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Article

Effectiveness of Environmental Solid Waste Management Policies and Practices for Sustainable Development

Theophilus Kweku Bassaw [1, *]

[1] Department of Social Sciences, Komenda College of Education, Komenda, Ghana

*Correspondence: Theophilus Kweku Bassaw (tkbassaw@yahoo.com)

Abstract: The purpose of this study was to examine the effectiveness of environmental solid waste management policies and practices for sustainable development in Komenda-Edina-Eguafo-Abrem Municipality in the Central Region of Ghana. The case study research design was adopted for the study. Using the simple random sampling procedure, 425 respondents comprising of 380 residents and 45 Zoomlion staff were involved in the study. The data were analysed through the computation of frequencies, percentages, as well as means and standard deviations. On the waste management strategic action plan for sustainable development, it can be concluded that, regular monitoring system should be in place to ensure that households adhere to the solid waste management practices; and education/training programmes on solid waste management should be provided for employees so that they can appreciate the need for sustainable development practices. It can also be concluded that, most of the environmental management policies and practices of solid waste management were not effective in the KEEA Municipality because the residents were uncertain about the effectiveness of the environmental policies that have been put in place. Perhaps, the Assembly does not conduct regular monitoring to find out solid waste management practices of the various households. It could be that the Assembly does not enforce bye-laws on sanitation on appropriate solid waste management practices. It is recommended that, the Environmental Protection Agency (EPA), and the Assembly should conduct regular monitoring system in order to ensure that residents adhere to the solid waste management practices. Again, the Assembly should make available a reliable data on solid waste generation for households in the Municipality. It is also recommended that, the Environmental Protection Agency (EPA) and the Assembly should ensure proper enforcement of the bye-laws on sanitation on appropriate solid waste management practices. Residents of the KEEA Municipality should be encouraged by the Environmental Protection Agency (EPA) to consider reuse and recycling as important activities.

Keywords: Environment, Solid Waste, Management, Policies, Practices, Sustainable Development

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1. Introduction

Waste is any unwanted and economically unusable by-products or residuals at any given place and time, and any other matter that may be discarded accidentally or otherwise into the environment [1]. A number of criteria are usually employed to classify wastes into types. Such classification of waste provides the basis for the development of appropriate management practices. Waste can be classified by physical state (solid, liquid, gaseous). Other ways in which waste is classified is by its primary use (packaging waste, food waste, etc); by material (glass, paper, etc); by physical properties (combustible, compostable, recyclable); by origin (household, commercial, agricultural, industrial, etc.) or by safety level (hazardous, non-hazardous) [2]. However, this study considers solid waste and solid waste management. The persistent increase both in the quantity and variety of solid waste necessitated the need for their effective utilization by some countries

as one of the ways of managing their solid waste, rather than relying on traditional forms such as collection, transportation and disposal [3]. However, inadequate knowledge of the impact of such activities on the environment and lack of willingness to pay for Solid Waste Management (SWM) are factors that make recycling a big hurdle to surmount. Waste, especially solid waste is increasingly becoming a menace to society [4, 5].

The management of solid waste in our urban communities has become a significant policy issue in the world over. However, some of the greatest challenges to solid waste management are felt most keenly in developing countries. This irony is based on the gap between the patterns of growth and modernization in the developing world on the one hand, and the capacity to pay for, plan for and effectively manage solid waste as part of an integrated national system on the other [6]. The Environmental Protection Agency and the World Bank noted that in the city of Accra alone, an estimated 89 per cent of the population has no home garbage collection [7]. Similar conditions exist in many other cities including Komenda and Elmina. A study noted that only 11 percent of the 1.4 million people benefit from the home collection of solid waste in Accra, the capital of Ghana. Here, as in many other cities, the uncollected waste is illegally dumped in open spaces, water bodies, and storm-drainage channels, buried, burnt or deposited along the streets or roadsides [8]. A survey carried out in low-income high-density population areas in 365,550 households in Accra revealed only 41 per cent of these households have solid waste disposal facilities provided in or around their houses [9]. Residents at Chorkor for instance, with a population of 45,379 only two collection points and each of these points has two old containers [9]. These are filled to the brim in the early hours of the morning. In the absence of attendants, garbage is left there and accumulates on the ground. One cannot help but be overcome by the strong stenches emanating from the open gutters and heaps of garbage, visible along drains and streets, in the neighbourhoods, schools and commercial places. A similar situation exists in Komenda-Edina–Eguafo-Abrem Municipality. These issues led to the identification and formulation of the problem statement for this research.

In an era of sustainable development with fast-growing concerns about threats to environmental quality and increasing pressures on natural resources, there is a need to minimize waste generation. The generation of solid waste is not a new phenomenon. The major constituents of solid waste were domestic wastes and agricultural residues which are both biodegradable. Solid waste could be conveniently disposed of on the ground or in pits covered with layers of earth. However, since the 1960s, not only has the quantity of solid waste increased but its quality has also changed globally as a result of rapid urbanization, increasing industrialization and rising incomes [10].

In Ghana, the increasingly growing population and its associated increase in urbanization and economic activities have made the impact of municipal solid waste very noticeable. The urban areas of Accra produce about 760,000 tons of municipal solid waste (MSW) per year or approximately 2000 metric tons per day [11]. The situation in the Central Region of Ghana is not any different as Municipal Solid Waste generated from commercial and domestic sources has been increasing steadily. Yet, literature on the amount of solid waste generated and its management in the Central Region of Ghana is virtually in extinct, and this study seeks to unravel this phenomenon and fill this gap.

The management of solid waste has evolved over time. It has gone through many transitions as technology continues to evolve. Even in recent times, new methods and approaches are emerging as best practices for managing solid waste. Earlier, some of the common practices used in managing the final disposal of solid waste were, dumping in water, on land, gullies and mining pits; ploughing into the soil; reduction and incineration [12]. This implies that when waste is produced it is first stored. Then it is collected and finally transported to landfill sites for disposal. Also, when waste is collected it can be transferred from small collection equipment like a tricycle to a bigger truck for final disposal. There were many hazards that were associated with these forms of practices and

there was a paradigm shift to other best practices. However, in modern times, there are a number of existing strategies, technologies and procedures employed in different parts of the world for waste management. Waste generated can be processed and recovered for materials to be reused [13].

Developing countries including Ghana are lagging behind in terms of best solid waste management practices. Some of the common practices of solid waste disposal in some hotels in Nigeria included the burning of solid waste and dumping of waste at unauthorized refuse sites [14]. The Government of Ghana has collaborated with various recycling companies such as Zoomlion Ghana Limited, Blowplast and Jospong Group of Companies to collect, sort, process and recycle solid and liquid waste [13]. The essence is to use them in the production of recycled products such as organic manure, rubber sandals and polythene bags. But what is unknown is how the people of Central Region and for that matter Komenda-Edina-Eguafo-Abrem (KEEA) Municipality manage their solid wastes. Do they patronize the services of the waste management companies listed earlier? Do they resort to burning, storage and dumping of solid waste at refuse sites? What waste management plan is being implemented in the Central Region, specifically, KEEA Municipality of Ghana? These questions have necessitated this study to be carried out in order to investigate solid waste management practices in the Central Region of Ghana. The purpose of this study was to examine the effectiveness of environmental solid waste management policies and practices for sustainable development Komenda-Edina-Eguafo-Abrem Municipality in the Central Region of Ghana. The study was guided by these research questions – (1) What is the waste management action plan for sustainable development in the Komenda-Edina-Eguafo-Abrem Municipality? (2) What are the effectiveness of the environmental management policies and practices of solid waste management in the Komenda-Edina-Eguafo-Abrem Municipality?

1.1. Solid Waste Management Strategic Action Plan

Waste management planning requires reliable data concerning solid waste generation, influencing factors on waste generation and forecasts of waste quantities based on facts [5, 15]. **T**here is no single approach to solid waste management that makes it sustainable; however, the principles of integrated waste management could be followed to guide the development of a site-specific MSW system that will be sustainable as demonstrated in the city of London [5, 16]. At the 10th International Waste Management and Landfill Symposium in Cagliari Italy, the determination of the best means to manage solid waste is not straightforward; nevertheless, solid waste management is characterized by ready-made prescribed answers, with single-issue interest groups promoting a single solution, at the expense of others [5, 17]. The truth, he argued, is that no single solution can manage society's waste adequately. Thus it is proposed that in practice, solid waste management must combine many different methods based on an integrated system.

Disposal of waste freely into the biosphere has now given way to think about and try to implement, an integrated waste management approach. The United Nations Environmental Programme (UNEP) defined 'integrated waste management' as *'a framework of reference for designing and implementing new waste management systems and for analysing and optimising existing systems'*. Incorporating a long-term and viable solid waste management system into a societal context requires that all of the elements in the 6-tier waste management hierarchy be addressed in an integrated approach, this hierarchy is defined as: ''reduction, reuse, recycling, recovery, treatment and disposal'' [18]. In preparing a strategic integrated solid waste management plan, such plan should be drawn taking into account the waste generation sources, quantity, characteristics and the socio-economic and cultural structure of the industry [16].

Furthermore, for the plan to gain social acceptability public participation is vital and communication is a critical part to secure public participation. The communities should be involved in making decisions concerning waste management strategies. There should

be a method of communicating waste management system performance and proposed strategies with the organisation in order to get feedback and support from the community [5, 16-18]. Organisation consultation and communication cannot be overlooked in developing a sustainable waste management plan. For example, in New York City (NYC), an IWM plan that focused on the solid waste stream was adopted in 1988 [19]. A 20-year plan worked on by 12 consultancies produced 12 different outcomes with two main general outlooks. Half called for a waste-to-energy plant with associated composting and landfill sites and the other half used a combination of material recovery facilities, processing plants, composting and landfills as their solutions. Interestingly, Citizen Advisory Boards rejected all 12 plans in 1992 and after meeting with communities, called for a plan that gave greater emphasis to source reduction and recycling. However, due to the overwhelming support of the Advisory Boards, NYC continued to support the programme and the process bore results [18]. Therefore, what may make sense for one organisation may be very different for another depending on existing infrastructure, policies, and environmental goals. This is why site-specific analyses are important in developing efficient and effective management plans [5, 17]. The USA has made major progress in increasing recycling rates. However, the choices to be made in the future are becoming more complex and material specific such as waste conversion technologies and wet waste recycling programmes [17].

1.2. Integrated solid waste management

Although considerable efforts are being made by many governments and other entities in tackling waste-related problems, there are still major gaps to be filled in this area [20]. The World Bank estimates that in developing countries, it is common for municipalities to spend 20 to 50 percent of their available budget on solid waste management, even though 30 to 60 percent of all the urban solid wastes remain uncollected and less than 50 percent of the population is served [20]. The programme (UNEP) suggested that if most of the waste could be diverted for material and resource recovery, then a substantial reduction in final volumes of waste could be achieved and the recovered material and resources could be utilized to generate revenue to fund waste management. This forms the premise for the Integrated Solid Waste Management (ISWM) system based on the 3Rs (reduce, reuse and recycle) principle**.** ISWM system has been pilot tested in a few locations (Wuxi, PR China; Pune, India; Maseru, Lesotho) and has been well received by local authorities. It has been shown that with appropriate segregation and recycling system significant quantities of waste can be diverted from landfills and converted into resources [5, 20]. Similarly, the United States Environmental Protection Agency in 2009 said that if a state or local government wants to plan for and implement ISWM, they have to consider a hierarchy of methods which are "reduce, recycle, and incinerate/landfill". Figure 1 below is a model of the ISWM [21].

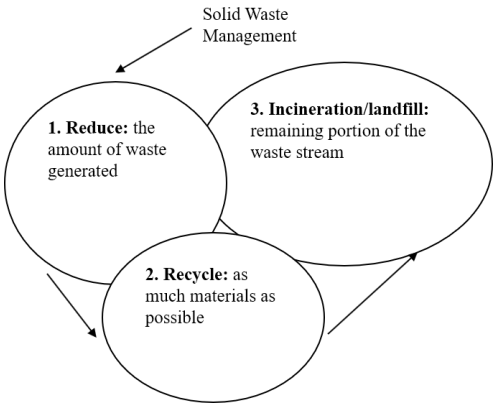

Figure 1. Model of ISWM

1.3. Environmental Management Policies and Practices

Several policies related to waste management are available at international, national and local levels [5]. In Ghana, there are laws to protect the environment. These laws include the Local Government Act in 1993, Act 462, the Environmental Protection Agency Act in 1994, Act 490, the Pesticides Control and Management Act in 1996, Act 528, the Environmental Assessment Regulations in 1999, (LI 1652), the Environmental Sanitation Policy of Ghana in 2010 among others. Ghana has almost all the institutions, agencies and policies for waste management at all levels of government; from central government down to the very local level of unit committees [22]. Waste management is the responsibility of the Ministry of Local Government and Rural Development, which supervises the Metropolitan, Municipal and District Assemblies. However, the regulatory authority is vested in the Environmental Protection Agency (EPA) under the auspices of the Ministry of Environment, Science, Technology and Innovations. The Metropolitan, Municipal and District Assemblies are responsible for the collection and final disposal of solid waste through their Waste Management Departments and their Environmental Health and Sanitation Departments [5, 22].

The policy framework guiding the management of hazardous, solid waste and radioactive substances includes the Local Government Act - 1993, Act 462, the Environmental Protection Agency Act -1994, Act 490, the Pesticides Control and Management Act - 1996, Act 528, the Environmental Assessment Regulations 1999, (LI1652), the Environmental Sanitation Policy of Ghana 1999, the Guidelines for the Development and Management of Landfills in Ghana, the Guidelines for Bio-medical Waste, 2000 and Environmental Sanitation Policy of Ghana, 2010). All these Acts and Regulations emanate from the National Environmental Action Plan. The only guidelines, which indirectly discourage unsustainable practices and promote sustainable consumption and production, are those of Environmental Impact Assessment. Environmental Impact Assessment is a requirement under legislation Act - 528 and guidelines have been prepared through the Environmental Protection Agency with private sector collaboration [23]. Even though Ghana has all these policies to guide waste management, enforcement of these laws has been a problem. This coupled with the poor institutional arrangement and funding present challenges to the implementation of solid waste management in Ghana.

1.3.1. Ministry of Local Government and Rural Development (MLGRD)

The MLGRD is the ministry that is the core agency responsible for the sanitation sector of the country. It is responsible for creating and coordinating sanitation policy, issuing guidelines on sanitation services and their management, and supervising the National Environmental Sanitation Policy Coordinating Council [24]. The MLGRD is supposed to have the overall responsibility for formulating environmental sanitation policies as guidelines for the MMDAs in the country.

1.3.2. Environmental Protection Agency (EPA)

The Environmental Protection Agency (EPA) seeks to ensure environmentally sound and efficient use of both renewable and non-renewable resources, to prevent, reduce, and eliminate pollution and actions that lower the quality of life; and to apply the legal processes in a fair, equitable manner to ensure responsible environmental behaviour in the country. The Environmental Protection Agency is the leading public body responsible for protecting and improving the environment in Ghana. Its job is to make sure that air, land and water are looked after by everyone in today's society so that the next generations inherit a cleaner and healthier environment [25].

2. Materials and Methods

The study adopted the quantitative research approach. In the context of this study, the quantitative approach helps to quantify data that was collected on the effectiveness of environmental management policies and practices of solid waste management in the Komenda-Edina Eguafo-Abrem Municipality of Ghana. The cross-sectional descriptive survey design was adopted for the study because it offers the researcher the opportunity to assess practices and policies of solid waste management in KEEA Municipality in the Central Region of Ghana. The population for the study comprised all residents of 18 years or older as well as waste management agencies in the KEEA Municipality. There were 32,819 residents who are 18 years and older together with 52 staff of the Zoomlion Waste Management Company in the KEEA Municipality. The accessible population for the study was 380 residents and 45 staff of the Zoomlion Waste Management Company in the KEEA Municipality. Residents and the staff of the Municipal Waste Management agency were involved in the study because they could provide information on the effectiveness of environmental solid waste management policies and practices for sustainable development. The simple random sampling procedure was used to select 380 residents and 45 staff of Zoomlion Company Ltd for the study. The main instrument for the study was a questionnaire. A self-developed questionnaire was designed to address each of the research questions. The questionnaires for the respondents were on a five-point Likert scale (1=Strongly Disagree (SD); 2= Disagree (D); 3= Uncertain (U); 4= Agree (A); 5= Strongly Agree (SA). Descriptive statistics was employed in the analysis of the data. Specifically, frequencies, percentages, means and standard deviations were used to analyse the questionnaire items. These were done with the use of the Statistical Package for Service Solutions (SPSS) version 21.

3. Results and Discussion

3.1. Waste Management Strategic Action Plan for Sustainable Development

Research question 1: *What is the waste management action plan for sustainable development in the Komenda-Edina-Eguafo-Abrem Municipality?* The aim of this research objective was to examine waste management strategic action plans for sustainable development in the KEEA Municipality. The responses given by the respondents are shown in Table 1.

Table 1. Views of Respondents on Waste Management Strategic Action Plan for Sustainable Development (n=365)

Statements: What strategies can be adopted for solid waste management?	M	SD
Regular monitoring systems should be in place to ensure that households adhere to solid waste management practices.	4.40	.55
Education/Training programmes on solid waste management should be provided for residents in the Municipality.	4.43	.50
Enforcing sanctions on those who do not adhere to proper waste management.	4.53	.56
There is a need for reliable data on solid waste generation for households in the Municipality.	3.93	.85
Through the provision of additional bins, solid waste generation could be reduced and recycled as much as possible through composting process and use this fertilizer for home gardening.	4.75	.49

Source: Field Data, August 2020; Scale: 1= Strongly Disagree, 2= Disagree, 3 = Uncertain, 4= Agree, 5= Strongly Agree; Mean of means = 4.41; Mean of standard deviation = .59

Table 1 sought to examine the views of the respondents on waste management strategic action plans for sustainable development. The means and standard deviation were obtained based on the responses recorded for each of the items on the questionnaire that were given to the respondents in the KEEA Municipality. A mean of means of 4.41 and a mean of standard deviation of .59 were realized. This means that the majority of the

respondents agreed to most of the statements that were posed to them about the waste management strategic action plan for sustainable development. Further discussions of individual items are presented in the paragraphs below.

From Table 1, a mean of 4.41 and a standard deviation of .59 were achieved for the statement: "Regular monitoring system should be in place to ensure that households adhere to the solid waste management practices". This means that, the respondents agreed to the statement. Also, from Table 1, the respondents agreed that education/training programmes on solid waste management should be provided for residents in the Municipality. This is evidenced by the mean score of 4.43 and a standard deviation of .50 for this item. The mean is 4, showing that the respondents agreed to the statement. This finding is supported by previous studies that, it is essential to educate and provide training about waste minimisation practices to enhance commitment to the programme. Regarding the statement; "Enforcing sanctions on those who do not adhere to proper waste management", the majority of the respondents strongly agreed to the statement [26]. This can be seen from the mean of 4.53 and a standard deviation of .56 that were realized. Also, a mean of 3.93 and a standard deviation .85 were recorded for the statement "There is the need for reliable data on solid waste generation for households in the Municipality". This means that, the majority of the respondents agreed to the statement. This is because the mean falls on scale 4 (agree) looking at the scale under Table 1. The finding depicts that, most of the respondents strongly agreed that through the provision of additional bins, solid waste generation could be reduced and recycled as much as possible through composting process and use this fertilizer for home gardening.

The responses from the Zoomlion staff are presented in Table 2.

Table 2. Views of Zoomlion Staff on Waste Management Strategic Action Plan for Sustainable Development (n=42)

Statements: What strategies can be adopted for solid waste management?	M	SD
Regular monitoring systems should be in place to ensure that households adhere to solid waste management practices.	4.24	.69
Education/Training programmes on solid waste management should be provided for residents in the Municipality.	4.10	.73
Enforcing sanctions on those who do not adhere to proper waste management.	4.31	.47
There is a need for reliable data on solid waste generation for households in the Municipality.	3.55	1.06
Through the provision of additional bins, solid waste generation could be reduced and recycled as much as possible through composting process and use this fertilizer for home gardening.	4.21	.42

Source: Field Data, August 2020; Scale: 1= Strongly Disagree, 2= Disagree, 3 = Uncertain, 4= Agree, 5= Strongly Agree; Mean of means = 4.08; Mean of standard deviation = .67

Table 2 sought to examine the views of the Zoomlion staff on waste management strategic action plan for sustainable development. The means and standard deviation were obtained based on the responses recorded for each of the items on the questionnaire that were given to the Zoomlion staff. A mean of means of 4.08 and a mean of standard deviation of .67 were realized. This means that the majority of the respondents agreed to most of the statements that were posed to them about the waste management strategic action plan for sustainable development. Further discussions of individual items are presented in the paragraphs below.

From Table 2, a mean of 4.24 and a standard deviation of .69 were achieved for the statement: "Regular monitoring system should be in place to ensure that households adhere to the solid waste management practices". This means that, the Zoomlion staff agreed to the statement. Also, from Table 2, the respondents agreed that education/training programmes on solid waste management should be provided for residents in the Municipality. This is evidenced by the mean score of 4.10 and a standard

deviation of .73 for this item. The mean is 4, showing that the respondents agreed to the statement. This finding confirms by an earlier study that, it is essential to educate and provide training about waste minimisation practices to enhance commitment to the programme. Regarding the statement; "Enforcing sanctions on those who do not adhere to proper waste management", the majority of the respondents agreed to the statement [26]. This can be seen from the mean of 4.31 and a standard deviation of .47 that were realized. Also, a mean of 3.55 and a standard deviation 1.06 were recorded for the statement: "There is the need for reliable data on solid waste generation for households in the Municipality". This means that, the majority of the respondents agreed to the statement. This is because the mean falls on scale 4 (agree) looking at the scale under Table 2. The finding depicts that, most of the respondents agreed that through the provision of additional bins, solid waste generation could be reduced and recycled as much as possible through composting process and use this fertilizer for home gardening. Here, a mean of 4.21 and a standard deviation of .42 were achieved.

From the above discussions, it can be concluded that, both Zoomlion staff and residents of the KEEA Municipality agreed to a number of the waste management strategic action plan for sustainable development. With this, they indicated that a regular monitoring system should be in place to ensure that households adhere to the solid waste management practices; education/training programmes on solid waste management should be provided for residents in the Municipality; there is the need to enforce sanctions on those who do not adhere to proper waste management. Again, there is a need for reliable data on solid waste generation for households in the Municipality; and through the provision of additional bins, solid waste generation could be reduced and recycled as much as possible through composting process and use this fertilizer for home gardening.

3.2. Effectiveness of Environmental Management Policies and Practices of Solid Waste Management

This sub-section presents results and discussion on Research question 2: What are the effectiveness of the environmental management policies and practices of solid waste management in the Komenda-Edina-Eguafo-Abrem Municipality? This objective sought to evaluate the effectiveness of environmental management policies and practices of solid waste management in the KEEA Municipality. The responses given by the respondents are shown in Table 3.

Table 3. Views of Respondents on the Effectiveness of Environmental Management Policies and Practices of Solid Waste Management (n=42)

Statements: How effective are the environmental management policies and practices of solid waste management?	M	SD
My home has engaged the services of a licensed collector (e.g. Zoomlion Company Ltd.) approved by the Assembly to collect solid waste generated from our premises.	2.77	1.33
The Assembly/licensed contractor determines the manner of disposal of all harzadous or healthcare wastes.	2.58	1.25
The collection of solid waste is subject to charging of fees as approved by the Assembly in its fee-fixing resolution.	3.17	1.13
The Assembly conducts regular monitoring to find out the solid waste management practices of various households in the Municipality.	2.71	1.19
The Assembly ensures that no person or firm deposits any solid waste at any site apart from the site designated by the Assembly for solid waste to be placed.	2.98	1.26
The Assembly ensures that we provide in our premises approved containers (plastic/galvanized containers) for storage of solid waste.	3.07	1.29
The Assembly sanctions any person or firm that burns solid waste on their premises.	2.71	1.24
The Assembly ensures that we do not burn solid waste on our premises	2.84	1.13
The Assembly provides education to persons/employees of the firm on appropriate ways of storing solid waste for collection.	3.13	.99

The Assembly sanctions persons or firms who dump solid waste in an open space, drain, gutter, sewer, open land, quarry, river channel, swamp or their place not designated by the Assembly for that purpose.	3.34	1.14
The Assembly ensures proper enforcement of the bye-laws on sanitation and appropriate solid waste management practices.	3.27	.96

Source: Field Data, August 2020; Scale: 1= Strongly Disagree, 2= Disagree, 3 = Uncertain, 4= Agree, 5= Strongly Agree; Mean of means = 2.96; Mean of standard deviation = 1.17

A mean of means of 2.96 and a mean of standard deviation of 1.17 were achieved showing that the majority of the respondents in the KEEA Municipality were uncertain about most of the statements that were posed to them on the effectiveness of environmental management policies and practices of solid waste management. Details of the individual items are discussed in the subsequent paragraphs. Most of the respondents were uncertain as to whether they had engaged the services of a licensed collector (e.g. Zoomlion Company Ltd.) approved by the Assembly to collect solid waste generated from our premises. This is because, a mean of 2.77 and a standard deviation of 1.33 were achieved for the statement. Again, when the residents were asked whether the Assembly/licensed contractor determines the manner of disposal of all harzadous or health care wastes, the respondents were uncertain about the statement. Here, a mean of 2.58 and a standard deviation of 1.25 were obtained for this item showing the respondents were uncertain about the statement. Also, from Table 3, the residents were uncertain as to whether the collection of solid waste is subject to charging of fees as approved by the Assembly in its fee-fixing resolution. This is evidenced by the mean score of 3.17 and a standard deviation of 1.13 for this item. The mean is approximately 3, showing that the respondents were uncertain about the statement. Regarding the statement: "The Assembly conducts regular monitoring to find out solid waste management practices of various households in the Municipality", the majority of the residents were uncertain about the statement. This can be seen from the mean of 2.71 and a standard deviation of 1.19 that were realized. Also, a mean of 2.98 and a standard deviation 1.26 were recorded for the item: "The Assembly ensures that no person or firm deposits any solid waste at any site apart from the site designated by the Assembly for solid waste to be placed". This means that, the majority of the respondents were uncertain about the statement. This is because the mean falls on scale 3 (uncertain) looking at the scale under Table 3.

The finding depicts that, most of the respondents were uncertain as to whether the Assembly ensures that they provide in their premises approved containers (plastic/galvanized containers) for storage of solid waste. With a mean of 3.07 and a standard deviation of 1.29 it could be concluded that the mean falls into the scale of 3 (uncertain). Thus, the majority of the respondents were uncertain about the statement. Also, from Table 3, the respondents were uncertain as to whether the Assembly sanctions persons or firms who burn solid waste on their premises. This is evidenced by the mean score of 2.71 and a standard deviation of 1.24 for this item. The mean falls on a scale of 3, showing that the respondents were uncertain about the statement. Most of the respondents were uncertain as to whether the Assembly ensures that they do not burn solid waste on their premises. With this, a mean of 2.84 and a standard deviation of 1.13 were obtained. Again, when the respondents were asked whether the Assembly provides education to persons on appropriate ways of storing solid waste for collection, they were uncertain about the statement. Here, a mean of 3.13 and a standard deviation of .99 were obtained for this item showing that the respondents were uncertain as to whether the Assembly provides education to persons on appropriate ways of storing solid waste for collection. Regarding the statement: "The Assembly sanctions persons or firms who dump solid waste in an open space, drain, gutter, sewer, open land, quarry, river channel, swamp or their place not designated by the Assembly for that purpose" the majority of the respondents were uncertain about the statement. Here, a mean of 3.34 and a standard deviation of 1.14 were obtained "The Assembly ensures proper enforcement of the bye-

laws on sanitation and appropriate solid waste management practices" The majority of the respondents were uncertain about the statement. This can be seen from the mean of 3.27 and a standard deviation of .96 that were realized. This means that, the respondents were uncertain as to whether the Assembly ensures proper enforcement of the bye-laws on sanitation and appropriate solid waste management practices.

From the foregoing, it can be concluded that, the residents of the KEEA Municipality were uncertain about the effectiveness of environmental management policies and practices of solid waste management. This is because, they were uncertain as to whether the Assembly ensures that they provide in their premises approved containers (plastic/galvanized containers) for storage of solid waste. Again, they were uncertain whether Assembly sanctions any person or firm that burns solid waste on their premises; and were uncertain whether the Assembly sanctions persons or firms who dump solid waste in an open space, drain, gutter, sewer, open land, quarry, river channel, swamp or places not designated by the Assembly for that purpose. They were also uncertain whether the Assembly provided education to persons on appropriate ways of storing solid waste for collection, and were uncertain whether the Assembly conducts regular monitoring to find out solid waste management practices. Again, the residents were uncertain whether the Assembly ensures that no person or firm deposits any solid waste at any site apart from the site designated by the Assembly for solid waste to be placed; and were uncertain as to whether the Assembly ensures proper enforcement of the bye-laws on sanitation and appropriate solid waste management practices.

4. Conclusions and Recommendations

On the waste management strategic action plan for sustainable development, it can be concluded that, a regular monitoring system should be in place to ensure that households adhere to the solid waste management practices and education/training programmes on solid waste management should be provided for employees so that they can appreciate the need for sustainable development practices. Again, there is a need for reliable data on solid waste generation for households in the Municipality; and through the provision of additional bins, solid waste generation could be reduced and recycled as much as possible through composting process and use this fertilizer for home gardening. Again, it can be concluded that, most of the environmental management policies and practices of solid waste management were not effective in the KEEA Municipality because the residents were uncertain about the effectiveness of the environmental policies that have been put in place. Perhaps, the Assembly does not conduct regular monitoring to find out the solid waste management practices of the various households. It could be that the Assembly does not enforce bye-laws on sanitation on appropriate solid waste management practices.

On the waste management strategic action plan, the study recommends that, the Environmental Protection Agency (EPA), and the Assembly should conduct regular monitoring systems in order to ensure that residents adhere to solid waste management practices. Again, the Assembly should make available reliable data on solid waste generation for households in the Municipality.

The study suggests that, the Environmental Protection Agency (EPA) and the Assembly should ensure proper enforcement of the bye-laws on sanitation on appropriate solid waste management practices. Residents of the KEEA Municipality should be encouraged by the Environmental Protection Agency (EPA) to consider reuse and recycling as important activities.

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visualization,; supervision,; project administration,; All authors have read and agreed to the published version of the manuscript.

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