



# South African Municipal Waste Management Systems: *Challenges and Solutions*



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**Cover image:** Goudkoppies landfill, Johannesburg. Credit: Suzan Oelofse, CSIR

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The International Environmental Technology Centre (IETC) works with developing countries to implement sustainable solutions to environmental challenges, with focus on holistic waste management.

## LIST OF ABBREVIATIONS

CA	Competent Authority
COJ	City of Johannesburg
CSIR	Council for Scientific and Industrial Research
COVID-19	The COVID-19 is a new virus identified in 2019 and linked to the same family of viruses as Severe Acute Respiratory Syndrome (SARS).
DARDLEA	Department of Agriculture, Rural Development, Land and Environmental Affairs, Mpumalanga
DEA	Department of Environmental Affairs (now DEFF)
DEFF	Department of Environment, Forestry and Fisheries
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
IDP	Integrated Development Plan
IWMP	Integrated Waste Management Plan
KSDLM	King Sabata Dalindyebo Local Municipality
NEMA	National Environmental Management Act
NWMS	National Waste Management Strategy
RSA	Republic of South Africa
Stats SA	Statistics South Africa
UNEP	United Nations Environment Programme

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# 1 Background

Waste management has become a major environmental issue in South Africa. The South African Constitution (RSA, 1996) assigns the responsibility for refuse removal, refuse dumps and solid waste disposal to municipalities (Section 156(1)(a) read with Schedule 5). Although the large majority of municipalities provide solid waste services themselves, some metropolitan and district municipalities outsource the function, although this trend seems to be declining (Treasury, 2011). The use of community-based delivery mechanisms are limited despite the potential for job creation (StatsSA, 2016). The National Policy for the Provision of Basic Refuse Removal Services to Indigent Households (DEA, 2010) aims to facilitate the provision of at least basic refuse removal services to poor households at no cost to these households. The success of municipal solid waste management relies heavily on an enabling governance environment determined by social, economic and psychological factors, including public participation, policy, and public attitudes and behaviour (Ma and Hipel 2016). The effectiveness and sustainability of waste management services, being one of the most visible urban services, therefore serves as an indicator for sound municipal management, successful urban reforms, and good local governance (Okot-Okumu 2012).

Population growth, urbanization, and income growth have resulted in increased waste generation, thereby increasing pressure on municipalities in terms of service delivery and waste management infrastructure, including landfills (Dlamini et al., 2018, 2018). These pressures exacerbate challenges faced by municipalities including lack of financial resources, operational challenges, enforcement of legislation, and poor planning and management. As a result, a lot of municipalities are currently struggling to provide basic waste management services (DEA, 2018). In 2018, about 12.2 million households received refuse removal in South Africa while 323 478 households did not receive waste services (Stats SA, 2018). The total domestic waste generated by households in South Africa is estimated at 12.7 million tonnes per annum, and approximately 3.67 million tonnes of this waste are not collected and treated through formal waste collection systems, resulting in large amounts being dumped illegally (Rodseth et al., 2020).

Exacerbating the inefficient waste management and service delivery in South Africa is the reliance on landfilling. About 75% of waste generated in South Africa was disposed in landfills in 2018 (Operation Phakisa, 2019). This is due to the slow response to the National Waste Management Strategy (DEA, 2012) and a lack of adequate measures to use waste as a resource through re-use, recycling and recovery, to protect the environment while enhancing economic and social development (Operation Phakisa, 2019). Adding insult to injury, many of the large municipalities are running out of landfill space to dispose of waste with little to no alternative waste management options. The Newcastle Municipality is a case in point where the municipality has *"effectively run out of landfill airspace with its existing landfill meant to have been closed in 2009"* (DEA, 2018a).

This report highlights solid waste management challenges faced by municipalities in South Africa.

## **2 Municipality solid waste management challenges**

Literature suggest that challenges faced by municipalities are not new. Reports dating back to 2007 and 2008 state that municipalities in South Africa are faced with four broad challenges, namely: financial management; equipment management; labour management; and institutional behaviour (DEA, 2007, Godfrey and Oelofse, 2008). These challenges manifest as ineffective utilisation of municipal resources (financial, equipment, capacity); non-compliance with environmental legislation; no or poor levels of service delivery; and potential environmental and human health impacts (Godfrey and Oelofse, 2008). The legal requirements for municipalities to provide refuse removal services have evolved and became more demanding over the years (Stats SA, 2016). Municipalities often refer to 'unfunded mandates' that have been added with the implementation of the Waste Act, 2008 (Act 59 of 2008). The overlap of functions between districts and local municipalities has also been mentioned as a challenge that result in a lack of accountability, hampering solid waste management in small municipalities (Stats SA, 2016). Documented information obtained from municipal Integrated Waste Management Plans and the status quo reports from municipalities as part of the Waste Flagship project by government, suggest that similar challenges remain. These are discussed in more detail below.

### **2.1 Financial challenges**

It is reported that solid waste management can be a city's single largest budgetary item, with municipalities spending 20 to 50 per cent of their annual budget on municipal solid waste management (Dukhan et al., 2012, Kubanza and Simatele, 2015), of which 50–90 per cent can go to waste collection alone (Hoornweg and Bhada-Tata, 2012). The costs of providing waste removal services vary significantly between municipalities (DEA, 2018). Non-payment of waste services by residents and businesses therefore has a direct impact on a municipality's ability to render services. In addition, municipalities are expected to provide services to poor households even if they cannot afford to pay (DEA, 2010).

The greatest operating budget amounts of municipalities are spent on municipal planning, solid waste and municipal roads (MDB, 2018). The average operating and capital expenditure on solid waste by municipalities in 2017/18 was R107 664 193 and R37 308 905 respectively (MDB, 2018).

Municipalities set tariffs for waste management services, including collections, city cleansing and disposal fees. Therefore, in theory, a municipality should be able to recover the costs of providing waste management services. However, DEA (2012) report that municipal solid waste services are mostly underpriced and therefore not adequate to cover the costs to carry

out the services. On top of this problem, most municipalities have less money budgeted for waste management services than required (UNEP, 2018 and KSDLM, 2018) and this leads to budget shortfalls in waste management. According to the NWMS this situation encourages waste generators to generate more waste, and consequently increase the need for landfilling (DEA, 2018b). These findings concur with DEA (2018c) which states that sustainable financing of waste management services, and compliance with relevant legislation in national standards and licensing conditions, is an ongoing challenge for most municipalities. The CSIR (2011) and DEA (2018b) indicate that transportation is a major cost which takes a big portion of the waste management budget allocation of any municipality. In addition, the location of the landfill sites, for example Buffelsdraai and Lovu in eThekweni municipality, with available airspace are usually far from where the waste is generated (DEA, 2018a). The distance travelled by the truck from the collection area to the landfill site is adding more transportation cost to the municipal waste management budget. This calls for a need to come up with cost effective means of transporting waste.

Stats SA (2016) also highlights the impracticality of ring-fencing solid waste finances in smaller municipalities as a challenge.

## **2.2 Operational challenges**

Waste management operations in a municipality resolve mostly around waste collections; city cleansing including litter picking and cleaning of illegal dumpsites; and the operations at municipal owned waste facilities including transfer stations, material recovery facilities, buy-back centers, drop-off- and disposal sites.

As it is the legal duty for the local government to deliver waste management services to the community (DEA 2018a), challenges, especially on the operational side of things, will result in ineffective service delivery including service interruptions and backlogs. Waste collection stands out (UNEP, 2018) due to a number of reasons as outlined by Oelofse and Godfrey, (2008) which includes; i) fleet problems, ii) staff shortage, iii) lack of adequate equipment. These operational challenges hinder or delay the municipality to deliver efficient waste management service.

### **i) Fleet problems**

Poor management of available fleet for waste collection is the main cause of problems. Waste collection trucks that are not well serviced leads to regular breakdowns. Common reasons raised for not doing regular maintenance service on tucks is the lack of spare capacity, old age of the vehicle fleets, and the cost associated with servicing of old vehicles. Hydraulic system failures of these trucks is one of the problems identified in many municipalities (Dr Beyers Naude local municipality IDP, 2017-2022; Mafube local municipality IDP, 2017-2022; uMzimkhulu local municipality IDP, 2017-2022;eThekweni

Municipality IWMP,2016). Hydraulic system failures may be attributed to improper operations due to a lack of or insufficient training of staff.

### **ii) Illegal dumping**

Polasi, (2018) have identified factors associated with illegal dumping as lack of sufficient or regular waste collection services.. The fleet problems in the municipalities lead to other waste management issues such as not being able to collect waste as per collection schedule. Eventually, waste get illegally dumped by the residents. This illegally dumped waste becomes a municipality responsibility to clean up, which is an added cost (COJ, 2011). Clearing of illegal dumping cost up to 30 times more than upfront correct disposal (Abel, 2014). In some municipalities, waste generators illegally mix general and hazardous waste, which ends up in a general waste landfill site (DEA and GIZ, 2018b).

### **iii) Shortage of staff and adequate equipment or infrastructure**

Appropriate infrastructure is a very important requirement to deliver a good and sustainable waste management services. Municipalities experience challenges with lack of infrastructure and manpower specifically in the waste management section (eThekweni municipality, 2016). This results in the municipality not being able to cover all the areas with waste management services adding to backlogs. For instance, in the area where waste collection truck cannot reach (inaccessible due to narrow roads or steep slopes), people are given plastic bags and a communal skip is placed where the truck can reach (CSIR, 2011). Many municipalities do not have the ability to source enough plastic bags continuously and therefore the waste collection chain may break because only those people who manage to buy refuse bags will put out waste for collection. Others may go for what works for them and unfortunately, illegal dumping is one of the options people choose when they do not receive a service.

The other noticeable challenge in most municipalities in the country is the aging infrastructure (DEA, 2012). This makes it hard for the municipality to manage waste properly when they have old and malfunctioning infrastructures. Infrastructure in this context refers to landfill compactors, weigh bridges, collection vehicles, etc.

### **iv) Other operational challenges**

In addition to the above challenges, DEA (2019) and DEA (2012) have listed among others 1) low participation rates in source separation initiatives, 2) lack of infrastructure for recycling, 3) lack of recycling culture and willingness to recycle in communities and 4) waste collection backlogs. These findings concur with DEA (2011) which stated that about 87% of the municipality does not have the means or proper infrastructure to initiate waste minimization and diversion which may include separation at source and resource recovery. DEA (2012) stated that municipalities find them opting for landfilling as a preferred disposal method because other available alternatives are more expensive than



landfill costs. Most of the municipalities in South Africa do not have source separation programs. In some municipalities source separation programmes are run by private operators through provision of separate containers for source separation of recyclables and drop-off points (DEA and GIZ, 2018a; DEA and GIZ, 2018b; DEA and GIZ, 2018c; DEA and GIZ, 2018d).

## 2.3 Legislation

In South Africa, like many countries in the world, landfill sites are regulated by law, specifically the Waste Act, 2008 and Norms and Standards for Disposal of Waste to Landfill (DEA, 2013). One of the key requirements for the landfill site is the operating license, which is issued by the Competent Authority (CA) once it has met necessary legislative requirements. In the case of municipal solid waste in South Africa, the provincial department responsible for Environment is the CA. However, there are several steps that need to be followed for a landfill site to obtain a license. Due to different reasons, application for landfill site licenses can be delayed especially during the public consultation processes, and application for a license is not a guarantee that the license will be approved. While the application process is still on, waste continues to be generated and it needs to be managed appropriately. Consequently, some of the landfill sites are forced or end up operating illegally, to avoid illegal dumping in the broader environment. Even when the license has been obtained, some municipalities do not comply with the license requirements. For example Buffalo City municipality was not compliant to the licensing requirements by operating a landfill that is not lined (DEA and GIZ, 2018a). The Department of Environmental Affairs (now DEFF) identified 69 illegal landfill sites in South Africa (DEA, 2016).

Waste management in general is governed mainly by The Constitution of the Republic of South Africa Act 106 of 1996, National Environmental Management: Waste Act No 59 of 2008 and many by-laws which may differ from municipality to municipality. These pieces of legislation are meant to assist the waste managers to manage waste in the best way possible. However, UNEP (2018) and Oelofse and Godfrey (2008) argued that there is lack of enforcement of legislation in the waste management field. In municipalities such as the Buffalo City Municipality there are people that have been trained to enforce by-laws (they are registered as peace officers) however, due to staff shortages, they are not effective (DEA and GIZ, 2018a). DEA (2012) also found that the policy and regulation environment does not always actively encourage or enforce the waste hierarchy. Due to this challenge, there is a missed opportunity of generating an estimated R10 billion per annum from recycling. Therefore, the availability of those waste by-laws and legislation become less useful. Lack of enforcement of by-laws leads to a number of waste management challenges such as illegal dumping and illegal waste management activities including recycling and processing of waste in unsustainable and often harmful ways negatively impacting on human health and the environment.

In addition, DEA (2018a) mentioned a number of other legislation challenges including i) lack of access control at the landfill sites, ii) burning of waste in the landfill sites, iii) inadequate daily compaction and cover of waste in the landfill site, iv) and dumping of hazardous waste at the general waste landfill site.

## 2.4 Planning and management

National Waste Management Strategy (NMWS) currently being revised by (DEA, 2012) highlights a number of municipal solid waste challenges. These challenges include growing population, which in turn puts pressure on municipal waste collection services and that leads to a backlog. The other challenge is the increasing complexity of the waste streams, i.e the hazardous waste which mixes with general waste. It makes it very difficult for municipality to handle and dispose of the waste properly.

Municipalities are struggling to manage landfill sites due to lack of funding (DEA, 2016). As a result DEA (2018b) stated that the majority of landfill sites reported by four provinces are not able to comply with the license conditions. Only 17 of 251 landfills in those four provinces had functional weighbridges. The studies showed that the landfill site with dysfunctional or no weighbridges end up having management difficulties. It is almost impossible to monitor the quantities of waste going into the landfill site. That in turn makes it hard to plan ahead in terms of the remaining landfill site life span and when to initiate cell closure processes. Inability to measure the waste quantities going into the landfill site can later lead to piling up of waste in a cell which is full and forming a "hill" of waste. In addition to the above, DEA (2019) notes that lack of landfill air space is a major challenge in South Africa. This is caused by other challenges which arise from waste management problems including lack of proper handling of different waste streams such as organic and recyclables which end up in the landfill site instead of being taken back to the economy by means of recycling, reuse and resource recovery. In addition, the Waste Act requires that Local Government must prepare an integrated waste management plan (IWMP) (DEA and GIZ, 2018) but most of the municipalities do not have updated IWMPs.

## 2.5 COVID -19

South Africa, similar to the rest of the world, is impacted by the COVID-19 pandemic which introduced a number of challenges to municipalities. The challenges specific to waste management service delivery include the following:

- *Waste management is listed as an essential service* that has to continue without interruption while adhering to safety protocols and social distancing to protect waste collection staff while providing waste collection services;
- *Waste pickers are not recognized as essential workers* resulting in pickers not being able to work during the lockdown (level 5);

- *Recycling is not listed as an essential service* despite being an integral part of the waste management system. This resulted in stockpiles of recyclable waste at processing facilities while in lockdown with the knock-on effect of backlogs when services may resume, and a resulting lower price paid for recyclables

### 3 Municipality submissions

Municipalities were required to submit expressions of interest to take part in this project. The challenges listed in this section were taken from the submissions by the different municipalities submitting expressions of interest.

Steve Tshwete Local Municipality (2018) mentioned four major challenges which include;

- a) Increasing political pressure for supplementary services in townships. This basically include extending services such as garden refuse collection which are rendered in Mhluzi township to other areas of the municipality but the operational budget does not allow the municipality to do so.
- b) Shortage of staff which leads to stretched management responsibilities in waste collection and disposal. This is mainly due to vacancies that needs to be filled. However, at the time (2018) when the report was written, the municipality indicated that the positions are advertised.
- c) Insufficient capital budget to implement strategic waste infrastructure. On the other hand, the municipality indicated that the inability to spend the budget results in diversion of some of the budget from the solid waste management division to other divisions within the municipality.
- d) There is only one operational municipal owned landfill site which services 10 areas and it was estimated to have 7 years remaining life span in 2018.

King Sabata Dalindyebo Local Municipality (2018) indicated in the status quo report that they also have solid waste management challenges. They outlined four major challenges including;

- a) There was political issues hindering the finalization of job evaluation which lead to absence of formal structure in the solid waste management department.
- b) The KSDLM failed to implement the IWMP because of lack of capital budgets, management capacity and lack of core waste management skills amongst the management and staff.
- c) The capital budget is also mention in KSDLM as a challenge like in most municipalities in South Africa.
- d) KSDLM operated two landfill sites, one in the Mthatha city which mainly services urban areas and one in Mqanduli which main services rural areas. However, the challenge is that in both landfill sites, there is lacking management skills. The Mthatha landfill site was reported to be under rehabilitation and closure process.

Mpumalanga provincial government (DARDLEA, 2015) list a number of solid waste challenges which are common in their municipalities including: financial, legislative, management, planning and operational challenges. Most of these challenges are not unique to the challenges experienced by other municipalities in the country. Amongst other challenges listed by Mpumalanga provincial government in the waste management summit are:

- a) The amount charged per customer for waste services is not enough to carry out sustainable services. On top of this problem, there are some customers who default payments and this makes matters worse.
- b) The province have waste by-laws but the challenge is the implementation of the by-laws. Having good by-laws on the books only and not effective on the ground is not so helpful in the waste management service. The changes and amendments in the legislation becomes a challenges to the municipality which is still trying to keep up with the older versions of the legislations.
- c) Institutional arrangements: waste services are placed under the directorate which basically deals with issues far from waste and in that process, waste management is not prioritized.
- d) Poor operations and management of waste facilities including non-determination of airspace, cover material, equipment and lack of technical skills are major challenges.
- e) The local and district municipalities have a poor and inconsistent communication regarding waste services.
- f) There is a significant shortage of human, technical, equipment and financial resource and that makes it difficult to deliver a good waste service. The IWMP is not implemented because of lack of budget to carry out all the activities planned.
- g) The infrastructure is aging and there is no maintenance plan in place. This poses a challenge in the near future once that infrastructure cannot function anymore.
- h) There is a notable lack of waste collection, capturing and reporting to Waste Information System (reliable data, access to information, identify priority waste streams requiring government intervention). This hamper proper and informed planning, management and leaves the managers with a reactive management approach as opposed to proactive one.

## **4 Possible solutions**

### **4.1 Financial challenges solutions**

One important issue in South Africa is a political will which tends to influence how decisions and budgets are made. Therefore to overcome the budget constraints, waste management must be made a political priority (UNEP, 2018). In this way, there will be more funding allocated in the budget of the municipality for waste management services. To minimize the

transportation costs, CSIR (2011) suggested that waste collection vehicles are modified to be able to collect general waste and recyclables at the same time. In that way, there will be no need to send two different vehicles to collect these two kinds of wastes. One truck can pull a trailer in which the recyclables will be collected or create two compartments in one truck to be able to separate recyclables from waste.

DEA (2019) mentioned the circular economy as one concept which can assist in implementation of waste hierarchy and boost economic activities on waste management. Therefore, the financial problems faced by the municipalities in the waste management field can be tackled from the circular economy point of view. The circular economy can be followed in every step and be incorporated in decision making regarding all the waste management activities in the municipality. For instance, the municipality can put measures in place to collect recyclables and get them back into the economic cycle to maximize the economic value of what was deemed to be waste while saving money and landfill airspace. In short, the municipality can invest more on resource recovery as it is suggested by circular economy concept.

Another important solution would be for the municipality to do a full cost accounting exercise and to charge cost reflective charges for waste management services. New waste management infrastructure, especially as it relates to diversion of waste from landfill, can be developed in partnership with the private sector. This approach will share the risk and investment costs on agreed terms that can be to the benefit of both the municipality and the private sector partner.

By incorporating the waste management projects identified in the IWMP in the IDP, the projects will be visible to Treasury and could influence the treasury allocations to the municipality. Timely planning is therefore required to include these projects early in the IDP so that the money could become available as planned.

Partnering with industry on waste separation at source initiatives is another alternative as it will support small business development while saving valuable landfill airspace.

## **4.2 Operational challenges solutions**

One of the reason why fleet breaks down is that some staff members who are not trained to operate some of the functions in the fleet actually do get involved and operate those functions. Therefor it is recommended that only trained staff members should operate the machinery or else, all the staff members should be trained on how to operate those machine/fleet.

Routine repair and maintenance of all the fleet as suggested by Oelofse and Godfrey (2008) is the very important factor to consider in order to keep the fleet up and running. The fleet should take turns in the workshop i.e. if you own four trucks, two can be taken in for service

while other two are working. It is suggested that there is at least one standby truck in case one of the trucks break down. This will allow uninterrupted waste services and that could minimize cumulative problems such as illegal dumping.

CSIR (2011) suggested that to avoid the gaps in waste collection due to fleet related problems, the municipality can do three things i) Have a dedicated workshop which will be responsible for the municipality fleet ii) the in-house mechanic who will make sure he check the fleet on daily basis and fix what needs to be fixed before it becomes a big problem which will lead to a break down and iii) have a lease agreement in place which will allow the municipality to get a replacement truck in case one breaks down.

The increasing waste generation vs constant waste management budget in the municipality has been proven to cause lack of capacity to handle the waste. Recycling rate is very low in most municipalities and waste is not separated when it is collected. This means that there are recyclables which end up being disposed in the landfill site. To mitigate this problem, the integration of informal sector in waste collection and recycling is highly recommended. This integration may be beneficial as the DEA (2018b) highlights the significance of informal sector (waste pickers) in the waste management chain, particularly in the waste collection and recycling. According to DEA (2019), increasing recycling rate can have a significant relief and assist to solve some of the operational problems on waste management and help to expand landfill sites life span. Waste diversion initiatives should not only focus on mainline recyclables (paper, plastics, glass, and cans), but should include more bulky waste streams such as builders' rubble and garden waste as well.

With regards to the lack of know-how, DARDLEA (2015) and DEA (2011) suggested that those who are involved in waste management should be equipped by means of frequent trainings and assistance on how to implement what they were taught in the training. This training must not only be given to top management, rather include the man who execute the duties on the ground. In this way, the technical knowledge will be implemented on the ground and this can help to eliminate some or most of the operational challenges in waste management.

### **4.3 Legislation solutions**

The legislation challenges identified in the municipalities are almost similar. Oelofse and Godfrey (2008) recommended that by-laws and legislations are enforced. There must be visible and active law enforcement officers (Environmental Management Inspectors as stipulated in chapter 7 of NEMA) and be placed strategically to be able to monitor the hotspot areas (DEA, 2009). These officers must be well trained and know exactly how to enforce the law. In some municipalities like City of Tshwane, City of Johannesburg and others, metro police do execute the enforcement of waste by-laws and legislation. The current amount of spot fines is sometimes a cheaper option which people who dump waste illegally

choose to pay if they get caught as opposed to disposal fees. Therefore the suggestion is to establish the price list of fines based on the quantity and type of waste dumped. The same system used for road traffic fines pricing can also be applied in waste management fines. It should also be noted that waste management by-laws should not be enforced in isolation as non-enforcement of other by-laws, for instance not regulating the number of people occupying a house, may increase pressure on the waste management system and lead to system failures.

Establishment of functional units for waste management with clear allocations of duties and responsibilities would be helpful in terms of by-law enforcements and executions of other waste related issues (DARDLEA, 2015).

#### **4.4 Planning and management solutions**

Planning is a critical phase of waste management which needs to be done correctly. However, if proper planning was not done at the beginning, solutions on how to correct and plan properly in future are suggested below:

- Most municipalities are unable to manage the landfill site properly due to factors such as budget constraints. Therefore, it is suggested that the municipalities hire a private contractor to operate and manage the landfill site services and impose strict operating requirements to the operator to ensure that he delivers quality work (UNEP, 2018).
- The implementation of circular economy in the planning and operational stages of waste management can assist the municipality in many ways including the financial sustainability by cutting cost of waste collection and disposal (DEA, 2019) and generating revenue from resource recovery. Then that revenue can be injected back into the waste management system to maintain smooth continuity in service delivery.

#### **4.5 COVID-19 responses**

##### *Municipal collection staff*

Solutions to the impact of COVID-19 on municipal workers relate to the provision of appropriate PPE with emphasis on wearing of face masks, combined with daily screening of staff. Screening of staff could include self-screening by providing questionnaires to staff to complete before reporting for work. The questions should include indicating contact with infected people, and self-reported symptoms. If staff report symptoms, then they should be sent for formal screening and testing. Positive cases must follow protocols as prescribed by the National Department of Health.

##### *Waste pickers*

Municipalities should create awareness about the importance of wearing a mask, not touching your face, social distancing, and regular hand washing. Municipalities could consider organizing hand washing/sanitizing stations in areas where pickers are working. Waste picker protection can further be supported by encouraging households to donate

cloth masks and hand sanitizer or simply putting out buckets with soapy water to enable pickers to wash hands regularly.

#### *Households*

Households should be encouraged to keep possible COVID-19 infected waste separately, put it in a double bag, and keep the waste at least 72 hours before putting it out for collection. On collection days, households should disinfect their waste bins before putting it out and again before taking it back in.

#### *General public*

The general public should be educated on the proper use, and management of disposable masks and gloves. Attempts to clean and reuse disposable masks should be strongly discouraged, and proper management of all waste should be emphasized to avoid illegal dumping and littering of COVID-19 related waste.

## 5 Summary of challenges and solutions

### 5.1 Operational challenges

<b>Challenge</b>	<b>Solution</b>
Lack proper and functional waste disposal technologies	<ul style="list-style-type: none"> <li>• Sourcing skills by training people</li> <li>• Implement suitable technology</li> <li>• Pilot test technologies in the local conditions to allow for adjustments and localization of technology before upscaling.</li> </ul>
Limited capacity to handle generated waste volumes due to lack of funding, staff shortage and lack of adequate equipment	<ul style="list-style-type: none"> <li>• Integration of the informal sector in waste collection and recycling</li> <li>• Part time workers can be employed</li> <li>• Introducing a shift system may reduce the requirement for overtime payments</li> </ul>
Fleet problems (poor waste collection)	<ul style="list-style-type: none"> <li>• Routine and repair maintenance</li> <li>• In-house mechanic</li> <li>• Dedicated workshop</li> <li>• Fleet lease agreement</li> </ul>
Low participation rate in S@S	<ul style="list-style-type: none"> <li>• Continuous education and awareness.</li> <li>• Make it an easy thing to do (convenient to participants).</li> <li>• Introduce incentives and disincentives to motivate participation</li> </ul>
Lack of recycling culture	<ul style="list-style-type: none"> <li>• Continuous education and awareness.</li> <li>• Lead by example</li> </ul>



	<ul style="list-style-type: none"> <li>• Introduce incentives and disincentives for recycling</li> <li>•</li> </ul>
Lack of skilled staff	<ul style="list-style-type: none"> <li>• Offer frequent training to the staff.</li> <li>• Guidance on how staff carry out daily duties.</li> <li>• On-the job mentoring and training</li> <li>• Upskilling of existing staff</li> </ul>

## 5.2 Legislation

Challenge	Solution
Illegally operating landfill sites	<ul style="list-style-type: none"> <li>• Enforcement of the by-laws and relevant legislation</li> <li>• Simplify waste license application processes</li> </ul>
Lack of effective legislation	<ul style="list-style-type: none"> <li>• Make the application processes easy and understandable.</li> <li>• Re-introduce fines for offenders</li> </ul>

## 5.3 Planning and management

Challenge	Solution
Management of landfill sites. Malfunctioning or absence of weighbridges.	<ul style="list-style-type: none"> <li>• Outsource landfill site operations.</li> <li>• Make waste management a political priority</li> <li>• Record waste data to enable better planning in future.</li> </ul>
Lack of communication between spheres of government	<ul style="list-style-type: none"> <li>• Set quarterly feedback sessions</li> <li>• Establish information sharing center (online platform).</li> <li>• Share annual plans</li> </ul>
Institutional misplacement	<ul style="list-style-type: none"> <li>• Place waste management under a correct directorate</li> <li>• Establish a waste unit with clear mandate and responsibilities</li> </ul>
Lack of adequate waste information to inform planning	<ul style="list-style-type: none"> <li>• Properly record waste data and actively participate in National Waste Information System (WIS).</li> </ul>

## 5.4 COVID-19

Challenge	Solution
Safety of workers/pickers	<ul style="list-style-type: none"> <li>• Provision of PPE</li> <li>• Education and awareness on the spread of the virus, wearing of face masks, hygiene and social distancing</li> <li>• Households keeping waste for at least 72 hours before putting it out for collection</li> <li>• Putting potentially contaminated waste in a double bag</li> <li>• Disinfecting bins/bags before putting it out for collection</li> </ul>
Interruptions in recycling	<ul style="list-style-type: none"> <li>• Providing safe storage space for pickers to store waste until the systems are back up and running</li> </ul>
Mismanagement of COVID-19 related waste that is not high risk waste i.e. masks and gloves used by non-medical businesses, private individuals	<ul style="list-style-type: none"> <li>• Awareness creation on proper management practices relating to the disposal of COVID-19 related waste</li> </ul>

## 6 Conclusion and recommendations

Most of South African municipalities experience similar waste management challenges including i) financial constraints i.e. limited budget allocated to waste management services, ii) operational problems i.e. fleet challenges such as break downs, not being able to collect all the generated waste, dysfunctional weighbridges and lack of adequate manpower, iii) legislation challenges i.e. mostly lack of law enforcement and the long waiting periods when applying for waste license, and iv) planning and management challenges i.e. not being able to manage the landfill site well, inability to render an effective waste management services. There were some suggested solutions to the identified challenges which include outsourcing of landfill site operations, integrating informal sector, having dedicated workshops, in-house mechanic, having fleet lease agreement, implementing law enforcement strategies and making waste management services a political priority.

Not all of these challenges are within the control of the municipality, but strategic and creative thinking can go a long way to overcoming most of the challenges listed. Change will not happen overnight, but each small change towards more effective waste management will contribute to improvements in the overall system. Waste management is not only the responsibility of the municipality, but it is the responsibility of every person generating waste. Solving the waste management challenges in municipalities will require collective action by all stakeholders including the municipality, industry and community.

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