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Evaluating Sustainable Solid Waste Management Strategy in Covenant University Otta, Ogun State, Nigeria

N. E. Ekhaese[1], I. A. Tari[2], and A.J. Umameh[3]
Department of Architecture, College of Science & Technology, Covenant University, Ota, Ogun State, Nigeria

Corresponding Author: I. A. Tari, ayuba.ishayapgs@stu.cu.edu.ng

ABSTRACT

The waste management system from research findings has been harmful to humans and the environment due to ineffective management, thus the sustainable approach to waste management may be appropriate in this contemporary society. Institution society like Covenant University generates high solid waste due to the various activities taking place within the academic and residential environment. The focus of this paper is to investigate the effectiveness of the sustainable strategy engage in managing solid waste in Covenant University Ota, to enhance the impact on humans and the environment. A qualitative method was engaged. A semi-structured random selected interview and observation guided with relevant photographs were used as data collection instruments. A case study approach was employed, field investigation of dumping sites within the institution, equipment, survey of the processing site and plant, were presented as a strategy for accomplishing the research. The findings showed that knowledge was gained from the strategy applied in collecting and processing waste using sustainable approach and can be used as a reference in other societies. The result of the study showed that sustainable solid waste management strategy is well deployed and executed, it results in zero waste, economic development and a cleaner environment. Recommendations from findings are suggested for use to promote sustainable waste management for a healthy and sustainable environment.

Keywords: *Academic Environment, Dumping Site, Solid Waste Management, Sustainable Strategy,*

INTRODUCTION

Covenant University, Ota, is located in Ado-Odo Ota Local Government, Latitude 6° 41'N and Longitude 3° 41'E, Ogun State, Nigeria. The population distribution of the institution, according to an article from universitycompass.com Retrieved 9th July 2021 the university has students population of about 8000 and 2000 faculty and staff, the university operates full residency of accommodation for all its students and almost all the staffs. With this population

and the nature of activities going on in the institution, high waste will be generated, which need to be managed effectively and sustainably. Waste management has been a major challenge in the world with the increased populations, urbanization and industrialization. It has many negative health effects on humans and the environment. Everyday human activities generate high Municipal solid waste, the need to manage this waste sustainably without destroying the environment and the ecosystem is very paramount in this our contemporary world. Nang, Samuel, Steve, & Senyo (2017) in their study stated that many studies have shown that municipal solid waste in developing countries is generating households (55%-80%), market area (10%-20%) and institutions among others. The solid waste generation will be difficult to avoid because it is a product of things people use to complement their life, but it can be managed effectively for the health, social and economic development of the people. Tertiary Institutions like Covenant University Otta, Nigeria generates high solid waste due use of paper for academic activities, construction solid waste due to construction and maintenance of building within the institution, household municipal solid waste from the student hall of residents/staff quarters and solid waste from the school restaurants etc. with the amount of waste generated, it needs a sustainable way of waste management to have a healthy environment. It is against the background that the focus of the study is to evaluate the method of solid waste management and the sustainable strategy or approach used in Covenant University Ota, Nigeria. To do so, the study conducted the following: Evaluate the solid waste collection strategy and examine the sustainable method uses in disposing of the solid waste.

A sustainable approach to the environment is a very important factor in having a healthy society, solid waste management is at the top of the ladder in this contemporary world in need of sustainable management strategies for the good of the people and the ecosystem. World bank group (2021) SWM (solid waste management) is a difficult task, to put all of the elements together, it takes tight coordination among multiple stakeholders, constant collaboration through partnerships, ongoing behavioural and mindset change, and financial resources. waste management is a component of the idea of sustainable development, and its state impacts the success of many of the concept's goals. simultaneously, researchers examine the key characteristics of various waste management models, as well as the opportunities these models bring in terms of sustainable waste management. Khudyakova and Lyaskovskaya (2021) in their study stated the three main directions to analyze the global practice of waste management: as a component of the concept of sustainable development; as the basis of a circular economy; and as a cause of environmental regional problems.

World Bank Group (2021) stated in their report on how collective effort of saving a world heritage site by the use of sustainable solid waste strategy in Machu Picchu, food wrappers and plastic bottles are the most generated waste in the site, and they manage it by: saying no to some plastics items, converting cooking oil to biodiesel, recycling and biodegradable waste treatment. All these are sustainable strategies used for solid waste management. Various reason leads to increase of municipal solid waste in the society. Kumar et la. (2017) stated in their study the factor that leads to waste generation in India is the growth of megacities in the country, the further stated that waste collection, storage, and transportation

are critical components of any SWM system, but they can be difficult in cities. In India, SWM disposal is in a critical stage of development. The development of facilities to handle and dispose of increasing amounts of MSW is required. In India, it is estimated that more than 90% of trash is disposed of unacceptably.

Beatrice, & Kantola, (2020) stated that sorting, storage, collecting, transportation, processing, resource recovery, recycling, and garbage disposal are all part of municipal waste management, they further stated that there are many technics in solid waste management, such as landfills, incineration, composting, anaerobic digestion and recycling, prominently preferred method of the solid waste management in Nigeria is open dumping, landfill, burning, while incineration method is seldom part to practice. Many factors are affecting the use of waste management such as poor legislation and implementation of policy, limited infrastructures and professionals, level of awareness, recovery and recycling disposal. Other factors that have to do with knowledge challenge is cultural belief, communication channel, collaboration with intended solid waste management organization/agencies, centripetal waste collection containers, packing and product producers involvement and personal morale. Nwosu, & Chukwueloka, (2020) in their study stated the waste minimization strategy in ascending order as waste prevention, waste reduction, waste reuse, waste recycle/recovery and waste disposal.

Table 1. Analyzing The Constant and Benefit of Solid Waste Management Strategy

S/N	**SOLID WASTE MANAGEMENT STRATEGY**	**CONSTRAINT**	**BENEFIT**
1.	TRADITIONAL WASTE MANAGEMENT STRATEGY. a. Generation/Characterisation b. Collection, c. Transportation and Disposal	Heavy reliance on government policies and authorities for implementation, Segregation of waste is nearly impossible, no coordination of the different steps since they are most times not exclusive, Limited public and environmental awareness, corruption etc	Reasonably cheap. No technical know-how is required.
2.	WASTE MINIMISATION STRATEGY a. Waste prevention b. Waste reduction c. Waste reuse d. Waste recycle/recovery	a. nil b. nil c. nil d. expensive, technical know-how is required, corruption, reliance on the government	a. Cheap, no technical know-how is required. b. No technical know-how is required. c. No technical know-how is required. d. provides an alternate source of revenue and resource while safeguarding the environment.
3.	TECHNOLOGICAL STRATEGY a. Application of GPS b. Application of GIS	Technical know-how is required, Expensive,	Easy and cheap source of data collection tool especially when

	c. Application of Remote sensing	Hardware and Software are limited	covering a large area and population, saves time and energy

Source: Nwosu and Chukwueloka (2020).

RESEARCH METHODOLOGY

The study employed a qualitative research method employing a case study approach. An observation guide, interview schedule and qualitative photo production checklist were used to elucidate data from respondents. The in-depth interview guide was used on experts and build environment professionals (BEPs) like civil energies, environmentalist, urban planners and architects. These experts were drawn from Covenant University centre for waste to wealth (CUCWW), the Planning and Property Department (PPD) and the waste collection and recycling site. An observation guide was used to document some features that are used in solid waste collection and processing. Several hours were spent daily to observe and document on the observation guide, and this process was repeated for weeks. While qualitative photo production was used to collect photographs of the waste management process, from the collection. Sorting, disposal and movement to a recycling site. In the end, some results were presented in tables and pictures.

RESULTS AND DISCUSSION

All the building and environment of Covenant University were visited and the relevant data was obtained. Image's presentation of the field survey from the collection to the disposal process is presented below. The results of data collected and analysed were presented according to the arrangement and the number of objectives of the study. The results of the finding were presented in tables and figures.

4.1 Result of The Evaluation of The Solid Waste Collection Strategies.

The number of waste bins and the nature of waste collected in various buildings and environments is presented in Table 1 below. The result showed an adequate waste bin for collecting waste in the university and a good waste truck collection point.

Table 2. Buildings in Covenant University Number of Solid Waste Bin, Collection Point and Type of Waste

SITE	SOLID WASTE COLLECTION BIN	COLLECTION POINT	TYPE OF WASTE COLLECTED								
			Paper/ cardboard	Plastic food pack	Plastic bottles	Tin cans	Food waste	Polythene bag	Polystyrene food pack	Building waste material	Appliances waste material
CDS	8	1	✓	✓	✓			✓	✓		
CUCRID	12	1	✓	✓	✓			✓	✓	✓	
CEDS	16	1	✓	✓	✓	✓		✓	✓	✓	✓
CST	23	2	✓	✓	✓	✓	✓	✓	✓	✓	✓
LT	5	1	✓		✓	✓		✓		✓	✓
Senate BD	6	1	✓		✓			✓		✓	✓
Access bank	3	1	✓		✓			✓			
ICT centre	2	1	✓	✓	✓			✓	✓	✓	✓
Sport complex	9	1		✓	✓			✓	✓	✓	
University library	12	1	✓	✓	✓			✓			✓
Chapel	7	2	✓	✓	✓	✓	✓	✓	✓	✓	✓
Chemical Engr.	6	1	✓	✓	✓			✓	✓		✓
Engr. Complex	21	3	✓	✓	✓	✓		✓	✓	✓	✓
Guesthouse	6	1	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cafeteria 1	18	3	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cafeteia 2	7	3	✓	✓	✓	✓	✓	✓	✓	✓	✓
Deborah hall	141	1	✓	✓	✓	✓	✓	✓	✓	✓	
Esther hall	132	1	✓	✓	✓	✓	✓	✓	✓	✓	
Mary hall	138	1	✓	✓	✓	✓	✓	✓	✓	✓	
Dorcas hall	121	1	✓	✓	✓	✓	✓	✓	✓	✓	
Lydia hall	118	1	✓	✓	✓	✓	✓	✓	✓	✓	
Joseph hall	113	1	✓	✓	✓	✓	✓	✓	✓	✓	
Daniel hall	224	1	✓	✓	✓	✓	✓	✓	✓	✓	
Paul hall	116	1	✓	✓	✓	✓	✓	✓	✓	✓	
Peter hall	114	1	✓	✓	✓	✓	✓	✓	✓	✓	
John hall	116	1	✓	✓	✓	✓	✓	✓	✓	✓	
P.G male hall	38	1	✓	✓	✓	✓	✓	✓	✓		
P.G female hall	39	1	✓	✓	✓	✓	✓	✓	✓		
P.G cafeteria	2	1	✓	✓	✓	✓	✓	✓	✓	✓	✓
Professor's quarters	38	8	✓	✓	✓	✓	✓	✓	✓	✓	✓

Senior staff's quarters	21	6	✓	✓	✓	✓	✓	✓	✓	✓	
University library	12	1									
Junior staff's quarter's 1	8	3	✓	✓	✓	✓	✓	✓	✓	✓	✓
Environment	31	22	✓	✓	✓	✓	✓	✓	✓	✓	✓

4.2. Result of the sustainable method used in disposing solid waste in Covenant University Ota.

The solid waste is collected from various facilities within the university using small waste bin provided by the university at various lobby, corridors and point in the environment. Every day the janitors collect them and dump them at a central waste bin of the various facilities. The waste is sorted at this point placing various types of waste accordingly. Every day the waste druck collects the solid waste that will not be recycle like the polythene bags, garbage's and dump them in the pit hole behing the school fence. More sorting is done at the pit hole and later level to fill the hole. Other waste like paper and plastic bottles that will be recycles are move to the central collection point in Canaan land where the will be collected and taken to the various reclying plants in lagos. The end product for paper such as toilet tissue paper, saviert are exchanged with the waste paper, bottles are recyle to lace, bag material, human hair material e.t.c. some of the food waste are collected from the various cafeteria and moved to the farm to be used after the decompose as manure, farmer also come over to buy as animal feeds like pigs and goats. Building material waste are moved to physical planning store for renovation and reduce or sort useful element to be use to create another product. The iron waste are sale out to experts for recycling by melting.

Table 2. Analysis of the interview results on the sustainable method used in disposing of the solid waste.

Interview questions	Prof. David O. Olukanni (Director CUCIRF)	Mr Daniel Olugbemi (PPD Covenant University)	Mr Abraham Folunrunsho (Metal waste PPD)
Solid Waste generation in Covenant University?	Organic/ inorganic waste. Plastic bottles, polythene bags, food waste, building material waste, polystyrene pack e.t.c	The university generates different type of waste. From the plastic bottle, paper, food waste and construction waste material e.t.c	Waste is generated from different activities in the University, from residents, academic environment, cafeteria and construction.
Solid Waste collection in Covenant university?	Waste bin (green for organic waste, blue plastic waste while the red is for paper waste)	We collect the waste using waste bin at the various building and every day move	They use a waste bin to collect waste from different points.

		them to a collection point of the particular building.	
Solid Waste disposal at Covenant University?	Waste like polythene bags and others that cannot be recycled is collected using the waste trucks and disposed of at the pit hole behind the school fence. Plastic bottles are gathered at the collection point to be a move for the recycling factory in Lagos. Papers are also collected mostly from the academic buildings and send to the factory in Lagos for recycling.	Sometimes we separate the plastic bottles that are mixed with garbage at the collection point and moved them to the central collection to be taken to the factory. Every week we moved 40 to 45 tons of plastic bottles (120 per ton) to the factory. Papers are collected and taken to the factory. Another waste like building material is moved to the maintenance area close to the new estate gate for reuse or separation. Food waste is collected and taken to the farm, and farmers buy for animal feed. The waste truck disposes of the waste that cannot be recycled to the pit hole 4 trucks per day.	The materials that cannot be recycled are disposed of at the pit hole using the waste truck. Some of the materials like this metal waste product are disposed of here at the maintenance area for reuse or selection.
Solid waste recycling in covenant University?	Paper is collected and recycled to tissue paper and soviet, plastic bottles are recycled to useable materials like bag materials, lace, women weave on e.t.c the metal waste is used to create other usable element or send to factory for melting and recycling to other product. Wood waste is converted to other useful elements, weak wood for cooking. Organic waste from food waste is used for farm manure and as animal feed.	For bottle recycling you should meet Prof. David O. Olukanni in CURID he knows what the recycle it too. Paper is recycled into tissue paper. Food waste is used for manure and animal feed.	We recycle some of this metal waste to create another element or renovate it for reuse. Some of the metal materials that cannot be used are sale out to factory owners that will recycle them for other use.

Figure 1a. Maintenance Waste at Junior Staff Residence

Figure 1b. Platic Refuse Bins For Solid Waste Collection in chapel.

Figure 2a. Small Waste Bin in Student Resident

Figure 2b. Building Maintanence Waste at Hall of Students' Residence

Figure 3a. Environment Waste Collection Point

Figure 3b. Waste Collection Truck.

Figure 4a. Solid Waste Dumping Pit

Figure 4b. Solid Waste Collection Truck After Dumping

Figure 5a. Plastic Waste Sorting Point

Figure 5b. Plastic Waste Transportation to Recycling Plant.

Table 2 shows the result of the interview carried out. The result showed the used integrated approach of waste management which involve collecting, storage, transfer, treatment/processing and disposal. According to Prof. David O. Olukanni during the interview treatment /processing are in three categories, he called it three R reuse, recycle and reduce, a sustainable way of waste management. He further said that plans are being made to use the food waste for bio-gas generation for cooking. The finding showed that the waste was collected using waste bins in the different buildings and environments, the waste was moved to the collection point for the waste truck to collect. The waste was sorted to remove plastic and paper material for recycling. Unwanted waste was disposed of in the in-pit hole using the waste truck, 4 trucks per day. The plastic and paper were moved to the collection centre to be transported to factories in Lagos for recycling. Maintenance and construction waste were collected and disposed of at maintenance stores to be renovated to reduce and sell the unwanted ones to factories for recycling. From the images above which were all author's survey images that showed the pictorial findings of the survey, (a) is appliances and maintenance waste from junior staff residents. (b) waste bin in the chapel. (c) waste bin in a student hall of the resident. (d) construction waste at the students' hall of residence. (e) PG hall waste collection bin. (f) waste truck collecting waste at PG hall of residence. (g) dumping pit hole. (h) waste truck moving out of pit hole after dumping waste. (i) sorting plastic bottles for recycling. (j) moving sorted plastic bottles to the recycling factory.

CONCLUSION

Solid waste management at Covenant University was carefully studied, and it was concluded that the strategy used is sustainable and effective for the environment. The result of the study

showed that sustainable solid waste management strategy is well deployed and executed, it results in zero waste, economic development and a cleaner environment.

RECOMMENDATION

The use of integrated solid waste management strategy was recommended as used by Covenant University to be adopted in other institutions and the society at large for an effective and sustainable solid waste management, to provide a healthy and serene environment.

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