

## **EFFECT OF RECYCLING SOLID WASTE ON THE SUSTAINABLE BUSINESS OPERATIONS OF SMES IN PORT HARCOURT, RIVERS STATE, NIGERIA**

**Eigege David Matthew (Ph.D), Prof. Okwu-Delunzu V. U. and Prof. Chukwu K. E.**

Department of Environmental Management, Enugu State University of Science and Technology

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**Abstract:** The study investigated the effect of recycling solid waste on the sustainable business operations of SMEs in Port Harcourt, Rivers State, Nigeria. The specific objectives are to, examine the effect of Reduce on the performance of SMEs in Port Harcourt and evaluate the effect of Reuse on the performance of SMEs in Port Harcourt, Rivers State, Nigeria. The study adopted correlational and survey research designs. The study adopted a primary source of data. The data was collected through a well-structured questionnaire. The research questions were analyzed with frequency counts, graphical illustrations, percentages, mean, and standard deviation. Pearson Product Moment Correlation (PPMC) was employed to analyze the hypotheses. The data were analyzed using both descriptive statistics and inferential statistics. The result revealed that the adoption of reduce has a significant positive effect on the performance of SMEs in Port Harcourt with A P-value of  $(0.000 < 0.05)$  while there is a significant relationship between the adoption of reuse practices on performance with a P-value of  $(0.001 < 0.05)$  of SMEs in the manufacturing sector in Port Harcourt, Rivers State. The study concludes that they should start with lower-cost strategies, such as reducing waste and reusing materials implied for easier implementation. The study recommended among others that Entrepreneurs in the SME should endeavor to identify the specific recycling opportunities available in Port Harcourt. This could include plastic recycling, e-waste recycling, or other types of waste materials that can be recycled.

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**Keywords:** Business Recycling Solid Sustainable Waste

### **1.1 Introduction**

Every sustainability project involves organizational changes, ranging from its most basic (e.g., replacing disposable plastic cups with individual ceramic mugs) to drastic changes in how a business operates. In the past few years, recycling has grown in importance in the business world. Motivational factors could include social aspects, regulatory aspects, and customer demand, among others (Epstein et al., 2010). Many businesses are dedicated to converting their business processes and implementing sustainability initiatives. However, several of them have yet to meet their expectations (Gallotta et al., 2016). However, according to Purvis, Mao, and Robinson,

(2019), a large percentage of these change initiatives fail due to factors that may include the lack of management support, lack of proper communication, and lack of stakeholder engagement, among others.

Organizations are facing various challenges when trying to implement change initiatives to become sustainable. If organizations cannot overcome a particular challenge, they might fail the initiative. Because the sustainability concept continues to be applied unsystematically, practicing organizations experience considerable difficulties in realizing their goals of achieving a full sustainability status. This is due to a lack of understanding and support for the design, development, and implementation process, and a lack of proper procedural and technological support for decision-making for sustainability management. In the manufacturing industry, the concern over sustainability is greater than ever. In addition to facing high-pressure competition, manufacturers must increasingly pay attention to resource usage, waste treatment, air emissions, water pollution, employee welfare, and so on. Failing to manage these sustainability issues can substantially damage the image of the company and thus affect its performance. Recycling materials is an innovative approach to effectively utilizing the earth's natural resources. Recycling offers great potential in helping to attain global sustainable development. Sustainable development is defined as society's ability to meet the present requirements for goods (and services) from the utilization of natural resources without jeopardizing the needs of future generations. Numerous products support our professional and private lives. The recycling concept was developed from studying how the complicated, self-regulated, and dynamic processes by which natural ecosystems replenish their nutrients could be applied to industrial systems. (Geiger et al, 2019). In industrial systems (from natural ecosystems), materials from end-of-life (EOL) products are used as raw materials (secondary raw materials) in the manufacture of products. Recycling can be defined as the entire chain of activities involved in collecting and using (of all or parts) an old product to manufacture new products or refurbishing other products (reuse). (Thiounn, & Smith, 2020).

Therefore, the business of recycling involves all activities along the recycling value chain. This includes customer interest in recycled products; markets for recycled goods; product design; recycling process; regulatory mandates/legislation; security of secondary raw material supply; logistics and overall economics of the recycling activity (Thiounn, & Smith, 2020). (Zhu et al. 2012), among others (e.g., Hart, 2005; Shrivastava, 1995), has supported this conclusion, suggesting that improved environmental and social practices can help companies gain competitive advantage and subsequently improve their performance. Hart (2005) used a natural-resource-based view to explain the above link. The central idea of the natural resource-based view is that companies that foster and maintain good relationships with the ecosystem can achieve sustainable competitive advantage from their efficient usage of natural resources. Shrivastava (1995) further argued that such a positive relationship can be facilitated through technology transfer, total quality environmental management, and so on. Montabon et al. (2007), Russo and Fouts (1997), Wu and Pagell (2011), and Hofer et al. (2012) have all supported the premise that environmental management practices can lead to innovation. Innovation, in turn, can help companies to increase their market share and to reduce their costs, resulting in greater financial gains.

## **1.2 Statement of the problem**

SMEs play a critical role within modern socio-economic systems and pose a burden on the environment. Manufacturing processes and manufactured products have to become more efficient and socially friendly to preserve future generations' wealth. Globally, many businesses are developing strategies how to achieve economic growth while protecting the environment. Governments, producers, and consumers are becoming aware of their actions and influence on the future generation. Given the abundance of products and choices, it has to be

clarified what their environmental, social, and economic consequences are, not only for the safety of the consumer but also for the overall environmental health. Like all the countries in the rest of the world, Nigeria has experienced a challenging situation in which there is a social need to extract recyclables from ever-increasing solid wastes. Recycling is required to better solve this emerging issue and achieve the overall environmental sustainability goal. The study provides an opportunity to study the evolution and business impact of a recycling management system. The study examines the recycling management system and the waste recycling policies implemented by the manufacturing organizations in Port Harcourt, Nigeria. However, no legislation from the government mandates that the manufacturers take financial responsibility for the recycling and treatment of used products and waste recycling in Nigeria. The recycling system represents a collective producer responsibility in which all producers jointly share the costs of managing all their waste products, thus collecting, transporting, and recycling scraps could be economically implemented by manufacturing organizations.

### **1.3 Objectives of the Study**

The study investigated the effect of recycling solid waste on the sustainable business operations of SMEs in Port Harcourt, Rivers State, Nigeria. The specific objectives are: -

- ❖ Examine the effect of Reduce on the performance of SMEs in Port Harcourt, Rivers State, Nigeria.
- ❖ Evaluate the effect of Reuse on the performance of SMEs in Port Harcourt, Rivers State, Nigeria.

### **1.4 Hypothesis of the Study**

- ❖ Reduce has no significant effect on SMEs in Port Harcourt, Rivers State, Nigeria.
- ❖ There is no significant relationship between the adoption of Recycling and Reuse and the performance of SMEs in Port Harcourt, Rivers State, Nigeria.

## **2. Review of Related Literature**

### **2.1 Conceptual Review**

#### **Waste management**

Waste management: Waste management refers to the collection, transportation, processing, and disposal of waste materials. Proper waste management practices are essential for environmental protection, public health, and economic development. (Obule-Abila B, 2020). Increased volume of waste production that occurs everywhere both in rural areas and urban areas and the habit of people who dispose of garbage is not in a place where people are at risk of environmental-based diseases such as diarrhea, skin diseases, and others. Therefore, there needs to be a concept or system of proper waste management so that it can help manage the waste produced by each household in society. The results of the study show significant findings related to poor solid waste disposal and its impact on the environment and public health, 75% of households involved in solid waste mass disposal, other factors that contribute to the disposal of poor solid waste and documents, distance to the disposal site, storage of household waste, and poor waste separation. More than 77% of households have perceptions of transmission of disease from poor solid waste disposal. 53% have good knowledge of diseases related to solid waste disposal. Significant awareness and good perception among households but there are bad behaviors in terms of effective solid waste management, the distribution of appropriate health education messages must be enforced for better behavior changes by relevant authorities.

The waste management system is required to be integrated into sectors to be integrated: Local Governments must follow the approach of sustainable development in resolving waste problems, in addition to environmental, economic, and social impacts of investment in the waste sector must be well integrated. All steps of management

of waste (for example: preventing/reducing, reusing, recycling, recovery, and landfill) are relevant decision points and need to adopt the appropriate analytical waste management framework (Cucchiella et al., 2014). Waste is produced from human activities and is usually managed to reduce its impact on health, environment, or aesthetics. Waste management is also carried out to restore natural resources (resources recovery) (Ike et al 2018).

### **Performance in Small and Medium Scale**

SMEs play an important role in enhancing the "reduce, reuse, recycle" business model. SMEs know green practices which are significant in reducing waste and enhancing recycling. However, SMEs in some countries don't need to recycle their waste. Therefore, only a small percentage of their waste is recycled. Managing waste and recycling in SMEs is a significant part of a sustainable supply chain. SMEs could improve environmental performance, achieve sustainable outcomes, manage waste, and achieve efficiency in production through lean and green thinking. Waste could be reduced by recycling, reusing, and remanufacturing strategies.

By using recycled materials, manufacturers can reduce their environmental impact and conserve natural resources. In conclusion, recycling solid waste for manufacturing operations can bring several benefits to businesses, including SMEs. These benefits include conserving resources, creating jobs, saving energy, reducing waste in landfill sites, reducing disposal costs, improving site logistics and resource utilization, rendering the whole process of production less expensive, and improving sustainability. (Rinkesh, 2023).

### **Strategies for waste utilization and reduction**

Generally, this involves the selection and implementation of the appropriate practices, technologies, tools, and infrastructure that are necessary to achieve a sustainable system. Every sustainable waste management schedule must include the following strategies, viz; prevention of the generation of avoidable wastes, reduction of the generated waste through recovery, reuse of the recovered wastes, recycling of the recyclables, composting of organic wastes for energy/electricity generation, and eventual disposal at sanitary landfills. With proper consideration of the environmental, economic, and social factors peculiar to the particular location, this principle, aids waste managers in the implementation of a sustainable system.

### **Reduce**

This involves the reduction of waste at the point of generation or before final disposal (Chadar & Keerti, 2017). It also involves the consideration and incorporation of necessary SW management principles starting from the material design through all the processes to the eventual material consumption. It significantly reduces the quantity, as well as the harmful effects of SW, generated. This can also be achieved by the use of less quality material resources in product manufacturing incorporating the principle of reusability of the products through the production and design stages. This will contribute immensely to actualizing the solid waste reduction strategy. Industries have major roles to play in the reduction of solid waste. They can adopt more efficient manufacturing processes by making larger quantities of products without increasing the use of raw materials. In other words, incorporating fewer materials in making products.

Another important strategy for achieving waste reduction is the separation at source (Sreedevi, 2017). This is achieved by providing separate bins/containers, which are clearly labeled, at designated places of collection or generation points like households, industries, workplaces, commercial areas, offices, etc. [(Adeniran, Nubi & Adelopo, 2017). Some of the possible ways of reducing the quantity of MSW generated include buying products that involve less packaging or buying products in bulk to reduce the number of materials used for the packaging; making use of reusable items rather than disposable ones, for instance, the use of handkerchiefs rather than tissue

papers, rechargeable batteries, refillable ink pens, etc.; making use of cotton/textile bags for shopping rather than plastic bags; maintaining/repairing of damaged products like clothes, leathers, furniture, etc.

The long-recognized hierarchy of management of wastes in order of preference consists of prevention, minimization, recycling and reuse, biological treatment, incineration, and landfill disposal. By reducing waste and improving resource efficiency, SMEs can minimize their environmental footprint and enhance their bottom line. Cost savings from reduced waste disposal, energy usage, and material waste can increase profitability and long-term sustainability. Reducing waste is a win-win for businesses because it's friendly to both the environment and your bottom line.

### **Reuse**

This involves the use of discarded or disposed-off materials in their original form without transforming them. It also involves the collection of discarded useful products from sources that no longer make use of them and passing the supposed wastes to the ones that can still make good use of the materials. Solid wastes that can be reused include glass bottles, PET bottles clothing, papers/cardboard, leathers, food leftovers, metals, and anything that can be used for a similar purpose to the first intended. Reuse is also the practice of using a material over and over again in its current form. The essence of reuse is that it preserves some or all of the energy and materials that go into making an item. Reuse is finding alternate uses for an item rather than disposing or recycling it. These instances indicate that reuse is a very important aspect of MSW management that can foster sustainability.

## **2.2 Theoretical Framework**

### **Stakeholder theory**

Freeman (1984) developed the stakeholder theory, which is a new paradigm consisting of redefining the purpose, the structure, and the management of firms to better serve the interconnectedness of actors' interests in society (Schilling, 2000). Stakeholders can be people and organizations who have a direct affiliation with a firm and who can influence or be influenced by its operations (Fernandez-Feijoo, Romero, & Ruiz, 2014). Stakeholders also involve indirect people or groups of individuals that can be affected by the attainment of the firm's objectives (Schilling, 2000). Primary stakeholders are the employees, customers, creditors, suppliers, and local community leaders (Schilling, 2010). Stakeholders also include institutions such as local, national, and global governments, network groups, nongovernmental organizations, union groups, media, activists, consumers, and even competitors (Bottenberg, Tuschke, & Flickinger, 2017). One of the challenges of business owners is that stakeholders sometimes have different expectations and interests (Vasileiadou & Tuinstra, 2013). A business environment can be referred to as an ecosystem to name all the direct and indirect actors that play roles in the firms' business environment (Adner, 2016). Business owners should be able to understand the systemic interaction of the stakeholders to develop successful and sustainable management strategies (Adner, 2016). A sustainable-oriented business owner should establish and implement strategies that take into consideration stakeholders' interests (Bottenberg et al., 2017). Oberoi (2014) proposed three steps to put in place a sustainable strategic plan; business owners should be able to identify the interests and expectations of stakeholders, create mutual and multilateral sustainability interests based on individual interests and expectations, and set up a monitoring strategy to perceive changes in the business environment to develop appropriate responses.

### **Innovation Theory**

Schumpeter is one of the influential thinkers about the content and the importance of business innovation (Miller, 2015). Schumpeter acknowledged that innovation is crucial and necessary in a free market for small businesses'

survival and longevity (Arnason, 2015). Damanpour (2014) and Spies (2014) affirmed that innovation involves any new ideas and practices that come with added value to the organization. The innovation could be introducing new products and services to meet consumers' needs, opening new markets, or carrying out new structures.

Hjalager (2014) indicated that innovation could come from inside of the organization, outside, or from benchmarking partners. Saunila, Ukko, and Rantanen (2014) showed the relationship between sustainability and innovation and the importance of innovation for the long-term profitability of businesses. Gronum et al. (2016) and Saunila et al. (2014) considered innovation as a vibrant aptitude that allows an organization to integrate, build, and reconfigure internal and external competencies to address changes in a fast-paced business environment. Lofoten (2016) stated that innovation is the company's ability to have a competitive edge by applying efficiently collective knowledge, resources, skills, and the organization system to create added value for the stakeholders. Batra et al. (2017) asserted that autonomy, risk-taking, and the ability of leaders to be proactive have a positive association with the introduction of disruptive business model innovation. Lopatta et al. (2016) posited that to be sustainable, small business owners should fulfill their social and corporate responsibility.

### **2.3. Empirical Review**

Oranefo (2022) conducted a study on the effect of waste recycling on the business profitability of Nigerian SMEs. The study examined the waste recycling on business profitability of small and medium enterprises (SMEs) in Nigeria. Data were generated from a questionnaire distributed to the respondents. Regression analysis was used to test the formulated hypothesis with the aid of SPSS version 20. 0. at a 5% level of significance. The study found that waste recycling, resource recycling, solid waste management, and municipal waste collection crew have a significant effect on the business profitability of small and medium enterprises (SMEs) in Nigeria, and this effect was statistically significant at a 5% level of significance.

Adoukonou (2012) conducted a study to examine strategies for small business sustainability in the District of Columbia. This study explores the strategies owners of small businesses in the District of Columbia use to sustain their businesses for longer than 5 years while fulfilling their firms' social responsibility obligations. A multiple case study approach was used for this research. The results revealed that these strategies contribute to positive social change by providing information to entrepreneurs about successful strategies for small business sustainability, which can lead to business owners, employees, and communities living and working in a human-oriented, prosperous, and healthy environment.

### **3.0 Methodology**

The study adopted correlational and survey research designs. Data was collected from primary and secondary sources. The primary source is collected through the administration of questionnaires to Small and Medium Enterprises (SMEs) in Port Harcourt while secondary data are collected through published articles from local and international journals. The population of the study was chosen based on the two thousand six hundred and thirty-four (2634) registered SMEs with the Rivers State Ministry of Commerce and Industry in 2019.

Taro Yamani formula was used in determining the population size according to Taro Yamani, (1967),

$$n = N / [1 + (Ne^2)]$$

Where n = is the sample size

N = is the population

e = is the error limit (0.05 based on 95% confidence level)

Therefore,  $n = 2634 / 1 + 2634 (0.05)^2$

$$n = 2634/7.585$$

$$n = 347 \text{ or } 350$$

Using a population of approximately 2634 small and medium enterprises with an error limit of 5%, a sample size of 350 is considered adequate as computed above. That notwithstanding, the study was based on a survey of 600 (six hundred) respondents drawn from a sample size of organizations in five different sectors. The five sectors of the SMEs covered are chemical and pharmaceutical, non-metal and mineral products, basic metal, iron and steel, food, beverages, and tobacco and textile within the Port Harcourt metropolis. A random sampling technique was used to administer the questionnaire according to density classification

The reliability of the instrument was determined using Cronbach Alpha reliability statistics to produce the reliability coefficient ( $\alpha = 0.81$ ), see appendix this indicates moderate internal consistency. The data collected were analyzed using both descriptive statistics and inferential statistics. The data from the tests and the questionnaires were scrutinized and then coded for computer analysis. The research questions were analyzed with frequency counts, graphical illustrations, percentages, mean, and standard deviation. Pearson Product Moment Correlation (PPMC) was employed to analyze the hypotheses. The analysis was based on a 5% level of significance.

## Data Presentation and Analysis

### 4.1 Data Presentation

**Table 4:1 Distribution of the Number of Questionnaires Administered and Returned**

Zone	Area names within the Zones	Number of questionnaires Administered	Number of questionnaires Returned (%)
I	Obio-Akpor/Rumuokoro	200	177 (88.5)
II	Rumuokwurushi	200	152 (76.0)
III	Old GRA/PHC	200	139 (69.5)
	Total	600	468 (78.0)

Table 4.1 shows the demographic characteristics of the organizations under study which are summarized using descriptive statistics of count and percentage and also presented in graphs and charts for further clarity. The table shows that on number of employees in their various organizations, 62.8% of the respondents indicated 1 to 10 employees, 34.8% of the respondents indicated 11 to 50 employees, 1.7% of the survey respondents indicated that from 51 to 500 employees while only 0.6% of them indicated they have more than 500 hundred employees. This result confirmed that the organizations under study are SMEs based on their number of employees of which 97.6% of the survey respondents have 1 to 50 employees. In the business category, approximately 42% of the respondents indicated the service sector, 22.0% of the respondents indicated the wholesale and retail trade sector, 18.2% of the respondents indicated the food, agricultural, and forestry sector, and 12.6% of the respondents are in the manufacturing sector. And 4.3% of the respondents indicated construction and utilities while 1.5% indicated other sectors not listed.

Regarding the organization's familiarity with recycling, 19.2% of the survey respondents indicated that they are not familiar with recycling in any way, 12.4% of the respondents indicated that slightly familiar with recycling, 21.8% asserted that they were only somewhat familiar with recycling, 36.3% attested to the fact that they are moderately familiar with recycling and 10.3% asserted that they are extremely familiar with the recycling process.

On the level of importance of recycling to the organization under study, 18.2% of the respondents indicated that it is not important at all, 22.6% of the respondents indicated slightly important, 42.3% indicated moderately important while only 5.8% of the survey respondents indicated it is extremely important to their organizations. However, 11.1% of the survey respondents did not indicate the level of importance of recycling to their organizations. The results above imply that the level of awareness and importance associated with recycling by the under-study organizations is on average. Furthermore, the breakdown of the data collected also reveals that 18.8% of the respondents indicated that their organization did not engage in the recycling process, 70.9% of the respondents asserted that their organization's involvement in the recycling process while 10.3% indicated their ignorance of their organizations' involvement in the recycling process.

**Table 4:2 Demographic Characteristics of the Organizations**

Demographic Characteristics of the Organizations	Degree	Frequency	Percentage
Number of employees in the company	1-10	294	62.8
	11-50	163	34.8
	51-500	8	1.7
	>500	3	0.6
Business Sector Category	Food, Agriculture and Forestry	85	18.2
	Manufacturing	59	12.6
	Wholesale & Retail Trade	103	22.0
	Construction & Utilities	20	4.3
	Service sector	194	41.5
	Others	7	1.5
Familiarity with recycling	Not at all familiar	90	19.2
	Slightly familiar	58	12.4
	Somewhat familiar	102	21.8
	Moderately familiar	170	36.3
	Very familiar	48	10.3
Importance of recycling to your organization	Not at all important	105	22.5
	Slightly important	106	22.6
	Neutral	52	11.1
	Moderately important	178	38.0
	Very important	27	5.8
Does your company engage in Recycling?	Yes	332	70.9
	No	88	18.8
	Don't know	48	10.3

### 4.3 Data Analysis

For this study, 4 research questions are formulated to analyze the need for recycling in maintaining the sustainability of business operations among SMEs in Port Harcourt, Rivers State. Therefore, data collected based



on these questions are analyzed using descriptive statistical analysis which includes frequency count, percentage, mean, and standard deviations. The results are presented in the subsequent sub-sections.

**4.3.1 Examine the effect of Reduce on the performance of SMEs in Port Harcourt, Rivers State, Nigeria.**

One of the purposes of this study is to examine the business operations of SMEs based on the effect of reduction in their business process. To pursue this objective some factors were identified to measure the respondents’ views regarding how the SMEs under study implement reduce in their business process. Thus, descriptive statistical analysis in the form of frequency count, percentage, mean, and standard deviations are employed on the data collected from the respondents and the results are presented in Table 4.3 which shows on implementing the reduction of waste as a business practice adopted by SMEs under study to sustain their businesses, therefore, based on type of waste, 8.5% of the respondents indicated they adopt reducing waste practice for metal waste, approximately 80.0% of the respondents indicated their companies applied reduction of waste technique to prevent excessive waste of cardboard and papers, and also 19.0% of the respondents indicated their company adopted reduction of waste practices to curb excess waste of plastics. Also, approximately 89% of the respondents indicated that their company implements reduction of waste process to curb excessive waste of food, and 4.5% of the respondents asserted that excessive waste of glass is curtailed in their companies using reducing waste process while 39.5% of the respondents attested to the fact that wood waste is in checked in their various company by adopting reducing waste technique. 39.7% of the respondents indicated other types of waste such as napkins, polystyrene, nylon, electric light bulbs, and demolition and construction debris.

**Table 4.3: effect of reduce on the performance of SMEs in Port Harcourt, Rivers State, Nigeria**

<b>Reducing waste</b>				
<b>Type of waste</b>	No	Yes	Mean	St. Dev
Metal	428 91.5%	40 8.5%	1.086	0.2799
Cardboard and or paper	96 20.5%	372 79.5%	1.745	0.4042
Plastic	379 81.0%	89 19.0%	1.190	0.3929
Food	53 11.3%	415 88.7%	1.887	0.3172
Glass	447 95.5%	21 4.5%	1.045	0.2072
Wood	283 60.5%	185 39.5%	1.395	0.4894
Others, Specify	282 60.3%	186 39.7%	1.393	0.4890

**4.3.2 Evaluate the effect of Reuse on the performance of SMEs in Port Harcourt, Rivers State, Nigeria**

To evaluate the reuse of materials as a business practice adopted by SMEs under study to evaluate the performance of their businesses, 71.6% of the respondents indicated their company recycled metal waste, 50.2% of the respondents indicated their company recycled cardboard and paper waste, 66.7% of the survey respondents

attested that their company recycled plastics waste, 42.3% of the respondents indicated their company recycled excess food or food waste and 68.6% of the research survey implied that their company recycled glass waste while 38.9% indicated their company recycled wood waste to sustain their business. Additionally, on reusing materials as a business practice adopted by SMEs under study to sustain their businesses, 73.1% of the respondents indicated that their company reused metal waste to curb wastage while only 1.7% indicated that their company reused cardboard and paper waste. And 73.3% of the respondents indicated that their company reused plastic waste materials to prevent excess cost of production among other things while only 4.5% of the respondent’s wasted food was reused by their company. Similarly, 71.2% of the respondents indicated that their company reused glass waste to curb excess wastage of glass materials and 63.9% of the respondents indicated that their company reused wood waste to curb it to enhance company sustainability. Finally, 47.3% of the respondents indicated other types of waste such as napkins, polystyrene, nylon, electric light bulbs, and demolition and construction debris.

**Table 4.4. Evaluate the effect of Reuse on the performance of SMEs in Port Harcourt, Rivers State, Nigeria.**

<b>Recycling materials</b>				
<b>Type of waste</b>	No	Yes	Mean	St. Dev
Metal	126 28.7%	342 71.6%	1.731	0.4440
Cardboard and or paper	233 49.8%	235 49.8%	1.502	0.5005
Plastic	176 33.3%	312 66.7%	1.624	0.4892
Food	270 57.7%	198 42.3%	1.423	0.4949
Glass	147 31.4%	321 68.6%	1.686	0.4647
Wood	286 61.1%	182 38.9%	1.389	0.4880
<b>Reusing Materials</b>				
<b>Type of waste</b>	No	Yes	Mean	St. Dev
Metal	134 38.6%	334 71.4%	1.714	0.4525
Cardboard and or paper	123 26.3%	345 73.7%	1.737	0.4406
Plastic	114 24.4%	354 75.6%	1.756	0.4287
Food	107 22.9%	361 77.1%	1.771	0.4204
Glass	218 46.6%	250 53.4%	1.534	0.4994
Wood	152 32.5%	316 67.5%	1.675	0.4688
Others, Specify	247 52.7%	221 47.3%	1.4722	0.4998

**4.4 Test of Hypotheses and Analysis**

For this study, two research hypotheses were raised to assess the need for recycling in maintaining the sustainability of business operations among SMEs in Port Harcourt, Rivers State. Therefore, Pearson Product Moment Correlation (PPMC) was employed to analyze the hypotheses.

**Hypothesis 1**

Ho1: Reduce has no significant effect on SMEs in Port Harcourt, Rivers State, Nigeria.

Therefore, with the aid of Pearson Product Moment Correlation (PPMC), the data collected was analyzed to test the strength of the effect of the variable under study, and the results are presented in Table 9 it shows that the mean score and standard deviation of the variable adoptions of Reduce is  $m = 52.901$ ,  $S.D = 3.1729$ . And the mean score of performance is  $m = 19.235$ ,  $S.D = 4.2978$ . The correlation coefficient ( $r$ ) is  $0.477$  when tested at a 5% significant level. This result implies that reduced has a positive effect on performance. This means that the adoption of reduce will contribute positively to the performance of SMEs in Port Harcourt, Nigeria. Although, the correlation coefficient value is not high, however, this could be due to or accounted for by other variables that also influence the performance of SMEs.

Also, from Table 4.5, the p-value obtained is  $0.000$  when tested at a 5% significant level, since the p-value is less than the significant level which is  $0.05$  (i.e.,  $p < 0.000$ ), therefore, it establishes that the effect is significant. Hence, hypothesis 1 is rejected. Hence, it can be succinctly deduced that there is a significant positive effect on the adoption of reduced practices and the performance of SMEs in Port Harcourt, Rivers state.

**Table 4.5: Adoption of Reduce has no significant effect on the performance of SMEs in Port Harcourt, Rivers state**

Variables	N	Mean	Std Dev.	Correlation coefficient (r)	p-value	Remarks
REDUCE	468	52.901	3.1729	0.477	0.000	significant
PERFORMANCE	468	19.235	4.2978			

**Hypothesis 2**

Ho: There is no significant relationship between the adoption of recycling and reuse practices on performance.

To test the relationship between adoptions of sustainability recycling and social performance, therefore, several identified variables used to measure adoptions of recycling were summed up to give a continuous variable tagged RECYCLE and also some variables used to measure reuse were summed up to give a continuous variable which was tagged REUSE.

Therefore, Pearson Product Moment Correlation (PPMC) analysis was employed on the data collected concerning these two variables was analyzed to test the strength of the relationship between them. Hence, ensued results are presented in Table 11 which shows that the mean score and standard deviation of the variable adoptions of sustainability recycling (RECYCLE) is  $m = 52.901$ ,  $S.D = 3.1729$  while the mean score of reuse (REUSE) is  $m$

=12.621, S.D =1.5497. The correlation coefficient (r) is 0.423 when tested at a 5% significant level. This result implies that there is a positive relationship between the adoption of sustainability recycling and social performance. This means that the adoption of effective sustainable recycling practices will positively enhance the social performance of SMEs in the manufacturing sector in Port Harcourt, Rivers State. Although, the correlation coefficient value is not high, however, this could be due to or accounted for by other variables that could also influence the social performance of SMEs. Also, from Table 4.5, the p-value obtained is 0.001 when tested at a 5% significant level, since the p-value is less than the significant level which is 0.05 (i.e.  $p < 0.001$ ), therefore, it establishes that their relationship is significant. Hence, hypothesis 2 is rejected.

Therefore, it can be succinctly deduced that there is a significant relationship between the adoption of sustainable recycling practices and the social performance of SMEs in Port Harcourt, Rivers State.

**Table 4.5: The relationship between the adoption of recycling and reuse practices on the performance of SMEs in Port Harcourt, Rivers State, Nigeria**

Variables	N	Mean	Std Dev.	Correlation coefficient (r)	p-value	Remarks
RECYCLE	468	52.901	3.1729	0.423	0.001	significant
REUSE	468	12.621	1.5497			

### 5.1 Summary of Findings

After analyzing the data collected and their presentations, the following findings are discovered from the study:

- The study also discovered that the adoption of waste management practices implemented by SMEs in Port Harcourt, and reduction of waste appeared to be the most implemented and recycling practice with cardboard and paper as well as Food. The materials most involved in the adoption of recycling practices are metals, plastics, and glass while reusing materials is a prevalently dominant practice with metal, cardboard, paper, food, and wood. Browsing through the results confirmed the fact that the most utilized waste management practices employed by SMEs in managing waste are reducing waste and reusing materials, compared to recycling material practices.
- Additionally, the study discovered that most of the respondents implied that government-funded support is the most efficient way to strengthen the adoption of these practices in businesses. Coupled with the availability of training support and technical assistance, as well as organizing seminars and workshops that will aid awareness and maximum utilization of recycling practices were also noted as key types of support. Finally, support from the community was also discovered as an important aspect of recycling business practices to incorporate recycling business practices as indicated by the sample under study.

### 5.2 Conclusion

How Recycling Solid Waste Can Be Adopted for Sustainable Business Operations of SMEs In Port Harcourt, Rivers State, Nigeria

The purpose of this study is to assess the need for recycling solid waste for the sustainability of business operations among SMEs in Port Harcourt, Rivers State. The findings in this study revealed implications for both SMEs, as well as government agencies and policymakers. Hence, for SMEs about to start implementing waste management

practices to sustain their business operations, this study concludes that they should start with lower-cost strategies, such as reducing waste and reusing materials implied for easier implementation. Recycling waste requires SMEs to acquire recycling machines which are unaffordable for most of the SMEs that intend to implement recycling business practices or strategies. Also, based on the fact that these two practices (reducing waste and reusing materials) are more easily implementable, with benefits that are more readily realizable, and these practices have been established by this study to have a direct contribution to a company's financial profits or sustainability. Based on the challenges faced by SMEs in adopting recycling business practices, this study concludes that, governmental entities and policymakers could provide financial assistance and technical assistance, while the companies could provide, training support, organize seminars and workshops as means of encouraging SMEs to implement recycling business practices in their business processes.

### **5.3 Recommendations**

The entrepreneurship opportunity in Nigeria is enormous. Entrepreneurs in the SME category create many jobs in Nigeria; however, entrepreneurs suffer a great loss when their businesses are not sustained. The motive behind this study is to find a solution to the problem SME owners face in sustaining their business beyond 5 years. Using the information gathered from SME owners who have done so could help others who are facing challenges to sustain their businesses.

SMEs should also consider the following steps,

- Identify the specific recycling opportunities available in Port Harcourt. This could include plastic recycling, e-waste recycling, or other types of waste materials that can be recycled.
- Reach out to government agencies or non-governmental organizations (NGOs) that are involved in management initiatives. These organizations may provide guidance, resources, or funding opportunities to support SMEs in implementing recycling practices.

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