

Developing an Environmental Management Accounting Framework for The Waste Management Sustainability of Municipalities in South Africa

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Abstract

The aim of the study is to identify environmental management accounting (EMA) practices currently used by the municipalities in South Africa in enhancing municipal solid waste management. To accomplish the aim of the study, 32 in-depth interviews were conducted with accountants, environmental managers and municipals managers on 10 municipalities in South Africa. Thematic analysis's was used to analyse the data and unearthed that environmental management system, waste management system, environmental reporting, environmental training and research and development are currently used as EMA practices to boost municipal solid waste management. To align these practices with the accounting system in municipalities, an EMA model was proposed that can make available monetary and non-monetary waste-related environmental information.

Keywords

Environmental Management Accounting, Municipalities, Framework, Practices, South Africa, Environmental Reporting

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1. INTRODUCTION

Municipal solid waste generation has become a key source of environmental challenges. Panya et al. (2018) posit that this is because the environmental externalities emerging from improper municipal solid waste management were for long time ignored. In most developing countries such as South Africa this has led to enormous pressure on waste disposal capabilities by municipalities. In developing countries, solid waste management remains a central role of the municipalities. Municipal solid waste management (MSWM) advances issues such as “generation, collection, transport, treatment, and disposal of waste” (Bartolacci et al., 2018). When not properly treated, waste can contribute to negative impacts on public health and environmental degradation. Solid wastes are a major source of greenhouse gas emissions. Bharadwaj et al. (2020) point out that this classifies the municipalities, through poor waste management, as chief contributors to climate change. According to scholarly estimates, waste disposal is responsible for about 5% of the global GHG emissions.

As climate change is world wide scourge, it also has been disturbing South Africa in form of inconsistency in rainfall and life-threatening weather conditions. The improper management of MSWM contributes 3% of the South Africa's GHG emissions (Adeleke et al., 2021). Department

of Environmental Management report, there has been a 31% increase in waste generation in South Africa for the past 5 years. This effectively calls for proper systems and solutions to be in place to curtail the effect of the poor MSWM in order to achieve sustainability. Even though, there are policies and regulations in place to lessen poor MSWM, it is critical to investigate the exact measures of environmental management practices municipalities are employing to minimise impacts from solid waste management. This helps to recommend practices that need special attention based on contemporary literature. Qian et al. (2018) contend that environmental management practices adopted by municipalities to improve solid waste management remain unknown. This is further supported by Adeleke et al. (2021) that environmental measures to enhance sustainability from the perspective of the MSWM needs scholarly attention to be established. This provides a research area that needs to be explored. Hence, this study aims to identify environmental management practices used by South African municipalities to improve solid waste management.

By identifying the environmental management practices mostly used by the local municipalities, it provides a solid ground to develop and propose an environmental management accounting (EMA) framework that specifically enhances waste management sustainability. This is because

previous studies have mostly provided engineering and technical solutions to the extant challenges from the MSWM. For that reason, Qian et al. (2018) affirm that EMA has been neglected and is still unknown in the municipalities. In this regard, this study proposes EMA as a pathway to poor MSWM in South Africa. Rikhardsson (2005) define EMA as “the generation, analysis and use of financial and non-financial information in order to optimise corporate environmental and economic performance and to achieve sustainable businesses”. Absence of waste related data has been cited as key factor majorly contributing to poor MSWM (Qian et al., 2018; Adeleke et al., 2021; Dlamini et al., 2019). In this case, EMA will ensure that both financial and non-financial environmental waste-related information is provided for management decision making. By presently using the traditional management accounting system, municipalities are not able to collect the financial and non-financial information waste-related data. This implies that management are not making sound and evidence-based decisions as some critical environmental information will be missing. This brings in and makes EMA relevant to the municipalities.

Moreover, the few EMA studies in municipalities have been conducted in developing countries such as Australia and Canada (Qian et al., 2018; Ball and Craig, 2010; Qian et al., 2011). This means that globally EMA in the municipalities has not been sufficiently subjected to scientific studies. Unfortunately, in direct contrast to global needs (Burritt et al., 2019), a large number of the prior studies were carried out in developed countries, the results of which may offer some valuable insights but cannot be strictly extrapolated to emerging markets such as South Africa. Hence, this study becomes crucially important to close this gap from an emerging markets perspective. To fill this gap, this study focuses on identifying EMA practices in municipalities in South Africa; an emerging market economy and thereof propose an EMA framework to enhance sustainability of the municipalities in South Africa. Setthasakko (2010) and Chathurangani and Madhusanka (2019) argue that without EMA frameworks organizations are unlikely to be able to adopt EMA tools. Hence, this study proposes a municipal sector specific EMA framework.

Table 1. Number of Interviewees

Job Title	Number of Respondents
Accountants/CFOs	13
Environmental managers/ officers	11
Municipal managers	8
Total	32

CFO = chief financial officer

2. EXPERIMENTAL SECTION

2.1 Materials and Method

To identify the environmental management accounting practices currently implemented by municipalities to improve solid waste management, 32 in-depth interviews consisting of municipalities' accountants/CFOs, environmental managers and municipal managers were conducted within a total of 10 municipalities across South Africa as displayed on Table 1.

32 interviews involving 13 accountants /CFO, 11 environmental managers or officers and 8 municipal managers were undertaken. Purposive sampling was done targeting municipalities in charge of urban towns because this is where solid waste is mostly encountered. Also, certain employees that were perceived to have adequate knowledge were purposively selected to answer the research questions. In-depth interviews were done to collect data from respondents.

2.2 Data Analysis

The transcripts of each interview were transcribed based on Braun and Clarke (2006) thematic analysis procedures. Theme or pattern identification is central to data conceptualisation. The following elaborates on themes that emerged from data analysis.

The quest for a sustainable health life is perpetually putting municipalities under severe pressure from stakeholders to reduce negative impacts from poor MSWM such as GHG emissions, related diseases and blocked drainage. To achieve this, it was critical to identify EMA practices currently adopted by the municipalities to overcome negative impacts from solid waste management. This was important as it facilitated recommendations on the current practices on what can be improved to have better MSWM. In the same vein, an EMA model was proposed to act a decision making tool on waste-related issues.

32 interviews from CFOs/accountants, environmental managers and municipal managers indicated that municipalities in South Africa are mostly using five EMA practices to address MSWM. The five EMA practices are EMS, waste management systems, environmental reporting, environmental training and research and development. These results show that municipalities in South Africa have a commitment to improve environmental and social impacts emanating from MSWM. Unfortunately, the municipalities are using traditional management accounting system to provide environmental information for management decision making. This calls for integration with EMA systems to have one system. The absence of EMA systems within municipalities in South Africa partly contributes to the poor MSWM as current EMA practices applied by the municipalities need a better accounting system in order for their effectiveness to be greatly recognized.

Table 2. EMA Practices used by Municipalities

EMA practices applied by Municipalities	Number of Municipalities Applying Identified EMA Practice
Environmental management system	10
Waste management system	8
Environmental reporting	7
Environmental training	6
Environmental research and development	5

3. RESULTS AND DISCUSSION

A closer analysis of the interviews transcripts reflect the following environmental management accounting practices as being mostly applied by the municipalities in South Africa.

3.1 Environmental Management Systems (EMS)

Table 2 shows that the most widely used solid waste management improvement practice in the local municipalities is the EMS. All the 10 sampled or 100% of the municipalities confirm using EMS as a tool to improve solid waste management. [Khanna and Anton \(2002\)](#) defined EMS as “collection of internal efforts at formally articulating environmental goals, making choices that integrate the environment into production decisions, identifying opportunities for pollution (waste) reduction and implementing plans to make continuous improvements in production methods and environmental performance”. [Khanna and Anton \(2002\)](#) further reveal that EMS includes numerous environmental practices. [Deegan \(2003\)](#) adds that EMS usually fail to avail accounting information to help managers in different decisions, but it is submitted that environmental accounting is a key component of a broad EMS since it “supports the compilation and analysis of relevant environmental information that is required to make decisions based on environmental impact added data” ([Gadenne and Zaman, 2002](#)).

By adopting EMS, municipalities show a commitment to protect the environment. For instance, [Phan et al. \(2017\)](#) emphasise that by using EMS, environmental trainings are regularly conducted which provides employees with skills and knowledge to gather and process EMA information. This simplifies the better adoption of both monetary and non-monetary EMA information.

3.2 Waste Management Systems

A waste management system can be defined as “management of all responsibilities, practices, procedures, processes and resources for establishing a system that manages waste and complies with environmental regulations” ([Panya et al., 2018](#)). Municipal waste management system consists of treating solid wastes. So, waste management systems expect to minimize negative impacts on public health and the environment. Currently, 8 of the 10 sampled municipalities

in South Africa prefer using waste management systems as a pathway to MSWM. In this regard, municipalities ensure that collecting, sorting, treating and recycling of wastes are properly done. This is inconsistent with prior studies. For instance, [Panya et al. \(2018\)](#) note that waste management system elevates SWM in waste management companies in India. The authors believe that waste management systems remain the bedrock of SWM. However, some studies contradict this finding. In one study, [Teles et al. \(2015\)](#) found that waste management systems are not directly related to environmental performance. In addition, [Voinea et al. \(2020\)](#) affirm that waste management systems are less effective on enhancing sustainability.

3.3 Environmental Reporting

Literature is awash with studies ([De Beer and Friend, 2006](#); [Gale, 2006](#); [Burritt et al., 2019](#); [Chaturangani and Madhusanka, 2019](#)) acknowledging that environmental reporting is a key practice of EMA. Environmental reporting in form of wastes collected within certain periods was also identified as a measure to improve MSWM. 70% or 7 of the municipalities resort to environmental reporting as part of a solution to environmental problems from MSWM. In South Africa, the emergence of king code III and IV transformed the governance structure. The codes and the National treasury mandated that municipalities extensively report on their environmental and sustainability issues. The environmental reporting in municipalities help communicate municipal performance on SWM to both internal and external stakeholders. In this way, stakeholders put considerable pressure on municipalities to actively improve SWM based on reported Figures in annual reports.

Environmental reporting remains the bedrock of EMA. By providing monetary and non-monetary environmental information, it is perceived that that improves management decision making in areas such solid waste management. However, the current reporting in all municipalities is done from the traditional management accounting system. [IFAC \(2005\)](#) and [Burritt et al. \(2019\)](#) note that this system cannot accurately administer EMA information. This suggests that municipalities in South Africa need to consider and adopt EMA as part of the mainstream accounting systems in or-

der to enjoy benefits of using monetary and non-monetary environmental information.

3.4 Environmental Training

Municipalities show that staff environmental training is quite common in addressing waste management. This is in sync with studies that training of staff on environmental matters augments environmental and financial performance. Recent studies by [Fuadah et al. \(2021\)](#) and [Dlamini et al. \(2019\)](#) recommend that the corporate sector proactively focus on shifting the mindset of employees as game changers towards environmental issues through training on environmental matters. In contrast, [Banamuka et al. \(2021\)](#) demonstrate that employee training on environmental issues has a negative impact on environmental performance. Based on the findings, this means environmental staff training does not increase environmental performance.

3.5 Environmental Research and Development

Respondents from five municipalities confirm that environmental research is being conducted to find better ways of improving MSWM. In other words, almost 50% of the sampled municipalities in South Africa are employing environmental research as an environmental management tool specifically to improve MSWM. [United Nations \(2001\)](#) describes environmental research and development as a process to establish better ways of resolving environmental problems. In this case, in municipalities, environmental research on MSWM concentrates on the transformation on going in the natural and human environments emanating from human actions with the key aim to grasp these changes or to find way out or solutions. In similar settings, scholars such as [Magara et al. \(2015\)](#) noted the importance of environmental research as a way of addressing environmental concerns. Furthermore, South Africa's government in a bid to reduce climate change impact sponsored and strongly encouraged environmental research. As a result, this has seen a large number of municipalities adopting environmental research as a sustainability tool. Conversely, empirical studies of [Kurapatskie \(2012\)](#) found out that environmental research was not statistically significant to enhance environmental issues.

Based on literature review and findings of the EMA practices currently used in South African municipalities to improve MSWM, an EMA framework can be proposed to enhance waste management sustainability. This framework will assist municipalities to collect monetary and non-monetary waste-related environmental information for management decisions. Scholars ([De Beer and Friend, 2006](#); [Ferreira et al., 2010](#); [Gibassier and Alcouffe, 2018](#); [Gunarathne and Lee, 2015](#); [Qian et al., 2018](#)) concede that getting environmental information improves corporate environmental and financial performance.

3.6 Proposed EMA Framework to Enhance Waste Management Sustainability

Stage 1, in Figure 1, the primary step would be the collection of data. This can be in form of monetary and non-monetary environmental data. This helps to ensure that waste levies are accurately charged on to residents because all the required waste-related information will be readily available ([Qian et al., 2018](#)). [Ball and Craig \(2010\)](#) argues that without accurate waste-related data municipalities are set to face acute financial challenges in the long term originating from inaccurate waste levies and other waste management costs recouped from residents. Therefore, monetary and non-monetary data help improve financial sustainability organizations like municipalities. Literature shows that the collection of the data is, in most cases, hindered by a communication gap between the accounting department and other environmental management departments ([Tsui, 2014](#)). The proposed EMA framework narrows the gap by linking the collection of waste-related data from the environmental management and accounting departments.

In Stage 2, once all the relevant data has been collected, as reflected on Figure 1, it is important that the traditional management accounting system is merged with EMA system. This is to ensure that the collected waste-related environmental data can be processed to produce specific environmental information such as environmental costs associated with SWM that cannot be generated from the traditional management accounting system. At this stage, externalities aligned to a cost centre responsible for environmental costs creation can be captured into the EMA system ([IFAC, 2005](#)). Also, the integration of traditional management accounting system and EMA systems enable municipalities to establish the size of their waste management impacts such as pollution, emissions and cost of solid wastes chemicals in monetary and physical terms.

The quantification of EMA impacts in Stage 3 is vital in reducing social, environmental and financial impacts as environmental impacts are the crucial components to be incorporated and shown in an organization's accounting system as shown in Figure 1. [Gray \(2010\)](#) argues that by addressing environmental and financial impacts, social impacts would also have been resolved. Hence, the model framework focuses on environmental and financial impacts of SWM.

After being able to quantify environmental impacts in monetary and non-monetary terms, municipalities will be expected to provide a detailed report generated from EMA systems to both interested internal and external stakeholders. This is done in Stage 4. This report details waste-related environmental issues such as volumes of wastes collected at a certain period or monetary value of chemicals used to treat wastes during a certain time frame. This provides stakeholders an opportunity to hold municipalities to account for their actions on environmental impacts stemming from poor MSWM ([Qian et al., 2018](#)). Also, this assists to exert pres-

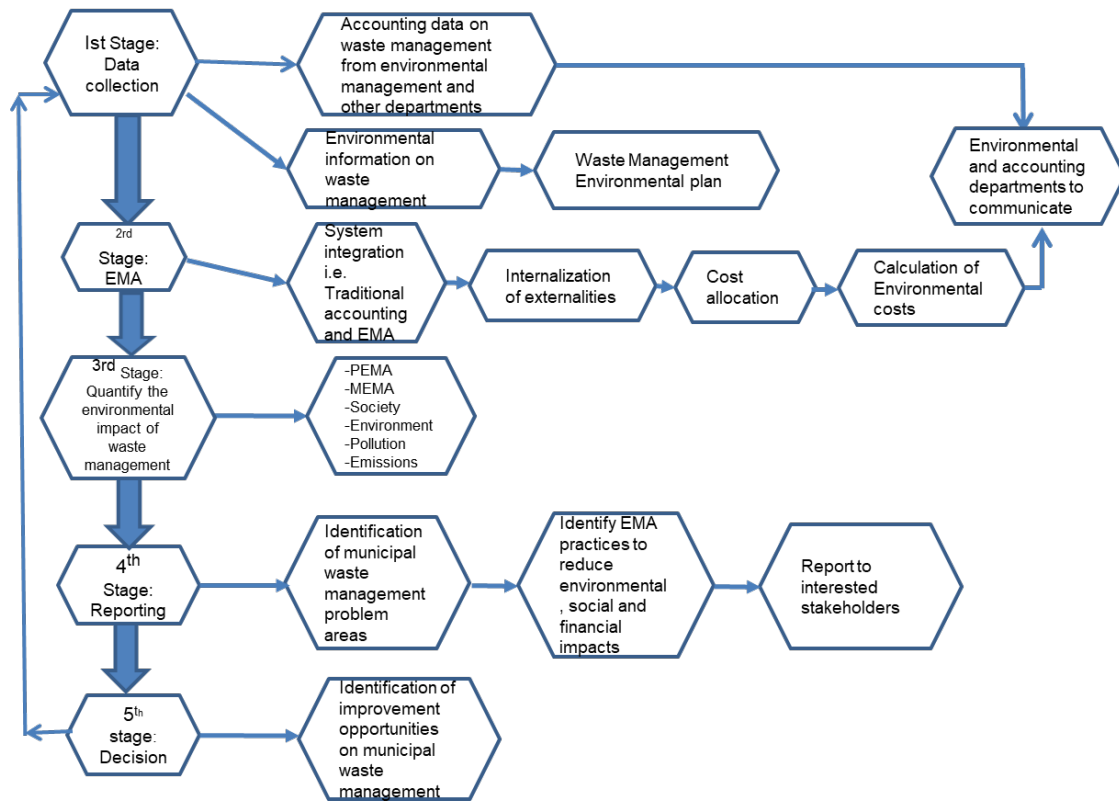


Figure 1. Proposed EMA Framework

sure on municipalities to extensively adopt measures such as EMA tools as an answer to calls to reduce waste-related environmental impacts.

Stage 5, as shown in Figure 1, with all accurate and adequate environmental waste-related data at the disposal of stakeholders, a decision need to be taken on the course of action required should there be material negative environmental impacts emanating from SWM. This is an all-stakeholders' involvement. The idea is to explore any improvement opportunities on SWM from various stakeholders. It is at this time that it can be identified on what is hindering the municipalities from attaining proper MSWM. In this regard, action can then be taken to root out the major obstacles standing in the way of achieving better MSWM. In this way, enhanced SWM would be closer to achievement. To remain effective on MSWM, municipalities need to constantly maintain and repeat this cycle of activities.

4. CONCLUSIONS

EMA practices currently used by 10 municipalities across South Africa to improve municipal solid waste management were identified. These practices were identified based on 32 in-depth interviews with municipalities' accountants/CFOs, environmental managers and municipal managers. As such, the findings have to be analyzed with caution as applicability cannot be guaranteed in other municipalities. The

study's empirical results reveal that environmental management system is the mostly applied EMA practice by the 10 municipalities in South Africa to improve municipal solid waste management. Furthermore, the other EMA practice used by these municipalities to improve solid waste management in ascending order are waste management system, environmental reporting, environmental training and, finally, environmental research and development. By identifying these EMA practices used by municipalities in South Africa the study has also contributed to present literature. Qian et al. (2018) clearly state that EMA practices used by municipalities are unknown and this has never been undertaken in the current literature. The goal of this research study is for municipalities to improve current EMA practices applied to enhance MSWM through adoption and implementation of EMA systems.

This study is without limitations. The sample size was small hence future studies can enlarge sample size and number of respondents. Also, future studies can focus on how the various stages of the proposed EMA framework can be implemented within municipalities.

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