
**THE IMPACT OF AWARENESS OF WASTE MANAGEMENT
PRACTICE ON WASTE MANAGEMENT IMPLEMENTATION IN
DELTA STATE**

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ABSTRACT

This study examined the impact of awareness of waste management practices on waste management implementation in Delta State, Nigeria. The study was motivated by the persistent challenges associated with poor waste disposal and ineffective waste management systems despite existing policies and institutional frameworks. Anchored on the Environmentally Responsible Behaviour theory, the study specifically investigated the extent to which awareness influences the implementation of waste management practices among residents. A descriptive survey research design was adopted to capture the perceptions and experiences of respondents across selected areas in Delta State. The population of the study comprised 4,098,291 residents of Delta State and 580 staff of the Delta State Waste Management Agency. Using the Taro Yamane formula, a sample size of 290 respondents was determined, while a systematic sampling technique was employed in selecting households. Data were collected using a structured questionnaire. The data were analyzed using both descriptive and inferential statistical methods. Descriptive statistics such as frequencies, percentages, and averages were used to summarize the data, while the Pearson Product Moment Correlation Coefficient (PPMCC) was used to test the hypothesis. The findings revealed that there is a significant relationship between awareness of waste management practices and their implementation in Delta State. This supports earlier studies which identify poor environmental awareness as a major constraint to effective waste management in developing countries. The study concluded that inadequate awareness and environmental education among residents significantly contribute to poor waste management practices, resulting in environmental and health challenges such as indiscriminate waste disposal,

drainage blockage, and flooding, particularly in urban centres. Based on the findings, the study recommended intensified public awareness campaigns and environmental education programmes across all local government areas in Delta State. It also emphasized the need for stronger government commitment through adequate funding, effective compliance strategies, and regular waste collection services. Residents are equally encouraged to take responsibility for their waste and comply with established waste management practices.

KEYWORDS: *Waste management, Awareness, Waste disposal, Environmental education, Waste management implementation, Delta State, Environmental sustainability*

INTRODUCTION

Solid waste management (SWM) is a critical environmental problem with direct effects on both the environment, e.g., air, water, and soil, and public health. The increase in waste generation across the world greatly complicates proper waste management activities (Poldnork, 2015; Taherzadeh & Rajendran, 2015). Any non-liquid waste created by individuals, households, small businesses, or institutions outside of the waste generated within cities is referred to as solid waste (SW) and the uncontrolled disposal of SW may affect public health and the environment (Baawain, Al-Mamun, Omidvarborna, & Al-Amri, 2017). It is known that the collection rates of SW may vary significantly from one country to another. According to Hoornweg and **Bhada-ccc**, less than 50% of waste generated is collected in low-income countries: 50% to 80% is collected in middle-income countries, and more than 90% is collected in high-income countries. However, hardly anywhere is 100% collected. The rapid growth in urban populations, economies, and power consumption in developing countries, combined with the failure of institutional authorities responsible for city planning, road works, SWM, and the environment to execute their core functional duties, has led to rampant SW generation (Oliveira, Vidal, & Ferraz, 2020; Saxena, Sarkar, & Singh, 2020; Habib et al., 2019; Habib & Sarkar, 2017) This is especially in Nigeria where there are less solid waste management aware and practices especially in semi-urban communities.

The management of solid waste is far from being satisfactory in Nigeria. Many parts of our cities and towns do not benefit from any organized waste management strategy and therefore wastes are unattended to, buried, burnt or disposed haphazardly. In areas where the authorities do the collection, it is often irregular and sporadic. Recycling of wastes is negligible, while the methods used for transportation and final disposal are very unsatisfactory (UNEP, 2010, Adejobi & Olorunnimbe, 2012, Agwu, 2012). Waste when left

unattended for a long time constitute serious public health hazard, causes offensive odour, pollutes underground water sources and decreases environmental aesthetics and quality (FME, 2015). The poor state of solid waste management in Nigeria is the same everywhere in the country. The situation is similar in the Southern as it is in the Northern part of the country. Take a trip through the cities of Lagos, Ibadan, Benin, Port Harcourt, Aba, Kano, Sokoto, Delta, Kaduna, Maiduguri etc. the story is same everywhere. At the moment, it is only the city of Calabar, Abuja Metropolis and of recent Lagos and Kano that have some measure of cleanliness practices as a result of strict environmental policy and public awareness campaign initiated by their state governments (Adejobi & Olorunnimbe, 2012).

In spite of the above efforts, the challenge of indiscriminate disposal of solid waste is increasing by the day with heaps of wastes on roads, open spaces and drainage channels. The presence of mounted heaps of wastes on roads, open spaces and drainage channels resulting in general environmental pollution, has led many to question the capacity of environmental agency in states in Nigeria especially Delta to perform this very important function. This is an obvious indication that there is a wide gap between public awareness and waste management in villages, towns and cities in Delta State. It is instructive to add that, if quick strides are not made to close the gap between public awareness and indiscriminate waste disposal, the waste burden will only result to potential hazards to human health and the environment. A study by Stanley et al. (2012) reveals that households generate substantial quantity of wastes which are not properly disposed. Some households are aware of the negative impacts of the wastes and try to reduce its accumulation by burning which in turn affects the quality of air within the immediate environment. Their study recommended that there should be community-based public enlightenment on the health impact of improper disposal of waste in the environment (Stanley et al; 2012). This shows how public awareness plays an important role in waste storage, waste segregation, recycling, waste collection and willingness to pay for waste management services. This study therefore examines the effect of awareness of waste management practice on waste management implementation in Delta State.

Objective of the Study

This study examined how awareness of waste management practice can be used to improve waste management implementation in Delta State. It specifically

1. Examined the impact of the awareness of waste management practice on waste management implementation in Delta State.

Research Question

1. To what extent does the awareness of waste management practice influence its implementation in Delta State?

Hypothesis

1. There is no significant relationship between awareness of solid waste management practice and its implementation in Delta State.

Literature Review and Theoretical Framework

Concept of Waste

Several explanations have been put forward for the definition of waste that are considered in this study. Waste can literally be seen as an unavoidable by-product of most human activity. Wastes have also been defined as any product or material which is useless to the producer (Basu, 2009). Dijkema et al, (2000) pointed out that, wastes are materials that people would want to dispose of even when payments are required for their disposal. Although, waste is an essential product of human activities, it is also the result of inefficient production processes whose continuous generation is a loss of vital resources (Cheremisinoff, 2003). Despite this subjective nature of wastes, it is important to describe clearly, what constitutes a waste because. This is because the classification of a material as a waste will form the foundation for the regulations required to safeguard the populace and the environment where the wastes are being processed or disposed of (DEFRA 2011). One common thread among these definitions is the concept that waste is a material that is unwanted by its producer or user. The unwanted materials may be by-products of a production process – fly ash from a furnace, for example.

Concept of Solid Waste

The term “solid waste” means any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities. In the words of Agbroko (2019) solid waste also refers to non-soluble material such as agricultural refuse, industrial waste, mining residues, demolition waste, municipal garbage or even sewage sludge. Most of these kind of wastes cannot be recycled or rehabilitated for further use. According to the Public Health Idaho Institute (2023), "solid waste" is defined as any discarded material that is abandoned by being disposed of, burned or incinerated, recycled or

considered "waste-like." A solid waste can physically be a solid, liquid, semi-solid, or container of gaseous material. Solid waste includes garbage, construction debris, commercial refuse, sludge from water supply or waste treatment plants, or air pollution control facilities, and other discarded materials.

Concept of Solid Waste Management

Solid waste management (SWM) system refers to a combination of various functional elements associated with the management of solid wastes. Nathanson (2018) defined solid-waste management, as the collecting, treating, and disposing of solid material that is discarded because it has served its purpose or is no longer useful. Improper disposal of municipal solid waste can create unsanitary conditions, and these conditions in turn can lead to pollution of the environment and to outbreaks of vector-borne disease that is, diseases spread by rodents and insects. The tasks of solid-waste management present complex technical challenges. They also pose a wide variety of administrative, economic, and social problems that must be managed and solved. The system, when put in place, facilitates the collection and disposal of solid wastes in the community at minimal costs, while preserving public health and ensuring little or minimal adverse impact on the environment.

Overview of Waste Management

Generally, solid waste categorized into agricultural waste, municipal waste, industrial waste, house hold waste and special waste (e-waste, medical waste, plastic waste and construction waste) have shown in figure 1. Plastic is widely used material around the world for different purposes and its usage is merged with people's everyday life. The rapid urbanization and the modernization led to larger usage of plastic material and mostly plastics were used once (single-use plastics) and are immediately discarded. The greatest environmental health effect was caused by plastic waste, viz., 6.3 Mt of plastic waste have been generated in 2018 itself but only 9% was recycled and 12% was incinerated (Alabi et al., 2019).

Globally plastic reached 330 Mt of its production in the year of 2016 (Eco-profiles, 2021). In the next 20 years, it was expected to double. Less than a quarter of the waste is being collected and treated. The mismanaged plastic waste (MPW) accumulated around 60 to 99 Mt globally in 2015 and this quantity can be tripled to up to 155–265 Mt y1 by 2060 (Lebreton & Andrady, 2019). Most of the plastic wastes were washed into the ocean, burned by incinerators and the residues or source is dumped in landfills. These huge volumes of plastic waste leads to very serious consequences, such as environmental pollution, food chain

contamination, energy waste, biodiversity break-downs, economic loss, impacts on wildlife with bioaccumulation of synthetic contaminants and plastic elements (Nnorom & Odeyingbo, 2020; Ntagisanimana, & Ma, 2021). There are four strategies to manage the plastic wastes that are (A) landfilling (B) incineration, (C) reduce, reuse, recycle, (D) create awareness among the people. Incineration decreases the need for landfill of plastic waste but not every country has the infrastructure.

Management of Solid Wastes in Nigeria

Nigeria is a country located in the western part of the African continent, covering an area of approximately 924,000 km². The country has a high population of about 170 million, an estimated growth rate of 2.6% and is placed 7th only behind China, India, the United States, Indonesia, Brazil and Pakistan on a global population ranking (CIA, 2012). Nigeria is made up of 36 states and the Federal Capital Territory (FCT) which are collectively constituted of 774 Local Government Areas; SWM has been identified as one of the major environmental challenges being faced in the country (Adeyinka, Bankole, & Olaye, 2015).

The World Bank (2012) reported that Nigeria is in acute poverty, with the per capita national poverty rate placed at 33.1%. It ranked Nigeria 3rd on World Poverty Index after India and China respectively. Those who fall under the poverty line, as defined by the World Bank, earn less than \$1.25 (0.96 GBP) per day. The report also stated that 7% of 1.2 billion people living below the poverty line worldwide are Nigerians.

It is estimated that 0.49 kg of solid waste is generated per capita per day in Nigeria with households accounting for about 90% of the municipal solid waste generated (Solomon, 2009). The increasing population of low income areas coincides with subsequent increases in municipal solid waste generation (Hoornweg & Bhada-Tata, 2012). The total municipal solid waste generated in urban areas in Nigeria was estimated to be 40,959 tonnes per day in 2012, and by 2025 it is estimated it will rise to 101,307 tonnes per day (Hoornweg & Bhada-Tata, 2012)..

The solid waste issue drew the attention of human civilization even before water and air pollution issues. Due to the advancement in the development of items, technologies, and services, the quality and quantity of solid waste kept on changing throughout the years. Hence, the solid waste qualities depend on individuals' income, culture and location as well as economy general public experiences and circumstances like a hazard to which the general public might be subjected to (Chen, Dietrich, Huo & Ho, 2011). The historical development of developing nations is not starkly similar to that of developed nations. The method of solid

waste disposal or sanitation and its associated human and environmental problems in Nigeria like any other African nation today are remindful of the 19th century of Europe and perceived as the 20th century of Asian and, it appears everyone needs to win 'as much conceivable' (Chandrappa & Brown, 2012). Thus, presently Nigeria like any other Africa are living in the past of the 19th century of Europe and the 20th century of Asian in terms of urban solid waste management and its attendant human and environmental problems.

As a result, Yongsi (2008) observed that, solid waste regularly spreads into the street, blocking traffic, gutters and so on. Hence, a reasonable amount of solid waste remains uncollected; when solid waste piles up, households and businesses gather it in the middle of main roads and burn it. Consequently, these lead to inadequate solid waste management with far-reaching ramifications to both public and environmental health (Zainu & Songip, 2017). From the background information described above, Nigeria is a country that epitomizes protracted solid waste management issues going by the trend of its population growth. That it is the most populated black nation in the world, with enormous wealth from crude petroleum. However, the country has been facing numerous environmental and socio-economic problems such as urban solid waste management and poverty, with the population more than 190 million, known as the giant of Africa (Ezeh, 2017).

Household solid waste in most Nigerian states is generally not collected directly from households, but residents take solid waste and deposit it in communal public solid waste containers prior to collection by the municipal solid waste collectors. The exception is a few states including Lagos, Calabar and Abuja, who engage the services of the private sector, and they collect solid waste directly from households. However in these states the system is not universal, rural and low income areas rarely receive such services (Iriruaga, 2012).

Awareness of Waste Management Practices and Waste Management Control in Delta State

The single greatest constraint to solid waste management in developing nations is poor environmental education and awareness (Srivastava, Kulshreshtha, Mohanty, Pushpangadan & Singh, 2005). It is important for the government to overcome this constraint and implement successful programs that will enhance public knowledge of the environment. It is widely accepted that environmental education and awareness programs that produces enduring knowledge and commitment can transform the residents into an environmentally conscious people. Through these programs, residents can understand how the environment can affect and be affected by their actions (Perron, Cote & Duffy, 2006). These programs will enable

the residents desist from indiscriminate dumping of refuse at illegal dumpsites, roadways, streets and public places. The government should intensify awareness program to educate and sensitize the residents on the need for proper solid waste management practice. Residents should take responsibility for their generated solid waste and be willing to pay the corresponding solid waste management fee. The government also must encourage the residents through steady and scheduled collection of solid waste.

Local governments often lack the expertise needed to evaluate technologies or solutions in order to identify the most appropriate ones for their situation. Difficult situations can arise when private companies contract with cities to provide a technology or implement a project but abandon the project if the city cannot meet the terms of the contract. For example, many solid waste treatment project contracts include requirements that the city guarantee a clean or consistent feedstock. Private companies can and will abandon the work if the city fails to meet these requirements. Cities do not always anticipate these challenges, and projects can fail as a result. Decision-makers and staff at the local level are often not aware of best practices that other cities in similar situations have implemented successfully.

Banga (2013) reported in her work that participation in solid waste management activities depends on the level of awareness, household income, educational level and gender. Ayodeji (2012) studied the waste management awareness, knowledge and practices of secondary school teachers in Ogun state and concluded that all the teachers were aware and knowledgeable about waste management even though they possessed negative waste management practices. He reported appreciable awareness and knowledge about waste disposal among people in Nigeria but indicated that they are only aware of the crude and traditional methods and are oblivious of the modern methods such as incineration and recycling. Adeyemo and Gboyesola (2013) stated that, the attitude of people towards waste management can be affected by their level of knowledge and awareness of waste management. They also reported that homes with waste bins engage more in proper way of storing waste than homes without waste bins. In Ghana, Asuamah et al (2012) reported that, people attitude towards recycling and waste management showed no significant effect on gender, employment and educational statuses.

Addaney and Anarfiwaah (2015) concluded that some public awareness being created with little supervision yielded results due to the rising indiscriminate disposal and littering in the municipalities. They added that abysmal solid waste practices have clogged most of the few available drains creating stagnant water for insect breeding and floods during rainy seasons. They also noted large open spaces in the Municipalities dotted with heaps of refuse sited

close to residential areas as contributing factors. All these pose risk to both public and environmental health.

Theoretical Framework

This study adopted Environmentally Responsible Behaviour theory. The Environmentally Responsible Behaviour (ERB) theory was proposed by Hines, Hungerford and Tomera (1987). The model argues that possessing an intention of acting is a major factor influencing ERB. The Model of Responsible Environmental Behavior indicates that the following variables; intention to act, locus of control (an internalized sense of personal control over the events in one's own life), attitudes, sense of personal responsibility, and knowledge suggested whether a person would adopt a behavior or not.

According to the model, the internal control centre has a very considerable impact on the intention of acting, which determines an individual's ERB substantially. This model also highlights the existence of a relationship between the control centre, attitudes of individuals and their intention to act. The authors asserted that the control centre directly affects an individual's attitudes which can lead to an improved intention of acting and improved behaviour. Thus, the theory concentrates more on existing interactions between parameters that influence a person's behaviour than on the singular impact of a single variable

In solid waste management processes, no single factor is responsible for current behaviors or sufficient to initiate behavior or cause behavior change. For instance, people pile up their solid waste materials in the middle of the streets in large cities like Ibadan, Port Harcourt, Jos etc., despite regulations from solid waste management authorities, prohibiting these acts. Many of these flouters do so at odd hours when law enforcement agencies are not available, others are influenced to indiscriminately dump these solid waste materials because they see others doing so, yet some still find ways of decently disposing off their solid waste materials. It includes both general actions (talking with others about environmental issues; encouraging family and friends to behave in environmentally responsible ways) and specific actions (recycling; purchasing environmentally friendly & sustainable goods; conservation of energy by turning off lights and using alternate sources of energy, such as solar, hydro, or wind energy; and reduction in fossil fuel dependence by utilizing alternative means of transportation) (Thogersen, 2006).

Research Method

A descriptive survey method was adopted for this study. This method is helpful in obtaining various forms of data concerning the existing status of the problems of the study area and incorporating human experiences from several dimensions as well as data description. The population of Delta State is (4,098,291) and the total staff of Delta State Waste Management Agency is (580) (Delta State Waste Management Agency, 2022). A total of two hundred and ninety (290) respondents were selected for the study. The Taro Yamane formula was adopted. The systematic sampling technique was used to choose the sampling units. Numbers was assigned to all the houses. Household number one was selected as the first Household and every fifth house in all the streets were systematically chosen until the whole areas was covered and this method was maintained for all the three areas. In all, 290 households were used as respondents in this research study. The study adopted the questionnaire as instrument of data collection for the study. The structured questionnaire was used. The study used the descriptive and analytical approaches in the treatment of data. Data were analyzed using descriptive statistical techniques involving tabulation, percentages and averages. The analytical tool to use to test all the hypotheses in the study was Pearson Product Moment Correlation Coefficient (PPMCC).

4.0 ANALYSIS AND RESULTS

This section contains the analysis of data and discussion of results. The analysis is presented below beginning with the socio-demographic features of the respondents.

		Frequency	Percentage
Sex	Male	66	26.4
	Females	184	73.6
	Total	250	100.0
Age	15-35 years	18	7.2
	26-35	115	46.0
	36-45	60	24.0
	46+	57	22.8
	Total	250	100.0
Marital status	Single	118	47.2
	Married	132	52.8
	Total	250	100.0
Monthly income	Less than 30,000	4	1.6
	31,000-50,000	46	18.4
	51,000-100,000	12	4.8
	101-200,000	84	33.6
	201,000-300,000	8	3.2
	301,000-400,000	39	15.6

	401,000-500,000	43	17.2
	501,000 and above	14	5.6
	Total	250	100.0
Family Size	Individual	45	18.0
	2-4 people	109	43.6
	5-7 people	67	26.8
	More than 8 people	29	11.6
	Total	250	100.0

Source: Fieldwork, 2023

Data obtained in Table 4.1 revealed that 26.4% of the respondents comprise of the male while 73.6% of the total population are females. Majority of the respondents comprising of females have better understanding about the environmental and health effects of solid waste management in the study area. Data obtained in the table also revealed that 7.2% of the respondents are between the age of 15-25years, 46% are between the age of 26-35years, 24% are 36-45years and 22.8% are 46years and above. Data obtained shows that 34.8% of the respondents are single, 47.2% are married, 52.8%. This indicates that majority of the respondents are married and comprise of the large household who generates large quantity of solid waste on daily basis. Therefore, solid waste generation and management problems could be more severe among married couples than the single population in the major towns within Delta State.

The data obtained in the table further revealed that majority (33.6%) of the respondents earn ₦101,000-₦200,000 monthly, followed by those who earn ₦31,000-₦50,000 (18.4%), ₦401,000-₦500,000 (17.2%), ₦301,000-₦400,000 (15.6%), ₦501,000 & above (5.6%), ₦51,000-₦100,000 (4.8%), ₦201,000-₦300,000 (3.2%), and less than ₦30,000 (1.6%). This indicates that waste generation and management problems are severe among high income earners who generate large volume/quantity of waste on daily basis in Delta State. This implies that income level is related to waste generation, the more income one earns, the more waste he/she generates. Lastly, the table showed that 18% of the respondents stay alone (individual), 43.6% live 2-4 persons per dwelling unit, 26.8% live 5-7 persons per dwelling unit while more than 8 people live in a dwelling unit. This indicates that the population comprise of large household size that generates large quantity of waste (especially food remnants) on daily basis resulting to environmental and health issues and solid waste generation/management problems in the area. The table reveals in all that waste generation is tied to sex, marital status, and income of the individual and family size as determinant factors in the studied areas.

Table 4.2: Awareness of the effect of improper waste management on health.

Awareness	Number of Respondents	Percentages (%)
Aware	91	36.4
Slightly aware	85	34.0
Unaware	74	29.6
Total	250	100

Source: Fieldwork, 2023

Data presented in Table 4.36 reveals that 36.4% are aware of the effect of improper waste management on health, 34% of the respondents are slightly aware and 29.6% of the respondents are not aware. This implies that there is high awareness of the effect of improper waste management on health in Delta State.

Hypothesis

There is no significant relationship between awareness of waste management practice and its implementation in Delta State.

Table 4.3: PPMC Correlations.

		awareness of waste management practice	its implementation in Delta State
Pearson Correlation	awareness of waste management practice	1.000	.453
	its implementation in Delta State.	.453	1.000
Sig. (1-tailed)	awareness of waste management practice	.	.000
	its implementation in Delta State.	.000	.
N	awareness of waste management practice	8	8
	its implementation in Delta State.	8	8

Source: SPSS Output, 2023

From Table 4.3, the computed PPMCC correlation value ($r=0.453$) is significant ($P>0.000$) at 0.05 level of significance. Therefore, the null hypothesis which states that there is no significant relationship between awareness of waste management practice and its implementation in Delta State is rejected, while the alternative hypothesis which states that there is a significant relationship between awareness of waste management practice and its implementation in Delta State is accepted. This indicates that the relationship between awareness and practice of solid waste generated in Delta State are significantly correlated.

DISCUSSION OF FINDING

The result of the analysis obtained in hypothesis two revealed that the F-calculated value of 0.453 is significant at ($p > 0.000$). This shows that there is a significant relationship between awareness of waste management practice and its implementation in Delta State. This is in line with the finding of Srivastava et al. (2005) who argued that the single greatest constraint to solid waste management in developing nations is poor environmental education and awareness. It is important for the government to overcome this constraint and implement successful programmes that will enhance public knowledge of the environment among residents of the state. It is widely accepted that environmental education and awareness programs that produces enduring knowledge and commitment can transform the residents into an environmentally conscious people. Through these programs, residents can understand how the environment can affect and be affected by their actions Also, the work of Perron, Cote and Duffy (2006) support this finding as it revealed that programmes of education and awareness creation will enable residents desist from indiscriminate dumping of refuse at illegal dumpsites, roadways, streets and public places. The government should intensify awareness program to educate and sensitize the residents on the need for proper solid waste management practice. Residents should also take responsibility for their generated solid waste and be willing to pay the corresponding solid waste management fee. The government should equally encourage the residents through steady and scheduled collection of solid waste.

5.2 CONCLUSION

The hypothesis tested showed that many people within Delta State are not properly educated on the management of waste and how to properly dispose them so as not to constitute health hazard and environmental challenges such as drainage blockage that will lead to flooding. This is especially in growing cities and urban centres where there are no proper designated areas for waste disposal.

RECOMMENDATIONS

Based on the research finding, the following recommendations/suggestions were made:

1. There should be more awareness created on waste management practices and how to dispose them within Delta State. The ministry of environment should develop a programme that will help to create awareness across the 25 local government areas in

order to get people aware and involved in the proper management and disposal of waste in the state.

2. The Delta State Government should be more committed to waste management concerns in the state through adequate funding and effective compliance strategies.

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