reusing, recycling, recovering, composting, and safe disposal through landfills [14]. However, these practices are often not applied, especially in developing countries, where a large proportion of solid waste is disposed of or burned [14].

One policy instrument to regulate MSW and its impacts is the Integrated Waste Management Plan (IWMP), which has been developed and implemented by many developing and developed countries. The concept of solid waste management planning has historical roots [15]. Countries such as South Africa, the United States, China, and Brazil have incorporated IWMPs into their policies [16–18]. IWMPs are essential for designing and enhancing waste management practices within organisations [19]. In South Africa, IWMPs are intended as decision-support tools to inform higher-level decision-making instruments, particularly in local government, such as Integrated Development Plans (IDPs), concerning waste-related matters.

In South Africa, IWMP development and implementation is a legal requirement under Section 12 of the National Environmental Management (Waste Act 59 of 2008). Additionally, the Department of Environmental Affairs (DEA) developed guidelines for IWMPs in 2012, which provide guidance on implementation instruments and plans [20]. According to these guidelines, “the primary objective of an IWMP is to integrate and optimise waste management planning to maximise efficiency, reduce environmental impacts and financial costs, and improve the quality of life for all South Africans”.

Municipalities are required by the Municipal Systems Act and the Waste Act to integrate IWMPs into their IDPs. South Africa’s Municipal Integrated Development Plan (IDP) is a strategic document that outlines a municipality’s development priorities and strategies over a five-year period, ensuring coherence between national, provincial, and local government plans.

Despite numerous governmental interventions, waste generation continues to pose a significant threat to human health, environmental quality, and the ecotourism econ-

omy [21]. Several studies have found that many completed municipal IWMPs lack successful implementation [22–24].

This study, therefore, aims to explore the barriers to implementing the IWMP system in developing economies, using South Africa's Makhado Local Municipality (MLM) as a case study. According to Hossu et al. (2021) [25], measuring the achievement of outcomes in many environmental plans is challenging, and little is known about whether such plans achieve their goals as intended. This study argues that with little or no quantitative data available to assess the effective implementation of plans like the IWMP, reliance on stakeholder perceptions is crucial to gaining insights. This paper contributes to international knowledge and literature by exploring stakeholder perceptions to identify the challenges of implementing IWMPs in developing economies, using South Africa as a case study. The findings may provide a basis for improving IWMP systems in other regions.

South African municipalities provide a good case study as the country is considered to have one of the most complex and mature environmental management and legal frameworks globally [26] (pp. 1–55). Despite this, waste management issues persist in the country, making it crucial to understand the perceptions of key stakeholders, such as implementing partners, to assess the effectiveness of the IWMP system in developing economies.

2. Review of Existing Similar Theories

Solid waste management has long been on the public agenda and has globally moved to the forefront of policymakers' priorities. This shift is due to decades of increasing waste generation in many countries, which has led to greater reliance on landfilling and, to some extent, the burning of waste as a management strategy. These outdated waste management measures have persisted for too long and are no longer acceptable or viable worldwide. Additionally, inadequate waste management practices have exacerbated socioecological issues, such as the rise in human diseases and climate change [16].

The world faces unprecedented production and resource demand due to continuous population growth, coupled with urbanisation, industrialisation, and other factors, which have significantly influenced the increase in the volume of solid waste generated globally [24]. Global waste generation in large cities has surpassed 2 billion tons annually and is expected to reach 3.4 billion tons by 2050. Africa, including South Africa, contributes significantly to this figure [7]. Due to the same factors mentioned by Mautla (2022) [24], global waste generation is expected to outpace population growth by more than double by 2050 [27,28]. Similarly, the rise in waste generation in Africa is likely to overshadow the global decrease [4].

In response to global waste generation and its associated challenges, such as poor waste management and outdated measures, many policymakers are adopting new strategies and sustainable practices. The most recently adopted strategies include zero-waste, circular economy (CE), sustainable materials management, and extended producer responsibility (EPR) schemes. Although countries like the United States, China, and South Africa have embraced these strategies, challenges remain with integrating them into solid waste policy and planning [15].

Many countries have adopted integrated waste management planning (IWMP) into their management systems. The concept of solid waste management planning has historical roots, and internationally, it provides mechanisms for improving waste management and related behaviours [15]. IWMP is essential for designing and enhancing waste management systems within organisations. As a signatory to several international protocols and conventions, South Africa is committed to promoting an integrated waste management (IWM) approach [24]. Similar to South Africa, policymakers and planners in other countries have invested millions of dollars and years of research into establishing and improving IWMP systems and their implementation [19].

In South Africa, the development and implementation of a municipal IWMP within the IWM system is a legal requirement under Section 12 of the National Environmental Management (Waste Act 59 of 2008). Monitoring the effective implementation of IWMPs

is crucial for identifying opportunities and challenges for continuous improvement [29]. IWMP is one of the key instruments in the Waste Act, enabling local governments to better manage their waste. Previous studies have highlighted the importance of developing IWMPs, including detailed implementation plans. Furthermore, these studies emphasise the need for further exploration into the extent of IWMP implementation within municipalities [24,30]. Viljoen et al. (2021) [31] recommended further research focusing on the challenges faced by municipalities in rural or remote areas and how these challenges can be overcome.

3. Methods

3.1. Data Collection

Document reviews, semi-structured open-ended interviews, and observations were conducted between August and October 2023. For the document reviews, the 2018 MLM IWMP Implementation report, MLM IDP, MLM waste by-law, and MLM IWMP MEC endorsement were reviewed.

Participants for the interviews were recruited via telecommunications, during which the researcher explained the background, importance of this study, and the role of their participation. The interviews were conducted one-on-one and face-to-face at agreed dates, times, and locations between the researcher and the participants. Voice recordings of the interviews were made with permission and using a cell phone.

South Africa is a constitutional democracy with a three-tier system of government, where the national, provincial, and local levels of government have legislative and executive authority in their respective spheres, which are defined in the Constitution as distinctive, interdependent, and interrelated [32]. The national and provincial governments assume a more strategic and focused role, providing support and resources to municipalities. The National Department of Forestry, Fisheries, and the Environment (DFFE) serves as the custodian of the environment at the national level and develops waste management policies. Provincial Departments of Environment, such as the Limpopo Department of Economic Development, Environment and Tourism, are mandated with managing waste within their provincial jurisdiction and developing waste management policies in accordance with their provincial context, while not contradicting national policies [10]. According to Mlambo and Maserumule (2024) [32], the role of local municipalities is to excel in providing public services, including waste management. District municipalities are responsible for macro-level functions such as planning and promoting integrated development planning, as well as land, economic, and environmental development [32,33].

The South African government actively promotes small and medium-sized enterprises (SMMEs) in the waste sector, with the view that SMMEs will contribute to the green economy through their participation in waste management activities [34]. The MLM IWMP particularly identified recyclers as implementing partners. Other stakeholders involved in waste management in South Africa include representatives from national, provincial, and local governments, all of whom were interviewed as part of the data collection process.

Purposive sampling, rather than representative sampling, was applied to select research participants. The general and broader landscape of solid waste management in South Africa includes key role players, mainly the government at the national, provincial and local spheres (both district and local government). It further includes small and micro-medium Enterprises (SMMEs)/industries, academia, research institutions, civil society organisations (activists and NGO/NPC, among others) and the informal sector, mainly constituted by waste pickers and reclaimers. Government participants from all spheres involved in waste management were interviewed. SMMEs/Industry representatives were also interviewed as part of the list of recycling entities from the MLM database. These participants had a direct participation in either the development and/or implementation of the MLM IWMP. A limitation identified in this study is the limited involvement of academia, research institutions, and civil society organisations in the IWMP development

and implementation process. These stakeholders were not interviewed for the MLM as they could not be identified at the time of this study.

The participants interviewed included recyclers and government officials responsible for waste management at the local, district, provincial, and national levels. In purposive sampling, the researcher intentionally selects participants based on specific criteria that align with the research objectives. This method focuses on gathering rich, detailed data from a targeted group of experts or individuals with unique perspectives rather than ensuring that the sample reflects the general population. The MLM database of recyclers (implementing partners) was requested and provided by the municipality. Purposive sampling was used to select recyclers for interviews, focusing on those who had been operational since or before 2018, the year the IWMP was developed and approved, to ensure meaningful contributions. The MLM database contained 18 recyclers, of whom 10 met this selection criteria. Nine were interviewed. One out of ten declined to participate. Six government officials were also interviewed, representing four institutions: the MLM, Vhembe District Municipality, Limpopo Economic Development, Environment and Tourism, and the National Department of Forestry, Fisheries, and the Environment. In total, 15 out of 23 potential participants were interviewed, equating to 65% of the implementing partners, which can be considered a sufficiently representative sample size from the purposefully selected individuals. The researcher targeted active participants who had played a role in the development or implementation of the IWMP. These participants were identified in the MLM IWMP as implementing partners and were considered relevant to this study.

The interview questions focused on the extent to which the goals, objectives, and actions in the MLM IWMP have been achieved, as well as the barriers and opportunities for implementing the MLM IWMP (see Supplementary Materials).

Observations were conducted as an additional method of verification. These observations took place in Limpopo, specifically at the Ha-Rabali Village, Elim, and Makhado, in April, June, and October 2023. During the observations, pictures of the existing waste management infrastructure were taken to complement the interview data.

3.2. Data Analysis

After the data were collected and transcribed, data were recorded in an Excel worksheet for a word-frequency count. Words mentioned most frequently reflected the greatest concerns or matters of importance. Names and other identifiable information were removed from the organised transcripts, and interviewees were manually assigned name codes.

The content analysis technique was used to analyse the response data collected from participating stakeholders. This technique is employed to determine and record the attitudes, views, perceptions, and interests of the stakeholders, either as individuals or in groups [35]. Content analysis examines what the data reveal, followed by organising the outcome information into themes, categories, or codes based on the key questions posed by the researcher [36]. Emergent themes were identified, categorised within those codes from the data, and presented in tables and graphs. The researcher reviewed the interpretations of the data according to the level of focus on each theme. First, the researcher thoroughly examined all responses to gain a general understanding of the content of each one. This was followed by developing themes for each identified meaning, after which a working definition for each theme was provided. This step ensured a more accurate interpretation of each specific meaning relative to other categories [37].

Themes emerged using a manual frequency coding of the barriers to the MLM IWMP implementation. Themes were counted based on the number of mentions by participants, with similar mentions grouped to form themes. Assessing the cases against the themes across the different activities provides a better instrumental understanding of the success of the selected case study across the three determination criteria [38].

As for the document review assessment, a conformity criterion adopted from other studies was used [38–40]. This criterion assessed the degree to which the MLM has successfully implemented its IWMP goals:

- (a) Conformity determination: actions were performed or achieved to completion.
- (b) Partial conformance: The actions' achievement process was underway but not yet completed.
- (c) Non-conformance: actions were not performed or were not in process. This included activities that were not aligned with the goal.

4. Results

4.1. Extent of the Implementation of the MLM IWMP

The 2018 MLM IWMP contains eight goals, along with associated targets and actions to achieve these goals. Table 1 shows the results of evaluating the extent to which these goals, targets, and actions have been implemented using the conformity criteria. The table indicates that out of the eight goals and 55 actions stipulated in the IWMP, 13 actions conformed, meaning they were fully implemented. Sixteen actions partially conformed, and 26 did not conform at all. These results were obtained through document reviews as well as interviews. This means that approximately 76% (42 out of 55) of the actions have not been fully implemented since the development of the MLM IWMP in 2018. Many of these targets and actions remain incomplete.

Table 1. Findings of the MLM IWMP's overall implementation of the goals.

MLM IWMP Implementation Plan Goals	No. of Actions	Conformance	Partial Conformance	Non- Conformance
Goal 1: Promote recycling and recovery of waste	11	3	3	5
Goal 2: Ensure the effective and efficient delivery of waste services	7	4	2	1
Goal 3: Ensure that legislative tools are developed to deliver on the Waste Act and other applicable legislation	5	2	3	0
Goal 4: Sound budgeting and financing of waste management services	5	0	1	4
Goal 5: Ensure the safe and proper disposal of waste	3	0	1	2
Goal 6: Education and awareness	7	1	4	2
Goal 7: Compliance and enforcement	8	3	2	3
Goal 8: Reporting on monitoring the implementation plan for Goal 8: Compliance and enforcement	9	0	0	9
Total averages	55	13	16	26

4.2. Barriers (Weaknesses) to Implementing the MLM IWMP

Table 2 shows the results obtained from interviews regarding the barriers (weaknesses) and opportunities for implementing the MLM IWMP. From the responses, eight key themes have been identified, which are discussed further below.

Table 3 shows a summary of the results obtained from interviews regarding the opportunities for implementing the MLM IWMP.

Table 2. Themes identified from stakeholder response on the barriers (weaknesses) towards the implementation of the MLM IWMP.

Themes on Barriers (Weakness)	Number of Mentions
Lack of compliance and enforcement	6
Poor planning, transport breakdowns, and poor infrastructure maintenance	6
Unreliable service and collection frequency challenges	5
Lack of skilled human capacity and unskilled technical position appointments	5
Political interference and corruption	4
Insufficient budget for waste infrastructure and resources	4
Inadequate community education and information awareness	3
Absence or lack of monitoring on the implementation of the IWMP by the MLM	2

Table 3. Themes identified from stakeholder response on the opportunities towards the implementation of the MLM IWMP.

Opportunities	Number of Mentions
Waste diversion from landfill and landfill airspace saving	10
SMME development, training and support	9
Create clean environment and illegal dumping conversion into parks	8
Job creation	6
Establishment of waste processing plant by the MLM	3
Revenue collection	3
Enhance tourism	1

5. Discussion

5.1. Absence or Lack of Monitoring on the Implementation of the IWMP by the MLM

A study conducted by Molaba (2019) [22], which critically analysed the IWMPs of local municipalities within the Fezile Dabi District Municipality, found that the implementation of the IWMPs was below 20%, as major targets were either not achieved or not met on time. The challenges identified included inadequate knowledge among waste management officials, lack of evidence for monitoring or reporting IWMP implementation progress, and insufficient financial resources [22]. The results of our study align with Molaba's (2019) [22] findings, revealing that the MLM does not monitor its IWMP. This is evident from the nine actions related to Goal 8 (Table 1), which failed to conform, meaning they were not carried out at all. Goal 8 of the MLM IWMP pertains to reporting and monitoring the implementation of the plan. At the time of this study, no annual monitoring report, as required under Section 13(3) of the Waste Act, was found. Moreover, the lack of monitoring emerged as a theme from respondents' feedback, with one stating that *"a five-year annual draft report is in the final stage and will be completed before the IWMP review process starts in October 2023"*.

Respondents also pointed out the absence of monitoring regarding the effectiveness of MLM's waste management programs, such as education and awareness initiatives. These findings are consistent with a study by Mautla (2022) [24], which highlighted inadequate reporting and monitoring of IWMPs at the municipal level. Similarly, Molaba (2019) [22] found that the failure of the provincial department to monitor implementation contributes to poor performance by local governments in implementing the IWMP.

5.2. Political Interference and Corruption

Our results further suggest that the MLM is facing significant challenges in managing the interface between politicians and officials. This theme was mentioned four times by respondents. Once again, this aligns with other studies highlighting political interference in the administration of basic service delivery as a serious problem in many municipalities, including the MLM [22]. Due to a lack of knowledge, councillors' support in implementing IWMPs is often very poor in many municipalities [22]. According to Naidoo (2009) [41], politics significantly influence municipalities, and such influence cannot be underestimated. Solid waste management, particularly in terms of budget allocation, is not a priority in South Africa compared to other services [41].

Although there was reluctance among interviewees to detail how political interference affects IWMP implementation and service delivery, some mentioned that political preferences sometimes take precedence over service delivery requirements. This study revealed that political interference is often linked to corruption. Some respondents indicated that *"when it comes to the appointment of entrepreneurs who were expected to recover waste directly from landfill sites, regardless of their successful application, they still have no access to recover waste from the landfill due to political interference"*.

However, this study could not directly establish how or to what extent political interference impacts IWMP implementation and service delivery. Political interference is not a

new issue in developing countries. Resnick (2014) [42] highlighted the troubling trend of recentralisation in developing economies such as Kampala, Uganda, and Senegal, where political and fiscal powers were stripped from city authorities aligned with opposition parties, negatively impacting efforts to address issues like urban flooding, waste collection, and infrastructure [42]. Similarly, Makanyeza et al. (2013) [43] identified councillor interference in administration and a lack of political and administrative leadership as causes of poor service delivery in Kenya and South Africa [43].

5.3. Insufficient Waste Management Budget

Poor financial management, characterised by inadequate funding, misappropriation of funds, and poor waste service recovery, deters effective Solid Waste Management (SWM) by interfering with institutional behaviour, equipment, infrastructure, and labour management [44]. Poor waste tariff allocation and financial constraints in the SWM sectors of many municipalities in South Africa underscore the seriousness of this challenge [44]. These challenges have made operational expenses, such as capital expenditure, employee remuneration, maintenance, and fuel, unrealistic to meet. Inadequate financial accounting of allocated funds, compounded by corruption, leads to poor management of the waste cycle due to a lack of investment based on service demands.

Insufficient funding, inadequate budget allocation, and budgetary constraints appear to be common reasons impacting the implementation of IWMPs [24]. Molaba (2019) [22] notes that while the IWMP may be in place, the availability of funds or resources remains a significant challenge for municipalities. The results in this study are no different, indicating that the MLM presents insufficient funding as a major problem. Furthermore, some respondents indicated that *“this is concerning because the municipality collects a waste revenue of about 9 million ZAR to 10 million ZAR annually, and it is claimed to be the best-performing municipality in revenue collection in the Vhembe District Municipality”*.

One important reason waste management poses a challenge for authorities in developing countries is the burden on municipal budgets due to the high costs associated with its management. Municipalities have struggled to manage waste effectively because substantial expenditures are required to provide the service [45]. The absence of financial support, the unwillingness of users to pay for the service, and the inadequate use of economic instruments have hampered the delivery of appropriate waste management services in South African municipalities, including the MLM [45].

Our results further suggest that the increasing costs of maintaining waste management-related equipment, infrastructure, fleet, and fuel have worsened and compromised MLM's budget availability for waste services. Fakoya (2019) [8] noted that municipalities in developing countries typically spend between 20% and 50% of their total expenditure on solid waste management service delivery. Although the MLM charges private waste disposal fees based on volume, our study found that the MLM does not implement cost-reflective tariffs; rather, it charges less than the costs associated with managing the landfill site. Like other rural local municipalities, the MLM faces community resistance to annual increases in cost-reflective tariffs.

5.4. Poor Planning, Transport Breakdown and Poor Infrastructure Maintenance

The ability of the MLM to provide effective waste management services has been worsened by the deterioration of solid waste infrastructure. This theme was mentioned by respondents approximately six times, as shown in Table 2. According to some respondents, the recent procurement of a new fleet was expected to alleviate equipment and infrastructure pressures. However, there is still high demand, particularly in rural areas where some communities are not regularly serviced. Waste from these communal areas requires frequent collection, as skip bins fill up quickly. Other challenges affecting the implementation of the MLM IWMP include poor maintenance, inadequate planning, and a lack of available waste infrastructure, such as waste transfer stations and transport or equipment to reduce travel distances, given that the MLM landfill site is located far from

many residents. One transfer station located in the Dzanani region was observed to be operational. Bartone and Bernstein (1993) [46] suggest that where collection and transportation distances exceed 15 to 20 km or travel times exceed 30 min, transfer stations should be considered. The existing waste buyback centres observed are owned and maintained by the private sector.

The vehicles and equipment used in waste collection processes are also considered inefficient due to these long distances. Some vehicles are not designed for frequent stop-and-go operations and are not located near disposal sites. These conditions reduce their effectiveness and often lead to a shorter operational lifespan. This was confirmed during interviews with the MLM officials, who mentioned difficulties accessing some villages in remote areas due to distances and gravel roads.

Similar challenges are also found elsewhere in Africa. Imam et al. (2008) [47] found that in Abuja, Nigeria, a shortage of waste collection vehicles is attributed to funding gaps and inadequate maintenance. Furthermore, challenges such as poor servicing of MSW collection vehicles, inadequate state infrastructure, and ongoing urban migration are common issues faced by sub-Saharan countries [48].

According to the MLM officials, although there is an existing plan and schedule for waste collection, it remains challenging to plan collection routes due to limited vehicles. Often, available vehicles are in the depot for maintenance or repair. These barriers are not unique to the MLM; Viljoen et al. (2021) [31] have documented that many municipalities face obstacles in waste collection due to inadequate equipment, infrastructure, and treatment facilities. These challenges contribute to issues such as littering and illegal dumping, particularly in remote and rural South African towns [31].

Guerrero (2013) [45] found that few cities have transfer station infrastructures where waste is temporarily stored, sorted, and recyclables recovered before disposal as a last resort. These cities include Ambon, Jogjakarta, Beijing, Bangkok, Dar es Salaam, Emfuleni, Langeberg, Pretoria, and Gazipur. However, the timing and methods of waste collection largely depend on the availability of waste transportation facilities and the quality of the roads [45].

5.5. Lack of Skilled Human Capacity and Unskilled Technical Position Appointment

According to Mautla [24], insufficient human resource capacity is a problem in implementing the IWMP in many municipalities in South Africa. Our results concur with this, showing that the shortage of skilled and qualified staff in the MLM is often the reason for inefficient, ineffective, and unsustainable waste management services. The greatest challenge appears to be inadequate knowledge among waste management officials in implementing the IWMP, especially supervisors who are the first line in enforcing the IWMPs [22]. This study also found that the MLM has only two municipal employees directly involved in the day-to-day operations of waste management. Although qualified and experienced, these employees are often supported by unskilled personnel.

Faccio et al. [49] suggested that improving infrastructure and roads, providing additional equipment, and enhancing human capacity positively impact the delivery of waste services. However, municipalities must allocate additional finances for waste collection, transfer, and transport, which are crucial but expensive [49].

5.6. Unreliable Service and Collection Frequency Challenges

According to the MLM IDP, MLM's total population was 416,728 in 2022. The municipality comprises four main formal towns: Louis Trichardt, Vleifontein, Waterval, and Dzanani, along with over 200 villages. The number of households was 116,371, of which 99,104 lacked refuse removal services, equivalent to 85.1% of its total households in 2022 [50]. The MLM generates most of its waste from households and businesses. According to MLM's reports to South Africa's Waste Information System, the MLM collects approximately 190 tons per week from its main townships, about 90 tons weekly from Waterval township, approximately 65 tons from Dzanani township, and around 25 tons from Vlei-

fontein township. The total monthly waste collection amounts to approximately 1425 tons, translating to 17,098 tons per year. This waste is collected using both compactor and skip loader trucks.

Dlamini et al. (2019) [27] argued that the ability of local authorities to provide effective waste management services in South Africa has been hindered by the deterioration of solid waste infrastructure. Waste collection in MLM's Dzanani and Waterval townships mainly occurs through kerbside collection, while other areas utilise communal skips or drop-off centres. Waste is collected once a week in townships, and a similar frequency is intended for other rural areas where waste is collected via drop-off centres. However, this is often not consistently implemented. This inefficiency is evident in skips that remain full and uncollected, resulting in waste accumulating around the skips for several days, as observed. The MLM officials state that they rely on communities or councillors in areas with communal skips to report when skips are full for collection. However, failure to report by communities and councillors leads to waste not being collected, causing nuisance and environmental pollution.

Moreover, according to Fakoya (2014) [8], many rural municipalities make the mistake of purchasing vehicles for waste collection that are not designed for long stop-and-go distances. Their study found that the MLM has only one transfer station located in Dzanani township, where recyclables are recovered, and non-recyclables are transferred to the waste disposal facility, thereby reducing the distance and loads for their compactor and skip loader trucks.

5.7. Inadequate Community Education and Information Awareness

According to Molaba (2019) [22], some Integrated Waste Management Plans (IWMPs) in municipalities, including those in Fezile Dabi, lack proper public participation processes. He also notes that consultation often only involves the office of the local municipality's mayor rather than engaging all relevant stakeholders. In the Fezile Dabi municipalities, specifically, Molaba (2019) [22] also found that public comments were not adequately incorporated into IWMPs during their development stages. In the City of Johannesburg metropolitan municipality, Malope (2020) [51] found that there are challenges related to gaining community participation in attending awareness campaigns.

In the context of the MLM, this study highlights several existing awareness programs related to the IWMP, such as Adopt-a-School, Nakisani Vhupo, the Greenest Municipality competition, executive mayor quarterly imbizos, and monthly environmental education and awareness initiatives. These programs aim to educate and engage the community in waste management practices. However, the effectiveness of these initiatives remains a critical question. Respondents noted additional opportunities for the MLM to enhance public awareness through platforms like social media and newsletters, although budget constraints often limit these efforts. Molaba (2019) [22] underscores that insufficient knowledge dissemination remains a significant barrier to effective IWMP implementation in developing economies, including the MLM.

Kubanza and Simatele (2020) [52] argue that education and awareness are crucial for fostering environmental consciousness and conservation efforts. Despite these initiatives, the MLM officials expressed concerns about the community's attitudes and behaviour towards waste management, indicating a need for improvement in public engagement and educational outcomes. While the MLM has implemented various awareness programs related to its IWMP, challenges such as limited public participation, budget constraints for effective communication channels, and inadequate behaviour change among communities still hinder comprehensive waste management initiatives. Addressing these challenges could enhance the overall effectiveness of MLM's waste management strategies and community engagement efforts.

5.8. Lack of Enforcement and Compliance

Radzilani (2019) [53] underscores that compliance and enforcement are major hurdles in many municipalities, attributing the lack of enforcement to resource constraints. This study aligns with Radzilani's (2019) [53] findings, emphasising that misunderstandings regarding roles, responsibilities, and powers within the MLM limit the effective compliance, enforcement, and monitoring of waste management regulations. It is specifically noted that waste management officials have requested training as peace officers but have not been granted this authority, which underscores capacity gaps in enforcement.

Comparative examples from Nigeria, highlighted by Ike et al. (2018) [54], illustrate similar challenges in solid waste management, including poor collection methods, inadequate infrastructure, and noncompliance with government policies and regulations. This noncompliance is often rooted in a lack of comprehensive waste management strategies and insufficient enforcement mechanisms, mirroring the challenges faced in the MLM.

Moreover, Ostrovskaya and Leentvaar (2011) [55] argue that developing countries like Tanzania, Rwanda, and Kenya struggle with the practical interpretation and application of environmental legislation due to its evolving nature and limited resources for enforcement. This resonates with the difficulties outlined in the MLM, where the enforcement of waste by-laws and environmental regulations remains inadequate.

5.9. Gaps in the IWMP Implementation Plan and IDP

Ideally, the status quo report provides a baseline assessment of the waste-related gaps and challenges, which are subsequently used to inform the municipality's IWMP goals, targets, and actions [50]. Using the document review method, this study finds a misalignment between some of the IWMP's goals, targets, and/or actions. A typical example is the target of establishing e-waste recycling, while the action aims to discourage people from disposing of garden waste in landfill sites. It is evident that this target may be difficult to achieve, considering that the implemented action does not contribute to achieving the target. According to Mautla (2022) [24], the successful implementation of the IWMP depends on the quality of the implementation plan, where the goals, targets, and actions in the MLM IWMP may be challenging or unrealistic to implement without proper and extensive consultation.

Furthermore, the IWMP is executed through an implementation plan, which needs to be incorporated into the IDP as a sector plan in accordance with the Waste Act, Section 4(a)(ii) [56]. Upon reviewing the IWMP and its Implementation Plan and IDP, it was established that only four IWMP-linked projects are incorporated into the IDP: the distribution of refuse bags to townships and villages, extending waste collection to villages, refurbishing six drop-off points, and establishing a new landfill site while rehabilitating the old Vondeling landfill site. It is important to note that the rehabilitation of the old Vondeling landfill site is not included in the IWMP but is part of the IDP. Many projects identified in the IWMP from 2018 to 2023 are not integrated into the IDP. This was further identified by Mautla (2022) [24] when evaluating the Drakenstein Local Municipality's monitoring and reviewing of its IWMPs.

5.10. Brief SWOT Analysis for Implementing the MLM IWMP

The SWOT analysis evaluates the internal strengths, weaknesses and external opportunities and threats in an organisation's environment with the aim of identifying resources, capabilities, core competencies, and competitive advantages inherent to the organisation [57]. Leigh, 2009 [58] summarised SWOT meanings as follows: strength is the internal competence and resource availability; weakness is the internal inhibitor of the competence, resources, or qualities necessary for success; opportunity is an external enhancer of performance that can be pursued to gain benefit; and threat is as an external inhibitor of performance that has the potential to reduce accomplishments [58].

Although this study's main aim was to identify the barriers, a SWOT analysis was also conducted to evaluate the IWMP system in general. The themes identified from stakeholder response on the barriers towards the implementation of the MLM IWMP in

Table 2 constitute the weaknesses and threats within the SWOT analysis approach. Table 3 further provides the opportunities identified from stakeholder responses. To complete the SWOT analysis of this study, the strengths and threats towards the implementation of municipal integrated waste management planning were identified from the literature review. The strengths identified towards the implementation of the integrated waste management plans include [59–61]:

- i. The planning system is properly introduced, including aims, tasks and costs of its realisation for funding purposes.
- ii. Communities mobilise each other and create cooperation for separate collections.
- iii. Introduction of environmental fees and fines, which are separate from the tax system but further enhance the waste management services cost reflective charge system.
- iv. Progress in separate collections is realised, although not all inhabitants may use it.
- v. Provision of financial support for new waste facilities and education and awareness programmes from management.
- vi. IWMPs identify problematic waste streams and a series of measures to be implemented.
- vii. Strong and guided awareness of local government promoting responsible waste management behaviour.
- viii. Promulgation of regulation to further strengthen the existing ones.

Threats identified towards the implementation of the integrated waste management plans include [59,62]:

- i. Lack of citizen participation and disinterested citizens in the development and implementation of the IWMPs.
- ii. Limited availability and inconsistencies of the relevant and reliable data in the development of IWMPs for efficient implementation.
- iii. Failure to fulfil the IWMPs set objectives, which may include reducing the amount of waste diversion from landfill facilities.
- iv. Lack of waste separation at source facilities.
- v. Set of unrealistic IWMP objectives and consequently objectives not fulfilled thereof
- vi. High cost of waste transfer in the urban area and high cost of disposal in the rural areas
- vii. Business as usual and not in my backyard syndrome
- viii. Strikes and vandalism of waste management facilities.

6. Conclusions

The IWMP is designed to be a decision-support tool that informs and influences higher-level decision-making policy instruments on waste-related matters. However, despite the existence of policy instruments such as IWMPs, waste-related issues like generation and management remain challenging in many countries.

We argue that the lack of quantitative data to assess the effective implementation of plans like the IWMP necessitates reliance on key stakeholders' perceptions to understand the barriers hindering the effective implementation of the IWMP system in developing economies. Using South Africa's MLM as a case study, our findings and analysis suggest the following concluding remarks:

- i. Of the eight goals and 55 actions outlined in MLM's IWMP, 76% (42 out of 55) have not been fully implemented since the plan's development in 2018. Most of these targets and actions have exceeded their implementation deadlines as specified in the report.
- ii. Similar to other municipalities in South Africa and in developing countries, the following key barriers or challenges are hindering the effective implementation of the IWMP:
 - a. Lack of monitoring of IWMP implementation by the MLM.
 - b. Political interference and corruption.
 - c. Insufficient budget for waste infrastructure and resources.
 - d. Poor planning, breakdowns in transport, and inadequate maintenance of infrastructure.
 - e. Lack of skilled human resources and appointments in unskilled technical positions.

- f. Unreliable service and collection frequency issues in urban areas, along with a lack of waste collection in rural areas.
- g. Insufficient community education and awareness.

Due to these barriers, this study concludes that the IWMP system is not currently effective in achieving its intended objectives in a developing economy such as South Africa. Until these barriers are removed or addressed, they will continue to pose a risk to the effectiveness of the IWMP system as a key waste management policy instrument. In addition, some opportunities have been identified in this study, including waste diversion from landfills and landfill airspace saving; SMME development, training and support; creating a clean environment and illegal dumping conversion into parks; job creation; establishment of a waste processing plant by the MLM; revenue collection; and enhancement of tourism. This paper, therefore, offers valuable insights for other nations facing similar waste-related challenges as South Africa by identifying the obstacles to implementing IWMPs. This can serve as a foundation for improving the effectiveness of IWMP systems elsewhere.

Supplementary Materials: The following supporting information can be downloaded at <https://www.mdpi.com/article/10.3390/su16229643/s1>, Questionnaire interview in relation to the implementation of Makhado IWMP.

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