PLASTIC RECYLING AND ENVIRONMENTAL SUSTAINABILITY IN CROSS RIVER STATE, NIGERIA

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Abstract

The study investigated plastic waste recycling and environmental sustainability in Cross River State. To achieve the purpose of this study, one objective and one null hypothesis were formulated and tested at 0.05 level of significance. Survey research design was adopted for the study. The population of the study comprised all adult residents in the study area. Stratified random sampling technique was employed to select ten local government areas. Simple random sampling technique was adopted to select forty communities while systematic sampling technique was adopted to select 816 respondents used for the study. A validated structured questionnaire was deployed for data collection. Data analysis and testing of hypothesis was done using linear regression analysis. The result obtained from analysis of data indicated that there is a significant influence of plastic waste recycling on environmental sustainability. It was concluded that waste to wealth activities significantly contribute positively to environmental sustainability. Based on the findings it was recommended among others that the Ministry of Environment should site recycling hubs across the state and therefrom, sensitize and encourage residents to recycle their plastic waste in order to reduce the volume of waste generated and promote environment sustainability

Keywords: Plastic, Recyling, Environmental Sustainability

Introduction

The well-being of humans and other living organisms is closely connected to the quality of the environment they live in. People desire to breathe clean air that is free of pollutants, potable water to drink and places to live that are almost totally free of hazards or toxic substances. As people continue to experience the long-term consequences of exponential growth of industries and use of energy, they must take urgent steps to reverse these consequences and prevent further damage and ensure that there are healthy places for several years to come. Environmental sustainability means being committed to environmentally sustainable practices to help build growing communities and secure potentials for future growth and development. Louis (2019) asserted that environmental sustainability is taking responsibility towards the conservation of natural resources and protection of global ecosystems to support health and well-being, now and in the future (Olofu et al, 2017). The reason is that several decisions that impact the quality of the environment are not felt immediately as they are implemented; a key characteristic of environmental sustainability is its forward-looking nature.

The standards for measuring environmental sustainability differ significantly based on social, local economy, and environmental conditions. The regulations for promoting and maintaining environmental quality or sustainability are usually developed at the federal level of governance. The Ministry of Environment through its approved agencies is responsible for regulating refrigerants, air pollutants and hazardous waste management. The Ministry sets standards for the quality of water, air, wildlife habitats, soil, and carbon emission and also

enforces the implementation of these standards with relevant restrictions and sanctions (Richard, 2017; Enya et al 2022).

The viability of natural environment is very relevant to the survival of humans and other living organisms of the earth. This places responsibility on humans to live in harmony with nature and care for it. As human activities go on in a geometric pace, a lot of pressure is exerted on the carrying capacity of the earth. Wanton and careless exploitation seems to focus on meeting the needs of today without providing for the requirements of our future generations. This implies that future generations face the threat of environmental resource deprivation, if we do not change our perception in order to support sustainable development. This is to ensure that the environment can continue to support the needs of the present as well as those of future generations at all times (Olofu et al, 2021). Barry (2020) maintained that environmental sustainability arose out of the realization that man's exploitation of nature continues to have damaging impact on the environment. This is based on the conviction that the future needs must be met. Sustainable development is a development that meets the needs of the people at present without compromising the ability of the future generation to meet their needs.

Waste management has become a contending issue in our metropolitan cities. Man on a daily basis is engaged in various activities that promote waste generation; be it food waste, paper, leather, broken glasses, bones, vegetables, fruits, wastewater, clothes among others. These have become very complex in nature and consequently, extremely difficult to manage. It has become common to see open spaces in major areas covered with materials considered to be wastes. The current trend in the management of solid waste has been identified as contributing to the problems facing environmental sustainability. There are various types of solid waste, and each has inbuilt potential to degrade the environment, if not properly managed. Kingston (2020) reported that it is no longer news that corporate entities, states and individuals are faced with the challenge of dwindling economic fortunes, which has pushed them to consider various alternatives aimed at generating more wealth. These groups have recently discovered that diversifying into waste management has become a lucrative business that should be adequately explored and utilized to boost business fortunes. This has created new jobs, boosted income, and revenue and profit levels. The waste to wealth concept has also contributed to a reduction in the hazards associated with indiscriminate waste disposal.

The recycling of waste is one of the three components of waste recovery. It involves collecting waste materials and converting them to other uses either for sale or put into other uses. In most cases, such wastes are converted to profitable ventures with the aim of creating wealth. Recycling, from an economic view point, is creating value from potential waste products. It is gaining wide acceptance as a blooming business venture in Nigeria. Though still at a low level of growth, the waste to wealth concept is expected to reduce the volume of wastes found in open spaces and enables individuals, states and corporate organizations to maximize the benefits associated with waste through recycling and reuse approaches. The wastes to wealth initiative usually involve some specific category of waste, which has been recycled in recent years.

One of the main raw materials for the wastes to wealth initiative is plastic waste recycling. Plastic material is in high demand and its usage is expected to increase as new products are developed to meet human demands. Plastic waste remains a major problem in most developing countries requiring very urgent attention. Plastic in the context of bottles, bags, and water sachets is constructed from high-density polyethylene terephthalate (PET) and low-density polyethylene (LDPE) and it remain in the environment due to their undegradable nature.

Plastic items are utilized in a variety of ways and have become an essential part of the everyday lives especially in packaging (Olofu et al, 2024; Sharuddin, Abnisa, Daud, & Aroua 2016). With the surge in human mobility and modernization Plastic will continue to be in high demand because of its durability, convenience, simplicity of production, and cheap cost [Wong, Ngadi,

Abdullah & Inuwa; 2015; Pan, Su, Liu & Guo 2020). Otu (2019) asserted that the recent innovation in bottling of liquid drinks has led to a significant increase in the volume of plastic waste generated across various locations. Once the contents are consumed, the empty plastics are usually discarded, thereby constituting indiscriminate disposal. The wastes to wealth initiative have encouraged the recycling of these empty plastic containers into other uses or even been reused (Bessong et al, 2023). This serves as a source of income generation to various individuals and corporate organizations. The conversion of these materials, which were usually considered as waste into other use has also contributed significantly to the promotion of environmental hygiene and subsequent sustainability of the environment.

Reprocessing of recovered plastic scraps or wastes into usable products is called plastic recycling. Most plastics are non-biodegradable in nature. Hence, the fundamental work is reduction of waste emissions, effective management and recycling of resulting wastes. Recycling of plastics is a major aspect of the worldwide efforts to minimize the yearly 8 million tonnes of plastics in the waste stream entering the Earth's ocean (Ifekwe, 2017). According to Hopewell (2018) plastic recycling terminology is complex due to varieties of recovery activities and recycling. There are four main categories of recycling which are: primary (which involves the mechanical reprocessing of plastics into a new product with equivalent properties), secondary (which involves the mechanical reprocessing of plastics into a product with lower properties), tertiary (which involves the recovery of the chemical constituents of the plastics) and quaternary (which involves energy recovery from the plastics). These processes help to generate income for various operators within the recycling industry as well as contribute significantly to the sustainability of the environment. Plastic waste recycling has twin benefits of wealth creation and environmental sustainability and requires to be given priority attention.

The act of plastic recycling reduces the demand for extracting new raw materials from the environment as it reuses the material that is already processed and protects natural resources. This can help reduce emissions of heat-trapping gases into the atmosphere. It also prevents adding more garbage to landfills. The process of increasing plastic recycling leads directly to a reduction in the use of waste dumps for disposal of wastes. This is achieved by turning recyclable plastics into new products and removing significant amounts of waste from the environment. This also means common dump site gases, such as methane, are not released into the atmosphere to cause damage to the planet or human health (Ejike, 2019; Atim, 2024; Itighise, 2016)). This reveals that the act of converting plastic waste materials into profitable outcomes also promotes the sustainability of the environment. This makes plastic waste recycling a wealth creation venture as well an environmental protection and sustainability initiative.

Huang, et al (2022) assert that Six categories of PW management strategies include: landfills, recycling, pyrolysis, liquefaction, road construction and tar, and concrete production. Landfilling is said to be the most undesirable strategy because of the environmental and human health concerns. Recycling is seen as the most sustainable.

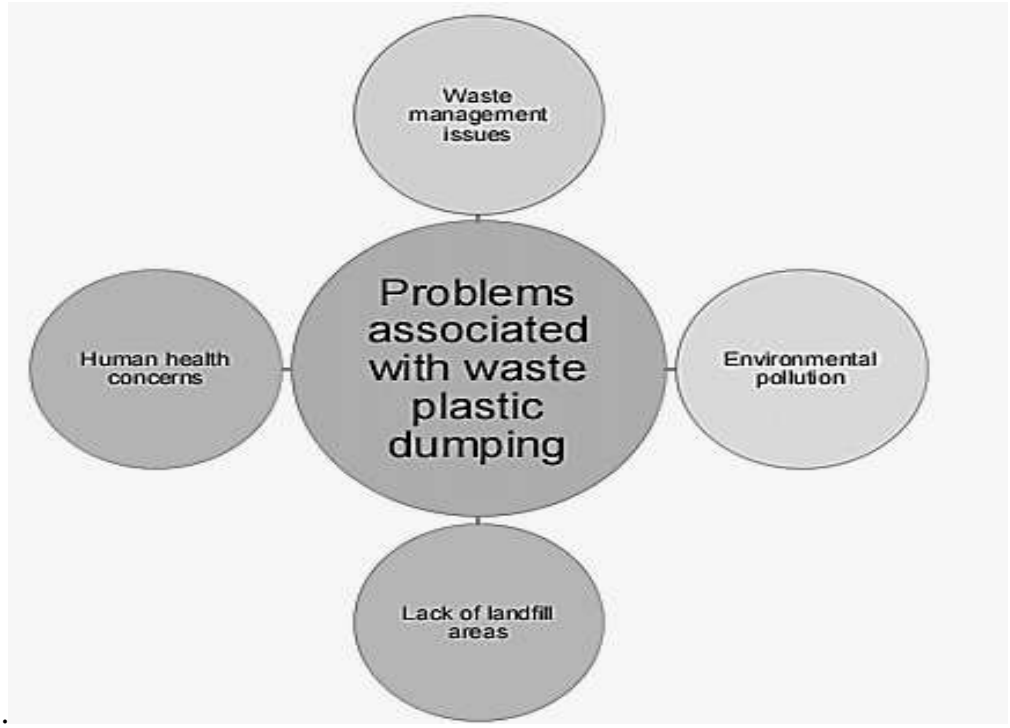

Figure 1 Disadvantages of plastic waste disposal in landfills SOURCE: Huang, et al[2022]

Humans have been involved in various survival activities without considering the consequences of their actions on the environment. This neglect has resulted in outcomes that seriously threaten environmental sustainability. The manner in which the waste generated from various human activities is handled poses a severe threat to the sustainability of the environment. The management of various forms of waste has been characterized by the throw-away attitude, where most materials considered to be useless are discarded indiscriminately into the environment. This has resulted in widespread littering of the environment with various forms of waste materials. These wastes material often constitute severe aesthetic nuisance in various locations within the study area.

Indiscriminate dumping of household, commercial, agricultural, construction and demolition wastes along streets has caused severe degradation to the quality of the environment, which now poses severe health challenge like bacillary dysentery, diarrhoea, viral fever, eye disease, irritation of the skin, nose, and eyes, gastrointestinal problems, psychological disorders, and allergies to people in such areas. The composition of a typical domestic refuse dump may include leaves, papers, rags, nails and cans, grit or dust, and polythene among others. A heavy downpour of rain can also wash the refuse into open bodies of water (i.e. surface waters like streams and rivers) resulting in pollution.

This situation has become so worrisome to various stakeholders who attribute these littering scenes to poor management of the waste materials generated from homes, offices, commercial premises, agriculture, schools, stadiums, markets and other public places. In response to these challenges, the government has since declared the last Saturday of every month as environmental sanitation day. There have been increased awareness creation programmes among residents of the study area, the establishment of sanitation courts among others have yielded little efforts in safeguarding the quality of the environment. This informed the call for alternative approaches to managing the high volume of waste generated on daily basis. One of the approaches suggested in recent years is the recycling of waste materials into other uses in order to reduce the volume of materials usually discarded into the environment as waste. It also enables individuals and groups earn money from such wastes.

Methods

The survey research design was used for the study. The research design studies situations as they exist at the time of a research activity. According to Brian (2018), survey research design is a research approach that attempts to systematically collect data about a group of individuals (sample) who have the same characteristics, through the use of written or oral data collection instruments. These include interviews, questionnaires, telephone interview, mails, and internet, concerning participants' responses on facts, opinions, attitude among others. This is to enable the researchers study the group (population) of which the researchers has no control over the independent and dependent variables and the phenomenon is studied in its raw form as it is happening. This design was chosen because this research is designed to investigate waste to wealth activities and environmental sustainability in Cross River State. The purpose of this study can be achieved through the survey research design.

The research area for this study is Cross River State, Nigeria. Cross River State lies between latitudes 4º 28′ and 6º 55′ north of the Equator and longitudes 7º 50′ and 9º 28′ East of the Greenwich meridian within the tropical rainforest belt of Nigeria. It shares boundaries with the Republic of Cameroon in the East, Benue State in the North, Ebonyi and Abia States in the West, Akwa Ibom State in the South West and the Atlantic Ocean in the South. Cross River State lies within the Cross River Basin which has a total area of 53,855 km2 of which 44,105 km2 lie in Nigeria and 9750 km2 in Cameroon. The Cross River Basin also covers parts of Benue, Abia, Ebonyi, Enugu and Akwa Ibom States in Nigeria.

The population of the study consisted of all adult residents of Cross River State. The projected population of the study comprised individuals that are drawn from various occupations including students, public service, mechanics, business, industry, trading, and other related occupations. The sample for this study consisted of eight hundred and sixteen (816) respondents that were randomly selected from forty communities in ten local government areas in Cross River State.

The instrument used for data collection in the study was a structured questionnaire titled Plastic and Paper Wastes Recycling as Wastes to Wealth Activities and Environmental Sustainability Questionnaire (PPWAWAESQ). The instrument is divided into two sections. Section A elicits personal data of the respondents. Section B was developed by the researchers using a four point rating scale Very Often (VO), Often (O), Sometimes (S) and Never. It contained twenty (20) items that measured the variables of the study. The designed questionnaire was validated to ensure that the content is rich enough to measure what it was purported to measure. The researchers designed the questionnaire and presented it to two lecturers in Environmental Education and three in Measurement and Evaluation for face validity of the instrument before it was administered for reliability test. Some items were rephrased; others were deleted while others were added to the items in the instrument. The Cronbach alpha reliability test of the instrument was carried out. The researchers administered 50 copies of the instrument once in two local government areas that will not be part of the actual study. Data obtained from the study was coded and analyzed using Cronbach Alpha reliability estimate. Result obtained from the analysis of the data revealed a reliability range of 0.728 to 0.842.

The researchers went to all the communities selected for the study for the purpose of data collection. In each of the communities visited, the researchers sought the permission and consent of the community leader after explaining the purpose of the visit. After obtaining the desired permission, the researchers with the help of two trained research assistant engaged the respondents for data collection. Eight hundred sixteen (816) copies of the questionnaire were administered and retrieved in four weeks. After the retrieval of the questionnaire, it was observed that it was only eight hundred and eight (808) copies that were responded to properly by the study respondents. Data obtained was coded and analyzed using simple linear regression analysis.

Result and Discussion

Simple linear regression statistical tool was employed for data analysis. The result of this analysis is presented in Table 2.

Table 2: Simple linear regression analysis of the influence of plastic waste recycling on environmental sustainability in Cross River State

Model	R	R2	Adj.R2	Std error of estimate	
1	.538*	.289	.288	.69503	
Model	SS	Df	MS	F	Sig
Regression	158.305	1	158.305	327.712	.000
Residual	389.347	806	.483		
Total	547.652	807			

*Significant at p<.05

The result of analysis of data presented in table 6 indicates that the independent or predictor variable (plastic waste recycling) has a significant influence on the dependent or predicted variable (environmental sustainability) among residents of Cross River State. This implied that plastic waste recycling accounted for 28.9% of environmental sustainability in the study area. Secondly, the result of regression ANOVA presented in table 2 revealed that there was a significant influence of plastic waste recycling on environmental sustainability, F (1, 806) = 327.712; p<.05. The result of this analysis indicated that there is a moderate contribution of plastic waste recycling on environmental sustainability. This showed that plastic waste recycling is positively influencing environmental sustainability in the study area.

The finding from analysis of data and testing of hypothesis one in the study indicated that the null hypothesis was rejected. This implied that there was a significant influence of plastic waste recycling on environmental sustainability in Cross River State. The reason for this finding could be that there is an increase in the gathering of used plastic containers for other uses after events. In the past, these plastic containers were discarded immediately after they had served their initial purpose. This resulted in littering of plastic waste all over major residential, industrial and commercial areas as well as schools and markets (Ibu et al, 2019). In the last decade, these plastic containers have rarely been disposed of after their initial use. They are now collected, washed, recycled, and reused by various individuals and groups. These activities have reduced the volume of plastic waste with subsequent implication for the sustainability of the environment, especially land and water resources of the earth.

The finding of this study agrees with that of Ejike (2019) who reported that the act of plastic recycling reduces the demand for extracting new raw materials from the environment as it reuses the material that is already processed and protects natural resources. This can help reduce emissions of heat-trapping gases into the atmosphere. It also prevents adding more garbage to landfills. The process of increasing plastic recycling leads directly to a reduction in the use of waste dumps for disposal of waste. This is achieved by turning recyclable plastics into new products and removing significant amounts of waste from the environment. This also means common dump site gases, such as methane, are not released into the atmosphere to cause damage to the planet or human health (Bessong et al, 2021; Ejike, 2019; Meremikwu et al, 2022; Kankpang et al, 2022). This reveals that the act of converting plastic waste materials into profitable outcomes also promotes the sustainability of the environment. This makes plastic waste recycling a wealth creation venture as well an environmental protection and sustainability initiative.

Recommendations and Conclusion

The essence of the study was to ascertain and present findings on waste to wealth activities and environmental sustainability in Cross River State. The finding that was obtained from analysis

of data and testing of hypotheses in the study revealed that there was a significant influence of plastic waste recycling on environmental sustainability in the study area. It can be concluded that waste to wealth creates activities that significantly contributes positively to environmental sustainability. Based on the findings, the researchers made the following recommendations:

i. The Ministry of Environment should site recycling hubs across the state to sensitize and encourage residents of the study area to continue to recycle their plastic waste in order to reduce the volume of waste generated and promote the sustainability of the environment.
ii. Relevant environmental agencies should continue to engage residents of the study area to encourage them to continue to recycle their waste and contribute to maintaining a safe environment.
iii. The sensitization on the economic value of bottles/glass waste materials should be intensified across the study area to enable more residents to earn money from the activity and promote environmental sustainability.

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