

## Integrated Waste Management Decisions in South Africa: The Role of the Management Accounting Function

Michael Bamidele Fakoya

*School of Accountancy, University of Limpopo, Sovenga 0727, South Africa*  
*Telephone: +27152683312, Fax: +27152683526*  
*E-mail: Michael.fakoya@ul.ac.za*

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**ABSTRACT** This paper reviews the role of the management accounting function in integrated waste management in an emerging economy like South Africa. South Africa experienced increased economic growth since 1994 which resulted in increased waste generation. Accordingly, the government has since developed a waste management policy aimed at reducing waste generation through the Polokwane Declaration on waste management in 2001. This paper reviewed relevant literature to support arguments for the role of the management accounting function in an integrated waste system. The paper found that a starting point for waste management is the gathering of relevant physical and monetary waste information within the various industries, so as to enable management to make well-informed process waste-reduction decisions. The paper concludes that, while it is important to have a waste management policy in place at a national level, individual organisation's development of own waste-reduction strategies is crucial to achieving improved national waste management.

### INTRODUCTION

Waste, including wastefulness and pollution, is a universal problem. Wastefulness occurs when industries, governments and households use more of resources such as raw materials and energy than they actually need in production; and pollution occurs when these wasted resources are discarded into the biosphere (Gray and Bebbington 2001). Waste is generated throughout the whole production and distribution process and in the consumption of the product itself. The waste generated in the production process is regarded as non-product output (Dues et al. 2013). Moreover, an essential objective from an environmental point of view is to minimise the use of resources throughout the production process (Gray and Bebbington 2001; Schilephake et al. 2009). This view is in line with the Polokwane Declaration of 2001 on waste management to adopt a goal of 50% reduction in waste disposal by 2012 and a zero waste disposal by 2022 (DEAT 2010). However, there is no record to suggest that this goal had been achieved. Moreover, organisations need to focus, where possible, on the prevention of waste generation rather than its treatment and disposal.

Organisations are confronted with increasing pressures to eliminate hazardous waste coming from their production systems through na-

tional and provincial laws; insurance organisation; and from the communities where the production takes place, as well as employee health and safety concerns (Gray and Bebbington 2001; Sarkis et al. 2010; Babiak and Trendafilova 2011). Hence, the National Environmental Management: Waste Act No. 59 2008 (henceforth referred to as the Waste Act) provides for the minimisation of pollution and the use of natural resources through vigorous control; cleaner technologies; cleaner production and consumption practices; and waste minimisation, which are key in ensuring that the environment is protected from the impact of waste (NEMWA 2009).

### Objectives of the Study

This paper postulates that waste management in South Africa has focused more on the exit level or end-of-pipe treatment of waste and meeting regulatory requirements, both of which failed to fully address the negative environmental impact caused by waste generation. Consequently, decision-makers require relevant and adequate waste information for effective waste-reduction decisions. Hence, this paper seeks to determine, from a review of relevant literatures, the role of the management accounting function in waste-reduction initiatives. The study is underlined by the prospect that the management accounting function will contribute to foster the

national waste minimisation strategy by providing both physical and monetary waste information relevant for decision-making.

The next sections of this paper discuss the concept of waste, the causes of waste generation, and the current focus of waste management in South Africa. The global waste challenge is also discussed in the subsequent section. Other sections review the role of the management accounting function as well as Material Flow Cost Accounting (MFCA) an Environmental Management Accounting (EMA) tool for waste reduction. The paper concludes in the last section.

## **OBSERVATIONS AND DISCUSSION**

### **The Concept of Waste and the Causes of Waste Generation**

The South African Department of Environment and Tourism describes waste as a predictable consequence of development, which should be managed in order to conserve natural resources so as to protect people and environment (DEAT 2010). Waste is driven by three primary factors, namely, the increase in the production of goods, the ever expanding population, and a constantly growing economy (Dasgupta 2010). Consequently, Lilja (2009) emphasises that waste prevention should be an inseparable part of growth and development, and needs to be managed to conserve the use of natural resource. Hence, waste is a factor of economic development.

The Waste Act defines waste as any substance, whether it can be reduced, re-used, recycled and recovered, that is surplus, unwanted, rejected, discarded, abandoned or disposed of, but which the generator has no further use of for the purposes of production, and hence needs to be treated or disposed of (NEMWA 2009). Such waste includes waste generated by the mining, medical or other sectors. A by-product is not considered to be waste; and any portion of waste, once re-used, recycled and recovered, ceases to be waste (NEMWA 2009). In addition, Jasch (2003) states that waste are the result of inefficiency in the use of purchased materials that has not been transformed into a marketable product. Hence, the United Nations' Department for Sustainable Development has developed an Environmental Management Account-

ing (EMA) workbook with the underlying assumption that all purchased materials should, by physical necessity, leave the organisation as either product or as waste and emission (UNSD 2001).

Gale (2006) and Jasch (2003) argue that waste is a major source of overhead costs to an organisation and occurs as a result of inefficiencies in the production process. Furthermore, Jasch (2003) states that waste are major source of environmental pollution by organisations. Most industrial waste includes solid, liquid and effluent or gaseous discharges. Other waste created in the production process includes energy; labour costs and hours; machine usage expended on the non-product output; as well as waste treatment and disposal costs (Jasch 2009). A reduction in industrial process waste through proper identification, recording, analysis, reporting and monitoring of the physical quantity and costs by industries will help to minimise overall national environmental pollution.

Increased economic growth has been the main cause of the increase in waste generation in organisations through increased production to satisfy the ever expanding consumption need of consumers (King et al. 2006). In striving to make profit for its shareholders, organisations have failed to take environmental protection into consideration (Sheu and Lo 2005; Barnea and Rubin 2010). But conventional business practices view environmental issues as a one-sided argument promoted by ecologists and environmentalists. As such, Sheu and Lo (2005) argue that it is very difficult for even the managers to deny that resources are being exhausted due to inefficient and ignorant use. However, the triple bottom line reporting suggests the inclusion of an organisation's environmental impact in their annual financial statements.

### **The Current Focus of Waste Management and the Global Waste Challenge**

In the past, researchers and organisations have focussed on end-of-pipe waste control and treatment (Gray et al. 1993; Gale 2006; James 2006; Jasch et al. 2012). In South Africa, a waste management strategy that incorporates waste minimisation was not regarded as a national priority until 1997, but rather the focus was by then on waste disposal, which is a reactive measure because it only addresses waste management

needs as they occurred (Swart 2004). Consequently, this initial focus changed as new action plans and policies that address issues of source reduction, waste recovery and recycling were enacted through the Waste Act. Society at large will benefit from a safe environment when organisations and governments alike realise, understand and agree to implement a waste strategy that focuses on reducing negative environmental consequences of their actions.

Van Berkel (2005) contends that, with recent advancements in economic and social spheres, both developed and developing countries face the challenge of increased waste problems. These challenges are closely linked with the increasing environmental burden on society resulting in climate change impacts necessitated by waste and emissions (van Berkel 2005). This means that industries and governments are expected to utilise the earth's limited resources efficiently to reduce environment impact through environmentally sound waste management systems. Furthermore, the Waste Act provides that productive activities undertaken by any person or organisation should make use of fewer resources (NEMWA 2009). The Waste Act provides that organisations should ensure the reuse, recycling or recovery of waste to the extent that its disposal is less harmful to the environment.

It is beneficial if organisations concentrate on process waste-reduction to ensure that waste recycling; waste disposal, wastewater treatment and systems costs, as well as environmental levies, fines and legal fees, are drastically reduced (Gray and Bebbington 2001). Process waste-reduction can be achieved through proper identification, documentation and analysis of both the physical and monetary waste information, which will assist in better decision-making to minimise overall environmental costs. The environment and society at large will benefit more if individual organisations provide records of all their waste-generating activities throughout the production process to enable well-informed waste-reduction decisions and improved waste management strategy.

In contrast, efforts to reduce process waste by organisations are thwarted by insufficient transparency of material flows (Jasch 2003). Insufficient transparency is the inability of the accounting system within an organisation to provide the necessary data on waste-flow quan-

tity and cost during production. A transparent view of the production process will ensure that well-informed decisions are taken to promote financial performance in terms of cost savings, increased profitability, environmental performance and reduction in the volume of waste disposed to waste sites.

### **The Role of the Management Accounting Function**

Management accounting is concerned with the provision of information to managers so as to help them make better decisions and improve resource efficiency and effectiveness of existing operations (Drury 2008). As such, it is the responsibility of the management accounting function to provide adequate and reliable waste information to improve resource efficiency in an organisation. Peat (2007) argues that accountants are more comfortable dealing with readily quantifiable information and have handled environmental issues with reluctance. It has become necessary for organisations to account for all its environmentally-related costs and benefits. Such environmentally-related information will include volume of resource extraction and consumption in production, and those relating to waste and emissions due to unsustainable production practices.

In recent years, considerable progress has been made with regards to corporate social responsibility (CSR), sustainability reporting and Global Reporting Initiative (GRI) and the Carbon Disclosure Project. But most of the environmental information provided in these annual reports has been inadequate, unclear, unverifiable, incomprehensive and inconsistent among organisations. Organisations therefore need to develop and apply an Environmental Management Accounting (EMA) tool that can track, capture, record, and monitor and report the use of resources in production. Some of the environmentally-related information to be captured by this EMA tool relates to capital maintenance and waste costs. These are issues that need to be addressed by the management accounting system. The management accounting function within organisations needs to provide adequate environmental information on every aspect of the organisation to its decision-makers for improved waste-reduction decisions. Such environmental information should address the information

needs of both external and internal stakeholders by providing for their diverse informational requirement. The environmental information provided by the management accounting function needs to address issues on how efficiently the resources of the organisation have been used (ICAEW 2004) and the impact the organisation's activities have on its external environment. The inclusion of all environmentally-related information will assist organisations to improve their impact on the environment and have a corresponding positive impact on national waste strategy.

The EMA tool needs to integrate with other Environmental Management Systems (EMSs) within the organisation to reduce the impact of waste and environmental pollution generated in the production system (Yakhou and Doweiler 2004). While conventional accounting systems incorporate issues of environmental pollution in overhead accounts, most of these environmental costs are hidden in overhead accounts (Jasch 2003; Yakhou and Doweiler 2004) and are not separated in the financial statements. This conventional accounting approach makes it difficult for both the internal and external stakeholders to access organisations' environmental activities and impacts effectively. A more detailed system of accounting is required to provide information on specific waste and emissions source in the production process. Activities within the organisation that result in emissions and waste need to be made transparent by identifying and determining the quantity generated in order to introduce corrective action to avoid, reduce or possibly eliminate its occurrence.

Moreover, the management accounting function should be able to provide information on activities such as capital investment appraisal; business strategy development; process design supported by existing management information systems which could be enhanced through the provision of adequate and accurate waste information. Other management accounting functions that can improve an organisation's waste-reduction strategy may include linking waste minimisation targets to budget process; using both physical and monetary systems to collect waste data; and developing a reporting system which incorporates waste minimisation objectives and performance measurement such as EMA.

### **Environmental Management Accounting (EMA)**

EMA is a system that generates and analyses financial and non-financial information to optimise corporate environmental and economic performance to achieve sustainable business (Bennett et al. 2002). This means that EMA includes both physical and monetary information to generate environmental issues that are internal to an organisation (Burritt et al. 2002). In addition, Gale (2006) stresses that understanding the material purchases value of waste and emissions, and its related processing costs, is the essential contribution of an EMA system. According to Gale (2006), while obtaining information on waste and emissions treatment is generally accurate, obtaining information on the material purchases value of waste and emissions and its related processing costs are difficult. Information on prevention and environmental management costs is even more difficult to determine because it overlaps with, or is confused with the cost of waste and emission treatment (Gale 2006). Therefore, obtaining accurate information about waste quantities and values may be the first step to reduce the overall environmental costs of an organisation and achieve the national integrated waste objective.

EMA provides information to management of organisations by focusing mainly on operational issues such as environmental costs and revenues. Environmental issues such as whether to introduce green products or change production technology for a more efficient process is of strategic importance to an organisation when such information are provided through an EMA tool (Figge et al. 2003). According to Loew (2003), in order to identify a suitable environmental cost accounting approach by an organisation, it is necessary to identify an approach that has a similar concept and purpose to meet the specific need of the organisation. The application of a more specific need-related tool, such as Material Flow Cost Accounting (MFCA) to waste and emission reduction, has been recommended (Jasch 2003; Kokubu et al. 2009).

Consequently, Jasch (2003) argues that the conventional environmental cost assessment approach has failed to consider material flows, but mainly considers waste treatment and disposal costs and investments in end-of-pipe technologies. Furthermore, Jasch contends that while the conventional environmental cost assess-

ment approach has been used to assess cleaner production projects; environmental performance disclosures in such environmental reports, including material flow balances such as input-output analysis, are usually done without systematically integrating material flows information and waste treatment and disposal cost information. Essentially, an appropriate assessment method that integrates beginning-of-pipe with end-of-pipe costs that quantifies environmental information is desirable for effective waste and emission reduction strategies.

Moreover, the management accounting function can adopt EMA as an additional flashlight to illuminate aspects of corporate environmental performance to influence overall organisation's performance. This additional flashlight is relevant for improved stakeholders' decision-making on environmental issues (Bennett et al. 2003). There will be improved environmental decisions when an organisation's environmental impact is revealed through the lens of specific EMA tool. Management need to consider the adoption of an EMA tool like Material Flow Cost Accounting (MFCA) because of its ability to provide illumination on specific waste and emissions generating process to enable corrective actions for improved environmental performance.

### **Material Flow Cost Accounting (MFCA)**

Material Flow Cost Accounting (MFCA) is an Environmental Management Accounting (EMA) tool developed in Germany by Bernd Wagner and colleagues at the Institute für Management und Umwelt (IMU) and widely adopted in Japan since 2000 (Kokubu et al. 2009). MFCA focuses on tracing and capturing waste, emissions and non-product outputs to boost organisations' economic and environmental performance. Kokubu et al. (2009) explain that MFCA is a management accounting information system that traces input material flows through the production process and measures output either as finished products or waste. The measurement and management of environmental and economic performance of an organisation is an important social issue because of the impact on climate change, hence, businesses are under pressure to satisfy their customers demand while reducing environmental impact at the same time.

The MFCA system measures material and energy flows through the production process

both in physical and monetary units (METI 2007). MFCA identifies quantity and costs of waste and emissions in the production process and focuses on these specific environmental aspects to achieve improved environmental performance and cost reduction (METI 2007). In material flow management, physical quantity is integrated with corresponding cost information and evaluated for corrective action (Nakajima 2003). MFCA offers a new set of information that is different to that of conventional cost accounting system, which helps improve managers' waste-reduction decisions for increased profitability and improved environmental impact to ensure compliance and compatibility with the objectives of sustainability (Nakajima 2003).

MFCA considers all of the environmental costs in the production process from input to output (Wagner 2003). These costs include costs of environmental protection, expenditures for environmental technology, cost of waste disposal, waste handling costs and the purchase price of material disposed of. Waste treatment costs, cost of energy included in waste, cost of auxiliary materials, cost of labour included in waste and systems cost are included in the environmental cost when MFCA is applied (Wagner 2003). MFCA is concerned with input-output costing, waste costing, material-only costing and pollution prevention costing and measures their environmental impacts in physical terms such as in kilogram or kilowatt-hour and in monetary terms in order to meet the information need of the organisation's decision-makers (Wagner 2003). The availability of adequate information on waste and emissions generated in both physical and monetary values is necessary for improved and effective waste-reduction strategy.

The gathering of input-output balances on physical quantities of wasted materials and the establishment of the costs of waste are made complex if an appropriate waste-collection tool is not used (Wagner 2003). The use of inappropriate waste gathering tool might have led managers to inaccurately estimate waste quantity and invariably make it the more difficult to make sound waste-reduction decisions (Wagner 2003). The lack of waste-information database is the result of inaccurate waste information, which means that opportunities for waste-reduction are lost. Therefore, the application of MFCA will increase the effectiveness of resource usage,

increase economic benefit to the organisation and improve an organisation's social and environmental performance.

While government policy is intended to instil a national culture of improved environmental performance through effective and efficient waste management approach, organisations on the other hand are the major culprit in pollution and waste generation. Organisations are then expected to utilise natural resources efficiently to reduce organisations' negative impact on the environment by promoting environmentally sound and sustainable waste management systems. The review found that while organisations strive to increase shareholders' return, they have neglected environmental issues. Waste-reduction by organisations is considered a factor for economic development and safe environment. The review revealed that a reduction in industrial process waste, through proper identification and analysis of the physical quantity and costs by organisations, will help to minimise overall national environmental pollution.

Review indicates that the society at large will benefit from a safe environment when organisations and government agree to implement a waste strategy that reduces negative environmental consequences. Hence, a transparent production process through the adoption of MFCA to capture waste accurately by organisations will ensure that well-informed waste-reduction decisions are taken. It is hoped that the adoption will promote financial performance in terms of cost savings and increased profitability and improved environmental performance in terms of reduced waste disposed to waste sites.

The review stressed the necessity for organisations to develop and apply specific environmental tool to track, record and monitor the use of resources in production process in order to reduce the final quantity of waste that ends up in waste sites. In addition, the review indicates that the inclusion of all waste-related information will assist organisations to improve on their impact on the environment and correspondingly translate to reduction in national waste. Hence, the application of a more specific need-related tool such as Material Flow Cost Accounting (MFCA) to waste and emission reduction by organisations will help drive sustainability practices for improved environmental impact.

## CONCLUSION

The paper reviewed relevant literature to determine whether the management accounting function has any role in integrated waste management decisions in South Africa. The ability of an EMA tool like MFCA to provide illumination on specific processes that cause waste generation, has made its adoption an essential management accounting tool to improve waste-reduction decisions and environmental performance. The lack of a waste database within organisations renders waste costs and quantities inaccurate, and opportunities for cost-reduction are lost. The inability of organisations to reduce overall cost is the reason for the lack of commitment and innovation to change from the conventional business practice. The review suggests that processes responsible for the creation of waste and emissions should be clearly identified in order to implement concrete waste-reduction strategy for improved productivity, lower costs, increased profitability and improved environmental performance through individual organisation's waste-reduction initiatives. Hence, the application of MFCA is a means to increase effective and efficient resource use, increased economic benefit to an organisation and an improved social and environmental performance to the nation at large.

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