

ASSESSMENT OF PLASTIC WASTE AND WEALTH IN ABAKALIKI URBAN AREA, SOUTH EAST NIGERIA.

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Abstract

The study examined the assessment of Plastic Waste and Wealth in Abakaliki Urban Area, South East Nigeria. The specific objective sought to; Examine the effect of Plastic Lifecycle Analysis on the Wealth creation and evaluate the effect of Environmental Impact on the Wealth creation in Abakaliki Urban Area, South East Nigeria. The study adopts a quantitative study. A primary source of data was adopted for the study. A well structure questionnaires was use to collect data. The questionnaires were design in line with a five-point Likert scale. The data was analysed using the structural equation modeling technique with the aid of SmartPLS 4.0. The study revealed that plastic lifestyle has significant positive effect on wealth creation given that $\beta=0.218$ and $P < 0.001$. While environmental impact has significant positive effect on wealth creation given that $\beta=0.240$ and $P < 0.001$. The study concluded that the assessment of Plastic Waste has significance positive effect on the Wealth in Abakaliki Urban Area, South East Nigeria. We recommended that The government should identify and invest in companies that are actively adopting sustainable and eco-friendly plastic alternatives. With the growing global focus on environmental responsibility, businesses in this sector are likely to experience increased demand, leading to potential returns for investors.

Keywords: Assessment, Plastic, Waste, Wealth

1.1 Introduction

The proliferation of plastic waste has emerged as a pressing global environmental challenge, demanding rigorous attention and innovative solutions. In the urban centers of developing nations, such as Abakaliki in the South East of Nigeria, the issue of plastic waste management poses a multifaceted dilemma. Rapid urbanization and population growth have led to increased consumption and disposal of plastic products, placing significant strain on local waste management systems. Simultaneously, urban areas often exhibit disparities in wealth distribution, exacerbating the challenges of equitable plastic waste management. Assessing the relationship between plastic waste and wealth within the context of Abakaliki Urban Area offers a critical lens through which to comprehend the complex dynamics of urban environmental sustainability and socioeconomic disparities. This research endeavor seeks to investigate the intricate interplay between plastic waste generation, disposal practices, and the socioeconomic status of residents in Abakaliki. By understanding how plastic waste is produced, managed, and

perceived across different wealth strata, we aim to provide valuable insights that can inform policy, community engagement, and sustainable development initiatives.

Plastic waste, characterized by its durability and persistence in the environment, has far-reaching ecological consequences, including the contamination of water bodies, harm to wildlife, and contributions to greenhouse gas emissions when incinerated. At the same time, the management of plastic waste has direct economic implications, as efficient waste collection and recycling systems can create job opportunities and support local industries. However, these benefits are often distributed unevenly, with marginalized communities facing greater environmental burdens and fewer economic benefits. Wealth distribution in urban areas is an equally pertinent issue, as it influences access to resources, services, and opportunities. Abakaliki Urban Area, like many urban centers in Nigeria, exhibits disparities in income, education, and access to basic services, which can affect the capacity of different groups to cope with and contribute to solutions for plastic waste management. By analyzing how plastic waste is generated, discarded, and perceived across various socioeconomic groups, this research will shed light on the potential disparities in environmental impacts and vulnerabilities among residents.

Furthermore, this study aims to contribute to the broader discourse on sustainable urban development and environmental justice by highlighting the need for inclusive and context-specific strategies to address plastic waste challenges. As Abakaliki continues to grow and urbanize, finding innovative approaches to plastic waste management that consider the diverse needs and capacities of its residents is not only an environmental imperative but also a crucial step toward achieving a more equitable and sustainable urban future.

1.2 Statement of the Problem

The rapid proliferation of plastic waste in urban areas of South East Nigeria, including Abakaliki, has raised significant environmental and socioeconomic concerns. While plastic waste management is essential for environmental sustainability, there is a notable absence of comprehensive research addressing the assessment of plastic waste and its potential for wealth generation in the Abakaliki urban area. The lack of effective plastic lifecycle analysis management and environmental impact affect the wealth creation in Abakaliki Urban Area, South East Nigeria.

The research aims to contribute to the development of a holistic and sustainable approach to managing plastic waste in Abakaliki urban area, ultimately mitigating its adverse environmental impacts while harnessing its potential for economic prosperity.

1.3 Objective of the study

The main objective of this study is the assessment of Plastic Waste and Wealth in Abakaliki Urban Area, South East Nigeria. The specific objective sought to;

- i. Examine the effect of Plastic Lifecycle Analysis on the Wealth creation in Abakaliki Urban Area, South East Nigeria.
- ii. Evaluate the effect of Environmental Impact on the Wealth creation in Abakaliki Urban Area, South East Nigeria.

1.4 Hypotheses of the study

- i. Plastic Lifecycle Analysis has no significant effect on the Wealth creation in Abakaliki Urban Area, South East Nigeria.

- ii. Environmental Impact has no significant effect on the Wealth creation in Abakaliki Urban Area, South East Nigeria.

Review of Related Literature

2.1 Concept Review

Plastic Waste

The concept of plastic waste refers to the disposal or abandonment of plastic materials, products, or items that are no longer in use or have reached the end of their lifecycle. Plastic waste has become a global environmental concern due to its widespread use, persistence in the environment, and detrimental effects on ecosystems and human health. Understanding the concept of plastic waste involves considering its characteristics, sources, impacts, management, and potential solutions (Mohamed 2016). The concept of plastic waste represents the environmental, social, and economic challenges associated with the widespread use and disposal of plastics. Effective plastic waste management requires a multifaceted approach that involves reducing plastic consumption, improving waste management infrastructure, and promoting sustainable alternatives to plastics to mitigate its negative impacts on the planet (Horodytska et. al, 2019).

There are four basic things man needs to survive, Air to breath, water to drink, food to eat and land to stand on. If plastic waste threatens these four basic needs, then a need for plastic waste management is necessary. The three solid waste management strategies are the 3R (Reduce, Reuse and Recycling) (Mohamed 2016, Yosi et al 2019), also suggested landfill and Incineration, however, one of the most efficient methods of managing plastic wastes is through recycling. Although, plastic litter comes from developing countries, a small amount comes from Western countries, primarily due to the limited capacity of collection systems and low recycling rates. However, Horodytska et. al, (2019), stressed the need for recycling in order to minimize the amount of waste to be disposed to avoid waste from ending up in rivers, oceans and other environments. From the environmental and socioeconomic standpoints, the best answer to the problem of how to manage waste plastic is to recycle it (Woldemar 2019).

Characteristics of Plastic Waste:

1. **Diversity of Plastics:** Plastic waste comprises a wide range of synthetic polymers, each with varying properties, durability, and recyclability. Common plastics include polyethylene (PE), polypropylene (PP), polyvinyl chloride (PVC), polyethylene terephthalate (PET), and polystyrene (PS).
2. **Persistence:** Plastics are highly durable and can persist in the environment for hundreds of years, slowly breaking down into smaller particles known as microplastics.
3. **Versatility:** Plastic waste encompasses various forms, including single-use items (e.g., plastic bags, bottles, straws), packaging materials, consumer goods, and industrial products.

Plastic Lifecycle Analysis (LCA)

Plastic Lifecycle Analysis (LCA), also known as Life Cycle Assessment of Plastics, is a comprehensive and systematic methodology used to evaluate the environmental impacts associated with the entire lifecycle of plastic products, from their production to their disposal or recycling (Horodytska et. al, 2019). This analytical tool is crucial for understanding the environmental footprint of plastics and identifying opportunities for improvement in terms of sustainability and resource efficiency. The concept of Plastic Lifecycle Analysis is instrumental in promoting sustainable plastic production and consumption (Yosi et al 2019). It allows for a holistic understanding

of the environmental consequences of plastics, which is essential in a world grappling with plastic pollution and climate change. By identifying opportunities for reducing environmental impacts and making informed decisions about the design, production, and disposal of plastic products, LCA contributes to the development of more sustainable and environmentally friendly plastic materials and practices. It is a valuable tool for researchers, industries, and policymakers aiming to address the complex challenges associated with plastics (Yosi et al 2019).

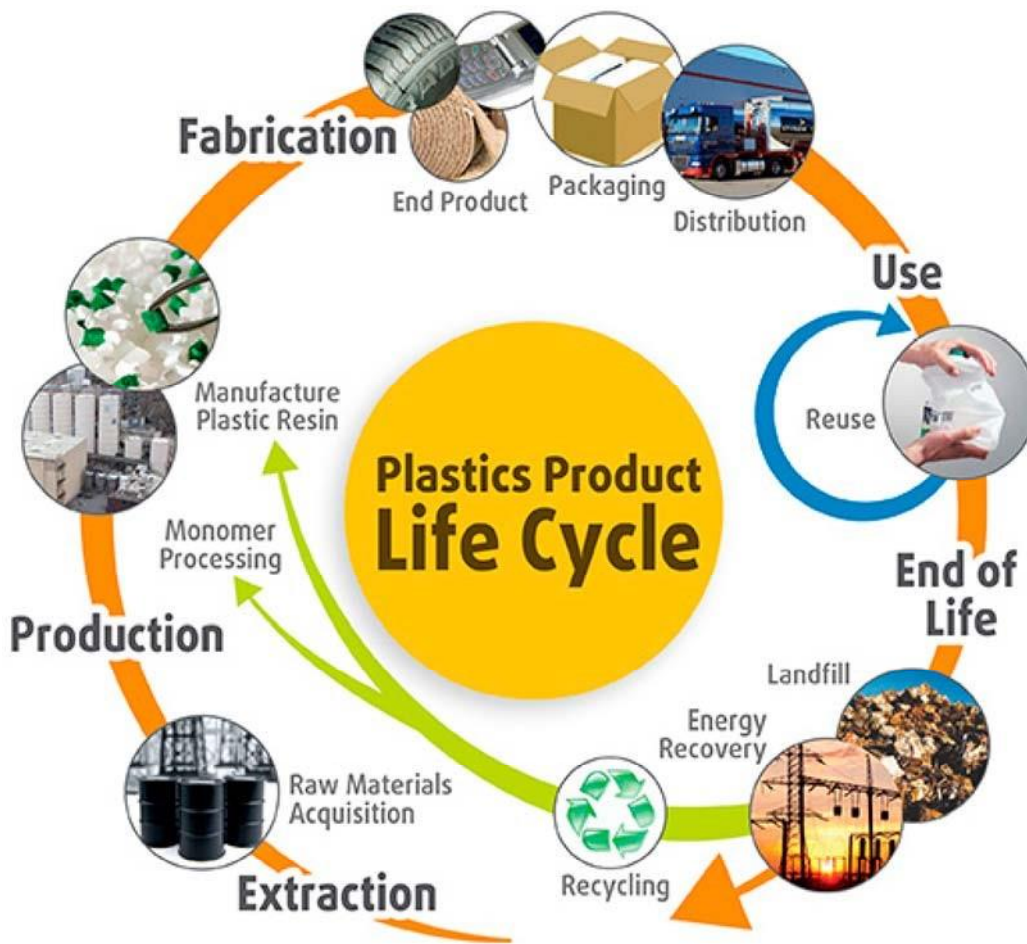


Figure 1. Plastic life cycling process.

The life pattern of plastic items has shown that the traditional straight model from birth to internment is an impractical interaction that brings about contamination. Plastics, for all intents and purposes, do not biodegrade, so disposed-of waste amasses on the grounds and in the oceans, getting ingested by creatures and delivering harmful synthetics to the detriment of our living surroundings. This need not be the situation. There are elective pathways plastics can take to evade their ‘destiny’ as waste and poisons

Environmental Impact

The concept of environmental impact in the context of plastic waste refers to the wide-ranging and often adverse effects that plastic waste has on the natural environment, ecosystems, and human well-being. Plastic waste, due to its persistence and widespread use, poses significant environmental challenges, and understanding its

environmental impact is crucial for mitigating its negative consequences. The environmental impact of plastic waste involves a multifaceted approach that includes reducing plastic consumption, improving waste management practices, promoting recycling and circular economy principles, and developing sustainable alternatives to conventional plastics. Government regulations, public awareness campaigns, industry initiatives, and international cooperation are all essential components of mitigating the environmental impact of plastic waste and fostering a more sustainable relationship with plastics in our society.



Figure 2 Impact of plastic waste on the environment.

There is no denying that plastic is an ingenious material. Composed of long chains of synthetic polymers, plastic is strong, light, and highly flexible. It can be manipulated into a multitude of forms, from drinking straws and bottles to car parts and diapers. Since the 1907 invention of Bakelite, the first synthetic plastic, the world has been plastics crazy. According to Our World in Data, over the past 65 years, annual production of plastics increased nearly 200-fold, to 381 million tonnes. Unfortunately, it now turns out, the increasing use of this versatile substance has come at a high cost to the planet. Data from the National Oceanic and Atmospheric Administration (NOAA) and Woods Hole Sea Grant shows that some plastic products can take up to 600 years to break down. Landfills are overflowing, oceans are becoming choked, and wildlife is suffering.

The World Economic Forum predicts that by 2050, oceans will contain more plastic, by weight, than fish. The Ocean Cleanup Project has estimated that the Great Pacific Garbage Patch (GPGP), about 618,00 square-mile area of marine debris between Hawaii and California, contains 1.8 trillion pieces of plastic. Such statistics, along with distressing photographs of birds and mammals tangled-up in — and even consuming — plastic waste, have highlighted the magnitude of the problem. Now, hashtags such as #plasticfree are trending on social media

as consumers, governments, and companies respond. Data is not only being used to track the whereabouts and volume of plastic on our planet; it is supporting the drive to reduce our dependence on it.

Wealth Creation

The concept of wealth creation in the area of plastic waste revolves around harnessing the economic potential of plastic waste management and recycling initiatives. While plastic waste is often viewed as an environmental problem, it also presents opportunities for generating wealth, creating jobs, and contributing to sustainable development. The concept of wealth creation in the area of plastic waste signifies the transformation of a perceived environmental challenge into an economic opportunity. By adopting sustainable practices, promoting recycling, and fostering innovation, societies and economies can not only address plastic waste issues but also generate wealth, create jobs, and contribute to a more sustainable and circular approach to plastic use and management. Here are key aspects of the concept of wealth creation in the context of plastic waste:

1. Recycling and Circular Economy:

- Recycling plastic waste allows for the recovery of valuable materials. This can include the collection and processing of plastic bottles, containers, and packaging for reusing them in the production of new plastic products.
- A circular economy approach promotes continuous recycling and upcycling of plastic materials, reducing the need for virgin plastic production and conserving resources.

2. Resource Recovery:

- Plastic waste contains valuable resources, such as polymers, which can be extracted and used to manufacture a wide range of products, including textiles, building materials, and more.
- The recovery of valuable materials from plastic waste contributes to resource conservation and reduces the environmental impact of raw material extraction.

3. Job Creation:

- The plastic recycling industry can generate employment opportunities at various levels, from collection and sorting to processing and manufacturing.
- Job creation in plastic waste management can particularly benefit local communities and economies.

4. Entrepreneurship and Innovation:

- The recycling and repurposing of plastic waste offer fertile ground for entrepreneurial ventures and innovation. Entrepreneurs can develop new technologies, processes, and business models to address plastic waste challenges.
- Innovation can lead to the creation of new products and services, further contributing to economic growth.

5. Waste-to-Energy:

- Some regions invest in waste-to-energy facilities that use plastic waste as a source of energy. This can contribute to energy production, reducing the demand for fossil fuels.
- Energy generation from plastic waste can also lead to revenue generation for municipalities or waste management companies.

2.2 Theoretical Review

The theoretical framework for this study emanated from different models in geographical studies. The diffusion model by Haggerstrand (1967) and nearest neighbour analysis by Evans and Clark (1954) were employed in this study. It is the hierarchical diffusion which describes transmission through a regular sequence or order of lease. This process is typified by the diffusion of innovations. For example, new methods of waste management trickle down from advanced societies to less developed societies. The developed countries have efficient waste management policies, which are gradually being adapted, in other countries of the world (expansion diffusion). With the present technological advancement and the trend towards globalization, waste management has improved over time. The diffusion model could be applied to a non-linear function as “S-shaped” curve that characterized any diffusion process.

This could be represented with the equation shown as;

Where:

P = proportion of people accepting a new innovation

T = the time, the process of innovation diffusion started, the two variables are linked by three parameters.

U = the upper limit

a = which determines the values of P, when T is zero.

b = a mathematical constant with a value 2.7183

The conceptual factor, which affects the operations of the PSP scheme mostly, is the distance factor to landfill sites. Its location will determine trip frequency time of haulage and invariably cost of transportation of the waste. Having realized this factor, government had decentralized the location of landfill sites. As at present, there are three landfill sites and PSP operators well encouraged to make use of the nearest landfill sites, so as to reduce time and cost and consequently, enhance efficiency. The mode of operation is in line with the distance decay concept, which according to Ayeni (2000), was based on a straight-line measurement of distance separating a phenomenon and the nearest neighbour space.

Adetokunbo and Herbert (2003) submitted that management of waste is a key element in the protection of public health, because failure to manage waste properly exposes people to increased risk of infectious diseases. Waste management is the selection and application of suitable techniques, technologies and management programmes to achieve specific waste management objectives and goals. Waste management for non-hazardous residential and institutional waste in metropolitan areas are usually the responsibility of Local Government Authorities, while hazardous commercial and industrial waste is usually the responsibility of the waste generator. According to Ogunleye and Ibitoye (2006), improper disposal of solid waste constitutes ‘serious threat to human health and to the achievement of sound environmental sanitation’. Igbanugo (1986) submitted that refuse dumpsites are converted to urinal and defecation sites by destitutes, invaded by scavengers and animals, and served as breeding ground for disease vectors (flies, rodents, etc). Also, accumulated garbage and rubbish become eye sore in the community, and pollute the air, and act as breeding grounds for mosquitoes and other harmful insects; they also encourage street folding.

3. Methodology

This is a quantitative study conducted in the urban area of Abakiliki south east Nigeria, by collecting empirical data from selected sample. Positivism pattern believes in an inferential approach where researchers agree on previous investigated studies and further investigate by collecting empirical data in a different context. More precisely, researchers agree with previous theory and conduct the study to prove it whether true or false. This study is following a quantitative method to test four hypotheses proposed in relation to the assessment of plastic waste and wealth in Abakiliki Urban south east Nigeria. The sample for this study is a relatively large group of people in residing within these urban areas. Simple random sampling technique applied to get a response from the selected population that every respondent has an equal opportunity being selected. This study collected 362 questionnaires to investigate assessment of plastic waste and wealth in Abakiliki Urban south east Nigeria. To test the hypotheses, 344 data utilized after data screening and structural equation modelling applied for the analysis and questionnaire distributed by the researchers directly.

Measures

The plastic waste and environment impact was measured by developing a measurement item that agrees with each of the variables. The outcome variable is wealth creation. All items were scored with a five-point Likert scale, ranging from (1) strongly disagree to (5) strongly agree. This construct reflects assessment of plastic waste and wealth in Abakiliki Urban south east Nigeria.

4. Data Analyses and Hypotheses Results

Table 1 shows the demographic distribution of the respondents for gender, marital status, age, education level and working experience in the industry. The study was analysed using the structural equation modeling technique with the aid of SmartPLS 4.0.

Table 1: Demographic Profile of the Respondents (n = 344)

Characteristics	Frequency	Percentage
Gender		
Male	187	54
Female	157	46
Marital Status		
Single	145	42
Married	199	58
Age(Years)		
20 -29 yrs.	90	26
30-39 yrs.	105	31
40-49 yrs.	58	17
50-59 yrs.	77	22
60 yrs.	14	4
Academic Qualification		
B.sc/HND	189	55
Masters	102	30
PhD	17	5
Others	36	10
Experience		
1-5	135	39

6-10	94	27
11-14	61	18
15 and above	54	16

As shown in Table 1, for gender, 54% of the respondents are male, and 46% are female. Majority of the respondents are married, which is 58% and single are 42%. In terms of age group, highest age group consists of "30 to 39years" which is 31% followed by "20 to 29 years" which is 26%, "50 to 59 years" 22%, "40 to 49 years" 17% and 60 years and above is 4%. For academic qualification, majority of the respondents are bachelor and master's degree holder, which are 55% and 30% respectively, while PhD and Others recorded the least response with 5% and 10% respectively. While looking into the job experience of the respondents, most of them have experiences of 1 to 5 years, followed by 6 to 10 years is 27%, 11-14 years is 11% and more than 15 years is 16%.

Study Results

The researchers examined the data using PLS-SEM to examine the assessment of plastic waste and wealth in Abakiliki Urban south east Nigeria. We report results using a level of significance at $p < .01$ and $p < .001$.

Table 2: Construct Validity and Reliability

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Wealth creation	0.861	0.868	0.906	0.706
Plastics lifecycle analysis	0.840	0.862	0.876	0.505
Environmental Impact	0.790	0.819	0.862	0.610

In developing the study variable, several important measures were followed to constructs validity and reliability and content validity. For content validity, different operational was evaluated by studying the existing literature and measurement used that contains multiples items. Both the confirmatory and exploratory analysis confirm the factorability of the variables. Figure 1 represents the factor loading of individual items. Only few items show the loading above 0.40, and the remaining items in the model exceeded the suggested loading of 0.70. All the constructs are shown in table 2 that none of the variable Cronbach alpha less than 0.70. Furthermore, composite reliability was above the accepted level. To ensure the convergent validity, the average variance extracted also checked and showed all variable exceeded the recommended value of 0. So, all the variables confirm content validity and reliability.

Table 3: Factor loadings of the construct

	PLA	ENI	WC	Comments
PLA1	0.693			>.40
PLA2	0.601			>.40
PLA3	0.743			>.40
PLA4	0.653			>.40
PLA5	0.800			>.40
PLA6	0.714			>.40
PLA7	0.754			>.40
ENI1		0.840		>.40
ENI2		0.762		>.40
ENI3		0.774		>.40
ENI4		0.774		>.40
WC1			0.836	>.40
WC2			0.817	>.40
WC3			0.897	>.40
WC4			0.808	>.40

Table 3 shows the factor loading of individual items which is above >.40 threshold and confirms the confirmatory factor analysis. To evaluate the discriminant validity of the 4-variables is used in the study, Heterotrait-and Monotrait (HTMT) analysis was executed.

Table 4: Discriminant Validity (HTMT)

	Wealth creation	Plastic lifestyle analysis	Environmental impact
Wealth creation	0.587		
Plastic lifestyle analysis		0.580	
Environmental impact			0.813

Result of confirmatory factor analysis shown in table 4 supports the empirical evidence of the uniqueness of most of the variables. It is pertinent to state that the values in bold in the above table indicated discriminant validity problems according to HTMT_{0.85} criterion. This implies that the HTMT criterion detects collinearity problem among latent construct. However, all the variable is ensured of the discriminant validity for further analysis by maintaining that no correlation exceeds the limit of HTMT.

Structural Equation Modelling

In Smart-PLS, to observe the effects of independent variables on the dependent variable, normally two steps followed are measurement model and structural model. Some of the criterions, such as construct validity and

reliability already discussed above. In addition to that in the structural modelling equation R square also shown for the predictive ability of independent variables on the dependent variables. The value of R^2 (0.591) indicates that the **59.1%** of the variation in wealth creation is caused by the two independent selected variables. Additionally, for the model fit SRMR value was examined, which is **0.038** means model is a good fit

Table 5: The Direct effect of plastic lifecycle analysis and environmental impact on the wealth creation of Abakiliki urban southeast Nigeria

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
Plastic lifecycle analysis -> Wealth creation	0.218	0.222	0.049	4.490	0.000
Environmental impacts -> Wealth creation	0.240	0.231	0.058	4.159	0.000

In structural modelling, the total of four hypotheses was examined through the use of empirical data collected from the individual living within the urban area of Abakiliki south east, Nigeria. All the two hypotheses were accepted. For a better presentation, Table 5 shows the p-value and t-value. There is a clear evidence that we will accept all the hypothesis presented in this study such that plastic lifecycle analysis and environmental impact are statistically significant and have a positive effect on the wealth creation in Abakiliki urban south east, Nigeria.

Summary of the test of hypothesis

Hypothesis One

H₀: Plastic lifestyle analysis has no significant effect on wealth creation in Abakiliki urban southeast Nigeria

H₁: Plastic lifestyle analysis has a significant effect on wealth creation in Abakiliki urban southeast Nigeria

Conclusion Table 5 above suggest that plastic lifestyle analysis is statistically significant and have a positive effect on wealth creation given that $\beta=0.218$ and $P < 0.001$. We therefore conclude that a unit change in plastic lifecycle analysis will cause a corresponding unit increase in wealth creation in Abakiliki urban southeast Nigeria.

Hypothesis Two

H₀: Environmental impact has no significant effect on wealth creation in Abakiliki urban southeast Nigeria.

H₁: Environmental impact has a significant effect on wealth creation in Abakiliki urban southeast Nigeria.

Conclusion Table 5 above suggest that environmental impact is statistically significant and have a positive effect on wealth creation given that $\beta=0.240$ and $P < 0.001$. We therefore conclude that a unit change in environmental impact will cause a unit increase in wealth creation in Abakiliki urban southeast Nigeria.

Conclusion

In conclusion, the assessment reveals a complex yet hopeful landscape in the interplay between plastic waste and wealth in Abakaliki Urban Area. While challenges persist, the study emphasizes the potential for positive change through strategic interventions, community involvement, and the cultivation of a circular economy mindset. By integrating the recommendations outlined in this research, Abakaliki has the opportunity to not only address its plastic waste management challenges but also to create a thriving, sustainable, and economically prosperous urban environment for current and future generations. The plastic lifecycle analysis and environmental impact are statistically significant and have a positive effect on the wealth creation in Abakaliki urban south east, Nigeria. We therefore, concluded that the assessment of Plastic Waste has significance positive effect on the Wealth in Abakaliki Urban Area, South East Nigeria.

Recommendation

The analysis underscores the correlation between sustainable plastic practices and enhanced wealth creation, shedding light on several key areas that businesses and individuals can leverage for financial gain. Here are some key recommendations based on the study:

- i. The government should identify and invest in companies that are actively adopting sustainable and eco-friendly plastic alternatives. With the growing global focus on environmental responsibility, businesses in this sector are likely to experience increased demand, leading to potential returns for investors.
- ii. The government should Encourage and invest in research and development initiatives focused on green technologies. The development of innovative solutions for sustainable agriculture, waste management, and clean energy can present lucrative opportunities for patents, creating a competitive advantage in the market.

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