



# THE EFFECTS OF SOLID WASTE MANAGEMENT STRATEGIES ADOPTED BY MANUFACTURING COMPANIES IN BENI, DEMOCRATIC REPUBLIC OF CONGO ON ORGANIZATIONAL SUSTAINABILITY

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## **Abstract**

*Increasing number of industries result in the generation of all kinds of waste which can cause changes in the environment and harm to animals, plants, and ecosystems discharging into all kinds of pollution. However, only a careful management will limit the damage done to the environment, to society and converse scarce resources. Until recently, waste management was not considered as an important issue in many industries and municipalities at large. Solid waste management is an important aspect of sustainable development in an industry. Companies seeking to increase their level of sustainability should well understand and consider the importance of designing effective strategies for waste management to extend their economic, social and environmental responsibilities. Study findings revealed that the employees of manufacturing companies in Beni City 49.02% generally agreed that public involvement in solid waste management is very influential in enhancing organizational sustainability. Further findings showed that most of the employees 66.957% generally agreed that economic efficiency and environment is very influential in enhancing organizational sustainability of manufacturing companies. Also, the majority of the employees 73.27% generally agreed that resource efficiency is very influential in the management of solid waste thus enhancing organizational sustainability.*

*Keywords: Solid waste, Management, Effects, Organizational Sustainability, Beni*

## INTRODUCTION

Information on health risks as a result of deficient solid waste management are important issues which have to be continually communicated to all sectors of the society (Mallak, S. K., Elfighi, F. M., Rajagopal, P., Vaezzadeh, V., & Fallah, M., 2016). Solid waste management is concerned with the generation, on-site storage, collection, transfer, transportation, processing and recovery, and ultimate disposal of solid wastes. Waste management strategies need to be developed in order to deal with the increasing trend of industrial waste generation sustainable. Organizational sustainability has many definitions. Wales (2013) defined sustainability as being to keep the business going while another frequently used term in this context refers to the future proofing of organizations. It refers to achieving success today without compromising the needs of the future (Wales, 2013). The Charter of Sustainability Committee created by the Board of Directors at Ford focuses on sustainable growth, which it defines as the ability to meet the needs of present customers while taking into account the needs of future generations (Ford., 2014).

According to the Chartered Institute of Personnel and Development (CIPD, 2012), the essence of sustainability in an organizational context is the principle of enhancing the societal, environmental and economic systems within which a business operates. This introduces the concept of a three-way focus for organizations striving for sustainability. This is reflected also by Wales (2013), who state that sustainability implies a simultaneous focus on economic, social, and environmental performance. The CIPD (2012) also emphasizes the importance of organizational culture in seeking to understand organizational sustainability, referring to the creation of meaningful values that shape strategic decision-making and building a culture that reinforces desirable behaviour.

Blaga (2013) identifies the birth of the concept of Corporate Social Responsibility (CSR) as resulting from Milton Friedman's tellingly titled article "The social responsibility of business is to increase its profits". The Author defines CSR as an approach to enhancing corporate governance, which he notably claims, leads towards sustainability. CSR is a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis and organizations are increasingly aware that responsible behavior leads to sustainable business success. In seeking to explain the development of the notion of CSR, Blaga (2013) highlights an increased focus on the need for organizations to demonstrate socially desirable behavior, perhaps in response to an increased awareness amongst societies and communities of the potential for organizations to have a detrimental impact on the environment and their way of life.

Blaga (2013), thus, concludes that CSR can be seen as a business strategy for achieving sustainable growth, in other words organizations can do well by doing good for communities. Organizations can and do seek to market their CSR strategies. This may include both the strategy of reputation protection and improvement; and also the strategy of building a virtuous corporate brand. Wales (2013) argues that shareholders may in fact be a driver to a more sustainable approach to business, highlighting the shifting nature of the business/society relationship. Though perhaps reduced during the recession, there are still pressures from some shareholder groups for more sustainable and ethical investment opportunities. The relevant stakeholders are increasingly diverse; for example, pressures from communities in relation to the environmental impact of business manufacturing arrangements such as increase of industrial manufacturing waste, plastic and hazardous waste opposing environmentally friendly products.

### **Solid waste management strategy and Organizational sustainability**

Waste management offers many opportunities for organizational sustainability. When developed and implemented soundly, strategically and in cooperation with other stakeholders, waste management policy and strategies deliver many benefits to a wide range of interests (UNEP, 2013). A well designed and carefully implemented waste management strategy contributes to all three pillars of sustainable development; environmental, economic and social. It contributes by improving economic efficiency, especially in resource extraction and use such as through waste prevention, reuse, recovery or recycling; by reducing the budget needed for solid waste collection services; by reducing or eliminating adverse impacts on health and the local and general environment; by delivering more attractive and pleasant human settlements and social amenity; and by creating sources of employment and potentially a route out of poverty for some of the poorest members of the community (UNEP, 2013). Waste management delivers benefits to subsequent generations, by proving them with a more robust economy, a fairer and more inclusive society and a cleaner environment, thereby facilitating intergenerational equity.

In the absence of strategies to produce a different result, the rate of waste generation typically increases with economic growth, advances in technology and the appearance of new products incorporating technological advances. Changes in the range of products on the market may lead to increased waste through the use of more disposable products or greater amounts of packaging. The hazardous nature of the waste may increase as product composition changes. A new product may stimulate increased demand simply by its novelty or added features. As waste is generated, the resources that made up the product and its packaging,

drawn from a resource base that is inevitably limited; unless reused, recovered, or recycled; are lost. The challenge for waste management is to interrupt and reverse the growth in waste by tackling the waste issue from the beginning of the life cycle, from product design, straight through the production, use and entry into the waste management system (Zaman, 2017). Only then can resource consumption begin the move to a sustainable path.

The analysis of solid waste management strategies in enhancing organizational sustainability has led to a number of concepts resulting to sustainable solid waste management strategies within the manufacturing companies. Sustainable production and consumption: it captures the idea that the production and consumption cycle should be reworked to put it on a sustainable basis (Choi, 2016). The challenge is to go beyond waste itself, and to consider instead the source of waste, such as the demand for goods and services and the productive activity that is undertaken to meet that demand. Economic growth and increased consumption are typically accompanied by increased rates of waste generation. Ruedig (2013) affirms that environmental sound management of solid waste is one of the environmental issues of major concern in maintaining the quality of Earth's environment especially when it comes to sustainable development in all countries. Industries being the great contributors of the increasing solid waste are responsible for solid waste management through the development of effective-sound waste management strategies.

The life-cycle approaches: this examines a product and its passage through distinct stages of a life-cycle from the very beginning; from the extraction of raw materials, manufacture, packaging, transport, distribution, sale, use and end-of-life, when it enters into the waste management system and the later phases of the waste hierarchy (Choi, 2016). Life-cycle assessment includes an inventory of raw materials input, process chemicals, energy and water as well as an inventory of emissions and waste generation, and their respective environmental impacts, during each life-cycle stage (Hosoda, 2014). Every stage of the life-cycle offers opportunities for interventions to prevent or reduce waste amounts and/or their level of hazard.

Resource efficiency: this consist of rethinking the life-cycle of a product from the perspective of the resources that go into each stage, since losing resources as waste is inefficient (UNEP, 2013). Eco-efficiency: it indicates a focus on delivering the same or increasing levels of goods and services at a reduced material and energy intensity, with a reduced impact on the environment (Choi, 2016). Cleaner production: this is defined by the United Nations Environment Programme as the continuous application of an integrated environmental strategy to processes, products and services to increase efficiency and reduce risks to humans and environment (UNEP, 2013). It aims at resource efficiency but also explicitly addresses and strives to reduce the use of hazardous substances in products and their

production processes, and generation of emissions and wastes. Programs in green chemistry support effort to reduce risks through materials substitution and use of safer chemicals.

Eco-design: this is an approach which includes the above considerations of resource efficiency and reduction of risks, in addition to focusing on design features which incorporate (Choi, 2016): extension of the product use period, design for disassembly, repair or upgrading (thus phasing out components that prevent reuse or recycling) and constructing a product from materials that can serve as inputs to another process. Cradle-to-cradle: this concept focuses, first and foremost, on defining the intention behind the design of a product in terms of its positive impact, such as its social, economic and environmental benefits (UNEP, 2013).

The cradle-to-cradle concept proposes a complete move away from the linearity of the cradle-to-grave model of the life-cycle approach. This approach moves towards a circular concept based on a model taken from the natural world, the example of residual materials from the metabolism of one organism constitute food for another organism, without the loss of quality that would eventually render them useless. Rather than ultimately ending up as waste, the materials in a product at the end of its use period begin a new life in a new cycle, at the same (or even higher) level of quality, time and again. As waste equates to food, cradle-to-cradle thereby eliminates the very concept of waste. In order to apply this approach to products and service: materials must have a known, well defined chemical composition; materials must be either biological nutrients (i.e. safe to return into a natural biological cycle) or technological nutrients; and the products must be designed for easy disassembly. Such a cycle calls for new forms of interaction along the supply chain of products, where respect, trust, and partnership play a prominent role.

Eco-innovation: this concept refers to any form of innovation resulting in or aimed at significant and demonstrable progress towards the goal of sustainable development, through reducing impacts on the environment, enhancing resilience to environmental pressures or achieving a more efficient and responsible use of natural resources. Waste is first of all an economic concept and implicit in the word, is the fact that resources are not being used efficiently. There is an economic loss every time resources, assuming they have some other potential use, are utilized in a way that results in being discarded as waste.

## LITERATURE REVIEW

A key development in waste management strategies is the focus on preventing the production of waste through waste minimization and the reuse of waste materials through recycling. This links directly to procurement issues, where careful selection of materials, suppliers, process redesign for disassembly and reverse logistics can all reduce the amount of

wastes produced or facilitate recycling and reuse (Wong, J. W. C., Surampalli, R. Y., Zhang, T. C., Tyagi, R. D., & Selvam, A., 2016). These waste management strategies are crucial to reducing organization's impact upon the environment. They are also fundamental requirements in achieving efficient cost savings and a better financial return for businesses.

Previous studies had also found that solid waste management strategies have effect on organizational sustainability. For instance, a study by Zaman (2017), found that involving communities in waste management programs often promotes publicity with tips on waste management hence eventually minimizing waste. Similarly, a study by Mpinda et al. (2016), indicates that two main underpinning group of drivers of waste management include public awareness and responsibility issues. Public involvement is critical in ensuring that there is waste management sustainability. Its starts from people knowing which waste elements exit in a company and which methods are to be used to effectively manage, reduce and properly dispose of the waste.

Another study by Kubanza and Simatele (2016),found that one of the challenges facing proper waste management in Nigeria is lack of proper pubic involvement. This is also observed by the fact the public has a negative attitude towards waste management; hence the government should carry out campaigns to enlighten the public on waste and waste management. Therefore, Kubanza and Simatele (2016) noted that enhanced awareness of decision makers may lead to changing socio-economic and industrial development policies and associated government programs in favor of improving solid waste management systems. For instance, more financial aid and tax incentives may be introduced to encourage the development of recycling industry and business, or laborer protection programs may be provided to improve wages and working conditions of laborer, including solid waste management workers.

In addition to this study's findings, Yousuf and Reza (2013),found that waste reduction as a waste management strategy can result in profit maximization and efficiency. That is by waste reduction has become a concern for businesses. As a result, thousands of manufacturers are creating waste reduction policies and strategies. However, only a few businesses understand the cost that waste can have on their bottom-line. Waste reduction is a tool that can be used to create a better business environment in industries thus enhancing organizational sustainability.

### **Organizational Sustainability**

The term sustainability should be viewed as humanity's target goal of human-ecosystem equilibrium, while sustainable development refers to the holistic approach and temporal

processes that lead us to the end point of sustainability (Wales, 2013). For an organization, sustainability means that it has the elements necessary to carry on and constantly enhance its activities in pursuit of a defined mission. Organizational sustainability represents an ongoing process rather than a state of perfection (Coblentz, 2002). It is like plant: it will grow and prosper if watered and cared for, but wither quickly if it is not. Furthermore, organizations are like a body: if one part is ill, the rest will not function like it should. If too many parts fail at once or in quick succession, the body dies. So keeping an organization sustainable requires a constant effort and unity of purpose focused on one overarching mission. Every staff member and manager must see both the forest and the trees or the organization becomes entangled in the underbrush (Lozano, R., Carpenter, A., & Huisingh, D., 2015). Sustainable organization needs to be strong institutionally, financially and morally. It needs all three in equal measure. Not even exceptional strength in one can overcome weaknesses in the others.

### **Institutional Sustainability**

A sustainable organization has a mission. A mission statement provides a succinct definition of why the organization exists and what it hopes to achieve (Coblentz, 2002). Based on that mission, a sustainable organization has a process in place to develop strategic plans that define how the organization will carry out its mission over a set period of time, such as three, four or five years. Strategic plans usually define a set of goals and objectives that concretize the results that the organization expects to achieve by the end of the planning period. Even better, many strategic plans generally define annual sets of goals and objectives that lead logically to the achievement of those of the strategic plan (Ruedig, 2013). The plans also generally define the activities they will carry out to reach them from year to year, the resources (human, financial) they will need to do so and how the organization plans to acquire those resources. Again, a strategic planning process enables an organization to see around corners in general terms. It provides a pathway, alterable whenever it appears necessary, a fluid instrument for pro-activity.

An annual planning process is another characteristic of a sustainable organization. Annual plans are based on the strategic plan and are precise definitions of the annual goals and objectives (what the goals/objectives are in terms of what your desired end result is, how you know you are making progress toward it and how you know when you have reached it) and the activities you plan to carry out to reach them. An annual plan also defines the resources needed to carry out the activities in specific terms and how these resources will be obtained (Coblentz, 2002). Consequently, a sustainable organization produces both an annual plan and annual budget. Sustainability depends more on process than plan. Sustainable organizations are



proactive, but simultaneously flexible. The world changes constantly and the organizational context along with it (Lemus-Aguilar, I., & Hidalgo, A., 2016). Opportunities come and go, as do threats. Sustainable organizations are alert enough to react to new realities and modify their plans so that they can be proactive again within a new context. At the same time, no organization is perfect and all-seeing (Hariz, S., & Bahmed, L., 2013). A sustainable organization allows for, and is understanding of human error, and has the process it needs to make modifications to control damage, regroup and find its strategic direction again.

Once the planning processes are in place, an organization then organizes and directs, ensuring the most efficient use of resources to carry out the organizational mission. This management process involves taking activities, dividing them into tasks that someone needs to carry out, grouping tasks into jobs or positions, organizing the positions into organizational subdivisions, and developing a chain of command and/or work teams (Longoni, A., Golini, R., & Cagliano, R., 2014). Staff is hired, trained and set to work. Equipment is procured, supply systems are set up and managed, policies and procedures are developed and modified as needed, staff interaction mechanisms (e.g., meetings) are organised, staff training and development activities are set up. Over all of this, management is constantly monitoring and evaluating the work rhythm, staff production, equipment and supply use to ensure that it all constantly contributes to the meeting of the organization's goals and objectives, both for the year and for the strategic plan.

### **Financial Sustainability**

Of equal importance to institutional sustainability, financial sustainability is the fuel that drives the institutional motor. Without financial sustainability, it will be impossible to hire the staff or purchase the equipment or supplies needed for the organization to carry out its mission. Sustainable organizations need to be self-reliant but not necessarily self-sufficient (Coblentz, 2002). A sustainable organization needs to know what financial resources it is able to generate through its own income, what it has on hand at any given time, what it needs over the long, medium and short-term to carry out its activities, how it will gather the resources it needs from other sources of funding, and what those other sources could be (American Accounting Association, 2016). This is organizational self-reliance.

A self-reliant organization probably needs resources other than its own to carry out its mission, but does not compromise its mission and take on activities purely because a potential funder is looking for particular types of activities and will not fund anything else (Lemus-Aguilar, I., & Hidalgo, A., 2016). One essential principle of financial sustainability is that sustainable organizations do not depend entirely on outside resources (Coblentz, 2002). They first ensure



that they are maximizing their own income before they assess the degree to which they must seek outside funding. If an organization is membership organization, it has mechanisms in place to ensure that dues are as high as they can reasonably be and that these dues are regularly and fully collected. If an organization derives its income from the sale of publications or other items, it has a transparent process for pricing these items, marketing them, and collecting and using the proceeds from their sale.

### **Moral Sustainability**

This aspect of sustainability gets to the essence of what makes an organization work. Institutional sustainability can be compared to the body and brain of an organization. Financial sustainability is the blood that nourishes it. But moral sustainability is its very soul. Like the soul, it is intangible. Yet it is as important to an organization's sustainability as the soul is to our very existence as living beings. Coblenz (2002), simply states, an organization is morally (philosophically) sustainable when: the organization's leader has a clear vision of, and commitment to the mission, and communicates it effectively to all staff; staff rally around the leader and become committed to it as well; staff feel that their commitment to the mission is rewarded by career development opportunities, adequate compensation and a dynamic work environment that allows each to use his or her capabilities for a greater good; Morale is high as a result, the general feeling is that problems are challenges that staff will overcome with unity of purpose and strength of commitment; and the leadership, management and staff not only act ethically, but are also perceived as doing so.

The final point is critical. Organizations can go for a long time while staff at any level are engaging in ethically questionable practices without being detected or sanctioned. Over time, however, word will get out. Staff will become uncertain and moral may fall (Longoni, A., Golini, R., & Cagliano, R., 2014). Clients and partner organizations may rely less on the organization and reduce or cease their collaboration. The press and the public may eventually become aware of this situation and cause considerable damage to the organization's reputation beyond the organization's ability to control the damage. Thus a sustainable organization would have a clear code of ethics applied to all staff from the top down, a monitoring system that keeps everyone vigilant, a clear communication chain for reporting violations and a specific set of sanctions that are well known to everyone. Finally, leadership will have the will and determination to carry out sanctions as a deterrent to those who might otherwise behave similarly.

### **Effects of solid waste management strategies on organizational sustainability**

The management of waste is a key component in a business' ability of maintaining sustainability. Companies are encouraged to improve their environmental efficiencies each year by eliminating waste through resource recovery practices, which are sustainability-related activities (Ascher, 2000). One way to do this is by shifting away from waste management to resource recovery practices like recycling materials such as glass, food scraps, paper and cardboard, plastic bottles and metal. Waste is not something that should be discarded or disposed of with no regard for future use. It can be a valuable resource if addresses correctly, through policy and practice. With rational and consistent waste management practices there is an opportunity to reap a range of benefits. Those benefits include: economic, through improving economic efficiency through the means of resource use, treatment and disposal and creating markets for recycles can lead to efficient practices in the production and consumption of products and materials resulting in valuable materials being recovered for reuse and the potential for new jobs and new business opportunities; social, by reducing adverse impacts on health by proper waste management practices, the resulting consequences are more appealing settlements.

Better social advantages can lead to new sources of employment and potentially lifting communities out of poverty especially in some of the developing poorer countries and cities; environment; by reducing or eliminating adverse impacts on the environment though reducing, reusing and recycling, and minimizing resource extraction can provide improved air and water quality and help in the reduction of greenhouse gas emissions; and inter-generational equity; by following effective waste management practices can provide subsequent generations a more robust economy, a fairer and more inclusive society and a cleaner environment.

### **Effects of Public involvement on organizational sustainability**

Effective management of solid waste requires the cooperation of the general public. Lifting the priority of, and allocating more resource to, the solid waste management needs the support from decision makers (Wong et al., 2016). It is, therefore, important to ensure that public and decision makers' awareness activities are incorporated into the strategy. The aim of these activities is normally long term and it takes some momentum to build up before the effects are realized. But, once the interests of the public and decision makers in improving solid waste management are created, the sustainability of solid waste management projects and of the company will be significantly improved.

Successful industrial waste management is often attributed to many reasons arising from policy implementation; however, the main reason why most companies have succeeded in

industrial waste management is due to public waste awareness and support (Hoveidi, H., Pari, M. A., Pazoki, M., Koulaeian, T., Faculty, G., & Box, P. O., 2013). In addition, involving communities in waste management programs often promotes publicity with tips on waste management hence eventually minimizing waste (Zaman, 2017). Similarly Mpinda et al. (2016), indicates that two main underpinning group of drivers of waste management include public awareness and responsibility issues. Public involvement is critical in ensuring that there is waste management sustainability. Its starts from people knowing which waste elements exit in a company and which methods are to be used to effective manage, reduce and properly dispose of the waste. One of the challenges facing proper waste management in Nigeria is lack of proper public involvement. This is also observed by the fact the public has a negative attitude towards waste management, hence the government should carry out campaigns to enlighten the public on waste and waste management (Kubanza, N. S., & Simatele, D. , 2016).

Enhanced awareness of decision makers may lead to changing socio-economic and industrial development policies and associated government programmes in favour of improving solid waste management systems. For instance, more financial aid and tax incentives may be introduced to encourage the development of recycling industry and business, or labourer protection programmes may be provided to improve wages and working conditions of labourers, including solid waste management workers.

### **Effects of Economic efficiency and Environment on organizational sustainability**

Sustainability demands deeper thinking than the simple “reduce, reuse, recycle” framework. And unlike consumables, where the responsibility for rethinking falls on consumers, for durables, the primary rethinking job belongs to business executives and environmental regulators. A rethinking of the problem should start with an examination of the ecological impact and economics across the full product life cycle, from manufacture through use, reuse, recycling, and disposal (Blaga, 2013). The economic incentives for the various industry players must also be considered, including original equipment manufacturers, retailers, service providers, remanufacturers, recyclers, and waste management companies.

Every industry has a unique set of players; for each of them, the costs and benefits vary considerably, and are sometimes at odds. This insight provides a starting point for thinking strategically about reshaping the industry value chain in ways that increase profits while reducing environmental impact. Such rethinking can be employed by business executives to seek out new profit pools or, alternatively, by regulators to alter the profit pools and enhance overall societal benefits. When we observe the environment, we determine that almost all kinds of waste can be recycled however the difference then comes in the value that is generated from

the recycled material, the value of the materials recycled also majorly vary depending on the demand for such recycled material, materials that have high demand levels often have a higher sale value compared to materials with low resale value, material recycling mostly depends on the policies that a company has enforced on recycling and also the availability of buyers (Choi, 2016). There are several advantages of recycling. For waste managers, recycling helps in the overall reduction of the waste volume, there is a lot of cost saved from handling, collecting, transporting and disposal of the waste in general. The economy will also benefit from recycling through reduction of cost of fertilizers since organic waste can easily be transformed into fertilizers, in addition the economy benefits since more people will get employment.

The environment is the overall beneficiary of recycling since there will be an overall sustainability of the environment and waste going into storage sites will be reduced resulting to a more manageable system (Choi, 2016). The author further opines that, recycling means the reprocessing of used materials that would otherwise become waste. It breaks material down to its main component and produces new products. Recycling is most common for valuable materials or materials that are costlier if produced from virgin raw materials (such as metal, plastic, glass, and electronic waste). Recycling of organic matter produces compost, which can be used as a soil.

### **Effects of Resource Efficiency on organizational sustainability**

Resource efficiency reflects the understanding that current, global, economic growth and development cannot be sustained with the current production and consumption patterns (Wong, J. W. C., Surampalli, R. Y., Zhang, T. C., Tyagi, R. D., & Selvam, A., 2016). Globally, we are extracting more resources to produce goods than the planet can replenish. Resource efficiency is the reduction of the environmental impact from the production and consumption of these goods, from final raw material extraction to last use and disposal. This process of resource efficiency can address sustainability. Albino et al. (2009), found out that sustainability-driven companies had innovated in order to achieve their aim. More than 70% of them have adopted a high level of green management, material eco-efficiency and energy efficiency; which has transformed mainly their supply chain.

### **METHODOLOGY**

According to Hay (2016), descriptive design is a method of collecting data by interviewing or administering a questionnaire to a sample of individuals which can be used when collecting information about people's attitudes, opinions, habits or any other social issues. The research used quantitative approach in data analysis. Quantitative data provides a pictorial

representation of the organization's performance and a general idea of the position held by the organization (Bryman, A., & Bell, E. , 2011).

Coopers and Schindler (2008) define a sampling technique as the method used to pick out a representative portion from which to carry out a test from the population. The sampling technique that was used was stratified probability sampling technique where the study grouped the population into different strata on the basis of employees among the selected companies. The strata represented different companies. A stratified sampling is a probability sampling design that first divides the population into meaningful non overlapping subsets, and then randomly chooses the subjects from each subsets (Mugenda, O., & Mugenda, A., 2003). The essence of stratification is to ensure inclusion, in the sample, of subgroup, which otherwise would be omitted entirely by other sampling methods because of their small numbers in the population (Neuman, 2014). The study used the proportionate stratified random sampling formula presented by Mugenda and Mugenda (2003) as:

$$n_h = (N_h/N) * n$$

where,  $n_h$  is the sample size for strata  $h$ ,  $N_h$  is the population size for strata  $h$ ,  $N$  is the total population size, and  $n$  is the total sample size. For instance, in Brasimba:  $N_h$ , the population size for Basimba is 82;  $N$ , the total population is 506;  $n$ , the total sample size is 152; the  $n_h$ , sample size for Brasimba was then equal to  $(82/506) * 152 = 25$  respondents.

Respondents in each strata were then obtained using simple random sampling as a probability sampling by generating random numbers representing target population in each strata where sample numbers was randomly picked from. This is a design in which every element in the population has a known and equal chance of being selected as a subject (Hay, 2016). Sekaran and Bougie (2016) confirm that a simple random sampling is probabilistic and is also is known as chance sampling. Simple random sampling is easy to implements and every unit has an equal chance of being selected and hence eliminating selection biasness.

Table 1 Sample Matrix

Company	Municipality	Target Population	Sample
Brasimba	Bungulu	82	25
Okapi Group	Ruwenzori	44	13
Kal-Manga	Beu	14	4
Esco-Kivu	Bungulu	51	15
NRA	Mulekera	92	28
Sicovir	Ruwenzori	49	15
Copac	Ruwenzori	32	10

Maison La Neige	Mulekera	15	4	Table 1...
Maison Salama	Mulekera	46	14	
SCAK	Ruwenzori	38	11	
Autrionfale	Beu	16	5	
Urgence Express	Mulekera	12	4	
Maison des Ingenieurs	Bungulu	15	4	
Total		506	152	

The respondents were required to respond to each and every question in the questionnaire. Questionnaires were very useful and cheaper in terms of time and finances in collecting data. Likert scale is an interval scale that specifically uses five anchors of strongly disagree, disagree, neutral, agree, and strongly agree. The Likert measures the level of agreement or disagreement. Likert scale is good in measuring perception, attitudes values and behaviors. The Likert scale has scales that assist in converting the qualitative responses into quantitative values (Neuman, 2014). The questionnaire was divided into four parts. Part A sought the general information about the respondents; Part B sought information about solid waste management strategies adopted by manufacturing companies in Beni; Part C sought information concerning factors affecting the effectiveness of solid waste management strategies adopted by manufacturing companies in Beni; and Part D sought information concerning effects of solid waste management strategies on organizational sustainability as well as challenges for incorporating solid waste management strategies into organization overall goals to increase organizational sustainability.

## ANALYSIS AND FINDINGS

The objective of this study was to examine the effects of solid waste management strategies adopted by manufacturing companies in Beni City on organizational sustainability. The study's focus was on three aspects: public involvement, economic efficiency and environment, and resource efficiency effects on organizational sustainability.

### Effects of Public Involvement on Organizational Sustainability

Respondents were asked to indicate their level of agreement on the statements that were designed with regards to the effects of public involvement on organizational sustainability in their respective manufacturing companies. Their responses are as summarized in Table 2.

Table 2 Effects of Public Involvement on Organizational Sustainability

Public involvement effects		SA	A	N	D	SD	NR	Total
<b>The public which includes cart pushers, resource merchants, private solid waste collectors, public, and neighborhood associations, is involved in managing solid waste</b>	N	20	50	16	36	4	14	140
	%	14.3	35.7	11.4	25.7	2.9	10.0	100.0
<b>The public plays the role of waste separation, composting, distribution of solid waste containers and subsequent re-usage of collected and separated wastes</b>	N	11	46	30	26	13	14	140
	%	7.9	32.9	21.4	18.6	9.3	10.0	100.0
<b>Private sector involvement can facilitate efficient municipal solid waste management services as compared to the public</b>	N	24	48	26	24	4	14	140
	%	17.1	34.3	18.6	17.1	2.9	10.0	100.0
<b>Negative attitude towards waste management by the public inhibits the creation of organizational sustainability</b>	N	23	47	23	23	6	18	140
	%	16.4	33.6	16.4	16.4	4.3	12.9	100.0
<b>All stakeholders are involved through implementation, monitoring and evaluation of solid waste management strategies in enhancing organizational sustainability</b>	N	25	49	26	19	7	14	140
	%	17.9	35.0	18.6	13.6	5.0	10.0	100.0

SA=Strongly agree, A=Agree, N=Neutral, D=Disagree, SD=Strongly disagree, NR=No response

The findings in Table 2 show that 70(50%) of the respondents agreed and strongly agreed that the public which includes cart pushers, resource merchants, private solid waste collectors, public, and neighborhood associations is involved in managing solid waste while 16(11.4%) were neutral, 40(28.6%) disagreed and strongly disagreed, and 14(10%) did not respond on the same. Further, 57(40.8%) agreed and strongly agreed that the public plays the role of waste separation, composting, distribution of solid waste containers and subsequent re-usage of collected and separated wastes while 30(21.4%) were neutral, 39(27.9%) disagreed and strongly disagreed, and 14(10%) did not respond on the same. 72(51.4%) agreed and strongly agreed that private sector involvement can facilitate efficient municipal solid waste management services as compared to the public while 26(18.6%) were neutral, 28(20%)



disagreed and strongly disagreed, and 14(10%) did not respond on the same. Also, 70(50%) indicated that negative attitude towards waste management by the public inhibits the creation of organizational sustainability while 23(16.4%) were neutral, 29(20.7%) disagreed and strongly disagreed, and 18(12.9%) did not respond on the same. Slightly more than half at 74(52.9%) indicated that all stakeholders were involved through implementation, monitoring and evaluation of solid waste management strategies in enhancing organizational sustainability while 26(18.6%) were neutral, 26(18.6%) disagreed and strongly disagreed, and 14(10%) did not respond on the same. With regard to these findings, Wong et al. (2016), noted that is important to ensure that public and decision makers' awareness activities are incorporated into the strategy. Based on the findings, it is probable to conclude that public involvement in solid waste management is very influential in enhancing organizational sustainability given the significance of the percentages where respondents agreed and strongly agreed on the related statements.

### Effects of Economic Efficiency and Environment on Organizational Sustainability

The researcher sought to establish how economic efficiency and environment influences organizational sustainability of manufacturing companies in Beni City. The study findings are as shown in Table 3.

Table 3 Effects of Economic Efficiency and Environment on Organizational Sustainability

Economic efficiency and environment effects				SA	A	N	D	SD	NR	Total	
Companies	should	invest	in	N	51	60	13	2	0	14	140
environmentally	friendly	treatment	technology	%	36.4	42.9	9.3	1.4	0.0	10.0	100.0
Sustainable and responsible living	should be embraced and practiced by	consumers by focusing on the principle of environmental conservation and stewardship		N	45	65	14	2	0	14	140
				%	32.1	46.4	10.0	1.4	0.0	10.0	100.0
Appropriate waste infrastructure	separate bins, kerbside collection	systems should be provided for		N	21	60	41	2	0	16	140
		continuous improvements of waste management practices		%	15.0	42.9	29.3	1.4	0.0	11.4	100.0
Empower social technologies such as	re-use, re-pair and recycling through	community participation		N	39	56	27	4	0	14	140
				%	27.9	40.0	19.3	2.9	0.0	10.0	100.0

<b>Application of environmentally friendly waste treatment technology to ensure a maximum resource recovery with a minimum environmental pollution should be encouraged</b>	N	38	60	24	2	2	14	140
	%	27.1	42.9	17.1	1.4	1.4	10.0	100.0
<b>Economic incentive mechanism should be facilitated to motivate and promote effective management practices</b>	N	20	63	40	2	0	15	140
	%	14.3	45.0	28.6	1.4	0.0	10.7	100.0
<b>Appropriate rules and guidelines should be enacted for the promotion of organizational sustainability</b>	N	11	67	31	2	0	29	140
	%	7.9	47.9	22.1	1.4	0.0	20.7	100.0

Table 3...

SA=Strongly agree, A=Agree, N=Neutral, D=Disagree, SD=Strongly disagree, NR=No response

The study findings presented in Table 3 indicate that most of the employees of manufacturing companies in Beni City agreed and strongly agreed that companies should invest in environmentally friendly treatment technology at 111(79.3%) while 13(9.3%) were neutral, 2(1.4%) disagreed, and 14(10%) did not respond on the same; they agreed and strongly agreed that sustainable and responsible living should be embraced and practiced by consumers by focusing on the principle of environmental conservation and stewardship at 110(78.5%) while 14(10%) were neutral, 2(1.4%) disagreed, and 14(10%) did not respond on the same; they also agreed and strongly agreed that appropriate waste infrastructure separate bins, kerbside collection systems should be provided for continuous improvements of waste management practices at 81(57.9%) while 41(29.3%) were neutral, 2(1.4%) disagreed, and 16(11.4%) did not respond on the same; and they agreed and strongly agreed that manufacturing companies need to empower social technologies such as re-use, re-pair and recycling through community participation while 27(19.3%) were neutral, 4(2.9%) disagreed, and 14(10%) did not respond on the same. They further agreed and strongly agreed that application of environmentally friendly waste treatment technology to ensure a maximum resource recovery with a minimum environmental pollution should be encouraged 98(70%) while 24(17.1%) were neutral, 4(2.8%) disagreed and strongly disagreed, and 14(10%) did not respond on the same; they agreed and strongly agreed that appropriate rules and guidelines should be enacted for the promotion of organizational sustainability 78(55.8%) while 31(22.1%) were neutral, 2(1.4) disagreed, and 29(20.7%) did not respond on the same, and they finally agree and strongly agreed that economic incentive mechanism should be facilitated to motivate and promote effective management practices 83(59.3%) while 40(28/6%) were neutral, 2(1.4%) disagreed, and 15(10.7%) did not respond on the same. These findings demonstrate

that economic efficiency and environment is very influential when it comes to organizational sustainability of manufacturing companies especially through the adoption of solid waste management strategies given the significance of the percentages where respondents agreed and strongly agreed on the related statements. Blaga (2013) also argued that a rethinking of the problem should start with an examination of the ecological impact and economics across the full product life cycle, from manufacture through use, reuse, recycling, and disposal.

### Effects of Resource Efficiency on Organizational Sustainability

Last but not least, the researcher sought to establish how resource efficiency affects organizational sustainability of manufacturing companies in Beni City. Respondents were asked to indicate their level of agreement on various statements regarding resource efficiency effects on organizational sustainability. Results are as shown in Table 4.

Table 4 Effects of Resource Efficiency on Organizational Sustainability

Resource efficiency effects		SA	A	N	D	SD	NR	Total
Zero waste programs or transformative knowledge should provide proactive support strategies to motivate behavior change towards responsible, efficient and sustainable resource consumption practices	N	28	66	31	2	0	13	140
	%	20.0	47.1	22.1	1.4	0.0	9.3	100.0
Consumption of resource should be improved through a shared-ownership of product service systems	N	22	69	32	4	0	13	140
	%	15.7	49.3	22.9	2.9	0.0	9.3	100.0
Local government should provide decentralized recycling and resource recovery facilities within the closed-proximity of the community	N	47	64	12	4	0	13	140
	%	33.6	45.7	8.6	2.9	0.0	9.3	100.0
Appropriate and affordable technological options should be made available to enable efficiency of resources	N	27	74	22	4	0	13	140
	%	19.3	52.9	15.7	2.9	0.0	9.3	100.0
Research and development should be promoted to support investment for resource efficiency and organizational sustainability	N	36	71	18	2	0	13	140
	%	25.7	50.7	12.9	1.4	0.0	9.3	100.0

<b>Financing strategies should be developed for waste treatment and recycling projects to encourage the implementation of projects and increase organizational sustainability</b>	N	36	53	36	2	0	13	140
	%	25.7	37.9	25.7	1.4	0.0	9.3	100.0
<b>The organizations should organize programs for building capacity on different approaches to solid waste management strategies to improve organizational sustainability</b>	N	40	85	2	0	0	13	140
	%	28.6	60.7	1.4	0.0	0.0	9.3	100.0

Table 4...

SA=Strongly agree, A=Agree, N=Neutral, D=Disagree, SD=Strongly disagree, NR=No response

Study findings in Table 4 show that majority the employees of manufacturing companies in Beni City agreed and strongly agreed that resource efficiency had a lot of effect on organizational sustainability of their respective manufacturing companies. This is based on the fact that majority of the employees who participated in this study generally agreed to all the statements which were used to measure the effects of resource efficiency on organizational sustainability. For instance, close to all employees at 125(89.3%) agreed and strongly agreed that manufacturing companies should organize programs for building capacity on different approaches to solid waste management strategies to improve organizational sustainability while 2(1.4%) were neutral, and 13(9.3%) did not respond on the same; 111(79.3%) agreed and strongly agreed that local government should provide decentralized recycling and resource recovery facilities within the closed-proximity of the community while 12(8.6%) were neutral, 4(2.9%) disagreed, and 13(9.3%) did not respond on the same; while at 107(76.4%) agreed and strongly agreed that research and development should be promoted to support investment for resource efficiency and organizational sustainability while 18(12.9%) were neutral, 2(1.4%) disagreed, and 13(9.3%) did not respond on the same; that zero waste programs or transformative knowledge should provide proactive support strategies to motivate behaviors change toward responsible, efficient and sustainable resource consumption practices at 94(67.1%) while 31(22.1%) were neutral, 2(1.4%) disagreed, and 13(9.3%) did not respond on the same; they also agreed and strongly agreed that consumption of resource should be improved through a shared-ownership of product service systems at 91(65%) while 32(22.9%) were neutral, 4(2.9%) disagreed, and 13(9.3%) did not respond on the same; they agreed and strongly agreed that appropriate and affordable technological options should be made available to enable efficiency of resources at 101(72.2%) while 22(15.7%) were neutral, 4(2.9%) disagreed, and 13(9.3%) did not respond on the same; and they agreed and strongly agreed

that financing strategies should be developed for waste treatment and recycling projects to encourage the implementation of projects and increase organizational sustainability at 89(63.6%) while 36(25.7%) were neutral, 2(1.4%) disagreed, and 13(9.3%) did not respond on the same. These findings, therefore, imply that resource efficiency is very influential in the management of solid waste thus enhancing organizational sustainability given the significance of the percentages where responds agreed and strongly agreed on the related statements. In support of the findings, Albino et al. (2009), also found out that sustainability-driven companies had innovated in order to achieve their aim. In addition, they also mentioned that more than 70% of them have adopted a high level of green management, material eco-efficiency and energy efficiency; which has transformed mainly their supply chain.

### Regression Analysis

Multiple regression analysis was conducted to test relationship between three solid waste management strategies (the independent variables) and organizational sustainability of companies in solid waste management sector (dependent variable). The three solid waste management strategies that the researcher sought to establish their influence on organizational sustainability of companies in solid waste management sector included solid waste reduction strategy, solid waste reuse strategy, and solid waste recycling strategy. The regression analysis coefficients were used in the determination of the relationship between the dependent and the independent variables. The coefficients explain the extent to which changes in the dependent variable can be explained by the change in the independent variables or the percentage of variation in the dependent variable that is explained by all the three independent variables.

### Model Summary

Table 5 Model Summary of the Regression Analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.830a	.611	.513	.30499	.611	9.377	139	1	.317

a. Predictors: (Constant): solid waste reduction strategy, solid waste reuse strategy, solid waste recycling strategy

The findings indicate that the three independent variables (solid waste reduction, solid waste re-use, and solid waste recycling) that were studied explain only 51.3% (as represented by the Adjusted R Square,  $R^2$ ) of the effectiveness of solid waste management strategies on organizational sustainability of manufacturing companies in Beni City, DRC. This therefore means that there are other factors, not studied in this research, that contribute 48.7% of the effectiveness of solid waste management strategies on organizational sustainability of manufacturing companies in Beni City, DRC. Therefore, further research should be conducted to investigate the other factors (48.7%) that influence on of the effectiveness of solid waste management strategies on organizational sustainability of manufacturing companies in Beni City, DRC

The findings also show that the F critical at 5% level of statistical significance is 0.317. Since the value of F calculated (value = 9.377) is greater than the F critical (value=0.317), the overall model is considered significant.

### **ANOVA Results**

Table 6 shows a summary of the ANOVA statistics obtained from the mean of the three types of solid waste management strategies (reduction, re-use, and recycle) that influence on the effectiveness of solid waste management strategies on organizational sustainability of manufacturing companies in Beni City, DRC. ANOVA cross tabulated results were obtained based on the consideration of average values of respondents' views and opinions on the effectiveness of solid waste management strategies on organizational sustainability of manufacturing companies in Beni City, DRC. Estimates were made based on the respondents' perception on solid waste reduction strategy, solid waste reuse strategy, solid waste recycling strategy.

Table 6 ANOVA of the Regression

ANOVA <sup>b</sup>					
Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	17.895	139	5.965	23.668	.000 <sup>a</sup>
Residual	9.325	1	.252		
Total	27.220	140			

b. Predictors: (Constant): solid waste reduction strategy, solid waste reuse strategy, solid waste recycling strategy

a. Dependent variable: organizational sustainability of companies in the manufacturing industry Beni, DRC.

The statistical significance value ( $p$ ) obtained in the regression model is used to measure whether relationship between the independent variables and the dependent variable is statistically significant. From the table above, the significance value for the relationship between solid waste management and organizational sustainability of companies in the manufacturing industry is 0.000. Since the statistical significance value ( $p$ ) is less than 0.05 ( $p < 0.05$ ), it can be concluded that the relationship between solid waste management and organizational sustainability of companies in the manufacturing industry is statistically significant in predicting how solid waste management influence organizational sustainability of companies in the manufacturing industry in Beni City.

## CONCLUSION

Solid waste management has become a global challenge with the rise of companies and industries in the manufacturing sector. The challenge is highly felt in rapid urban development areas like towns and cities where the concentration of population is relatively high thus high rate of production and consumption of industrial and manufactured products. Increasing number of manufacturers result in the generation of all kinds of waste which can lead to global environmental and climate that could to animals, plants, and ecosystems leading to pollution. This calls for adoption of effective solid waste management strategies that not create a friendly environment but enhance sustainability of the manufacturing companies.

In relation to this study's findings, Ochoro (2016), also found that public education and waste awareness is also a critical method of ensuring waste management and organizational sustainability. Waste awareness can also be created through rallies as people get very excited with rallies and street plays and they tend to attract a large crowd to come and witness what it is all about. Embedding waste management into school programs is also a plus since children are the future of tomorrow, this is a more sustainable tool toward effective waste management (Hoveidi, H., Pari, M. A., Pazoki, M., Koulaeian, T., Faculty, G., & Box, P. O., 2013). Motivating individuals towards waste intolerance is a plus since; the individuals will exert pressure to the companies and authorities that will ensure proper waste management support and implementation.

This study found that the three solid waste management strategies (reduction, re-use, and recycle) explain only 51.3% of the effectiveness on organizational sustainability of manufacturing companies. This implies that there are other factors (48.7%) which influence the effectiveness of solid waste management strategies in enhancing organizational sustainability. As a result, a further research is recommended to establish the factors contributing to effectiveness of solid waste management strategies in enhancing organizational sustainability.



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