

IMPACT OF PUBLIC PARTICIPATION ON SUSTAINABLE MANAGEMENT OF PLASTIC WASTE IN PORT HARCOURT

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ABSTRACT	KEYWORDS
The paper focused on investigating the impact of public participation on the sustainable plastics waste management in Port Harcourt. Public participation was assessed using public environmental cognition, public environmental emotions, and public willingness behaviour, three dimensions of sustainable waste plastic management were considered, namely; Social, economic and environmental dimensions. Analytical cross-sectional research design was adopted. Multi-stage sampling technique was used to sample 400 respondents from five communities in Port Harcourt namely Diobu, Borokiri, Bundu-Ama, D-line and Azubie Town power using Taro Yamane sample size determination formula. The instrument for data collection was structured questionnaire designed based on 5-point Likert scale. Descriptive statistics analysis (percentage and weighted mean score WMS). Multi-linear regression analysis was used for data analysis. There is high level of public participation in terms of environmental cognition (WMS = 3.01>3.00)), environmental emotion (WMS = 3.58>3.00)) and willingness behaviours (WMS = 4.00>3.00). and there is high level of sustainable plastic waste management in Port Harcourt both socially (WMS = 4.45>3.00), economic (WMS = 4.00>3.00) and environmental (WMS = 4.64>3.00), Regression analysis showed that public participation factors (B=0.716, p=0.000) have positive and significant impacts on sustainable plastic waste management at significant level of 0.05. It was concluded that public participation initiatives have positive and substantial impact on sustainable plastic waste management in Port Harcourt.	Public Participation, Sustainable Management, Plastic Waste, Port Harcourt

Introduction

The United Nation defines waste as "materials that are not primary products for which the generator has no further use regarding his or her own purposes of production, transformation, or consumption, and of which he or she seeks to dispose" (United Nations, n.d.). Even though people have always been generating waste, significant environmental problems happen when the natural capacity to assimilate waste is exceeded. Waste can be categorised according to several characteristics, including physical

condition (solid, liquid, or gas), material composition (glass, paper, wood), intended purpose, and safety classification. Among these classifications, solid waste is especially concerning due to its appearance, persistence, and direct effects on urban ecosystems. Typical constituents of solid waste comprise paper, glass, food, metal, and plastics, accounting for roughly 10% of total solid waste (Amasuomo & Baird, 2016).

In recent years, the issue of public participation has gained significant attention in the literature (Das, 2015; Wang, 2014; Wukich & Mergel, 2015). While a decade ago, there were concerns about limited opportunities for public involvement, participation has now emerged as a crucial element in policy-making and implementation (Azam & Mansoor, 2006; Buchy & Race, 2001). By the early 2000s, public participation had become a widely recognized and expected aspect of public policy-making (Buchy & Race, 2001). The focus has shifted from debating its necessity to acknowledging its significant benefits for decision-making, citizenship, and inclusion when executed effectively (Bryson et al., 2012). The practice of public participation has evolved into a more professionalized endeavor, with a dedicated community of facilitators (Zinke *et al.*, 1999) and the construction of public participation knowledge becoming a common component (Antoci *et al.*, 2007). However, the methods and approaches to participation vary considerably, prompting substantial interest in the design and implementation of these processes (Halvorsen, 2001).

Engaging the public in the process of program implementation is crucial for them to recognize the value of their participation in shaping their future (Meredith & MacDonald, 2017). Buchy and Race (2001) have shown that public participation in program implementation serves as a means for individuals and communities to express their interests and concerns related to development strategies, particularly when these practices have implications for the general public and specific groups (Buchy *et al.*, 2000; Buchy & Race, 2001). Apart from information dissemination and raising awareness, public engagement plays a vital role in establishing an efficient planning system by better understanding the interests and needs of stakeholders, contributing to effective resource planning and management. It is important to note that involving the public in the development process helps alleviate political and administrative issues while fostering accountability within the professional climate (Lukensmeyer *et al.*, 2011) addressing perceptions of power disparities.

Public participation has long been recognized as a fundamental aspect of environmental assessment (EA) (Sinclair & Diduck, 2017). The validity of the EA process itself is questioned if substantive participation is not allowed (Pandebesie *et al.*, 2019). Reflecting this, most EA legislation includes participation as a core element, outlining practical steps for involvement. The benefits of public participation in EA have been demonstrated both theoretically and practically. One key theoretical argument is that participation upholds the fundamental values of democracy and enhances the social fabric of society (Feng *et al.*, 2020; Yan *et al.*, 2020). This viewpoint positions EA as a primary mechanism through which the public can directly engage in decisions that affect them. Additionally, EA is seen as an empowerment tool for individuals and groups (Taylor *et al.*, 2001).

The problem of plastic and other solid waste disposal and management have been a recurring problem in Port Harcourt and other surrounding cities within Rivers State. In these cities, considerable percentage of refuse is deposited either on the roads, unapproved dump sites, in water ways, drainage systems, open sites, etc. The menace of plastic waste, particularly, is common to all markets, commercial centres and most streets in the city. In most area around Port-Harcourt, plastic along with

other solid wastes are found recklessly dumped in the middle of the roads. This is partly because of population surge in the city centres and inadequate waste receptacles located along the highways. Even when waste disposal contractors clear them, particles of refuse still litter the streets. At designated refuse collection points or dump sites, refuse is neither treated nor disposed of regularly.

The underlying problem with these uncivilized acts of plastic waste management is that plastic materials carelessly disposed on highways are washed into the drains hindering free flow of storm water that causes adverse flooding in the city centres. For instance, it has been observed that the flooding recently being observed in parts of Port Harcourt might be connected with blocked drains. This is evidenced by plastic containers that litter the roads or surfed up from gutters after the rain. Another problem is that if plastic wastes remain untreated, it might lead to pollution, (Chukwu, 2020). The most widely used waste management method in Nigeria essentially entails gathering various waste products and then disposing of them at approved disposal locations. Separating waste materials at the source or at any stage of handling is not standard practice (Lawrence et al., 2020). There is little infrastructure for recycling, and current waste management procedures including collection and disposal are ineffective. Additionally, there is limited public involvement in waste management and little knowledge of how waste plastic affects the ecosystem. The absence of strict regulations and innovative alternatives complicates efforts to manage waste plastic sustainably. To reduce waste plastic and lessen its detrimental effects, public involvement is desperately needed. This study seeks to assess the impact of public participation on sustainable management of plastic waste in Port Harcourt Nigeria.

2.0 Methodology

2.1 Research Design

The research design adopted in this study is analytical cross-sectional research design. This approach allows the researcher to get a deeper understanding of the phenomena under investigation, acquire fresh perspectives, and establish a more precise research topic or hypothesis. Analytical cross-sectional research strategy involves gathering data from multiple people across different organizations at a specific moment in time, typically linked by a shared characteristic (Lauren, 2020). This design is suitable for this study because the selected enterprises share a common characteristic and frequently undergo changes in their management.

2.2 Study Area

Port Harcourt is the capital city of Rivers State. The local government areas is bordered in the North by Ikwerre and Etche LGA, in the South by Degema and Okrika LGAs, in the East by Eleme and the West by Emuha and Degema LGAs. With a population of 3,793,780 as of the 2025 projection, Port Harcourt is the second most populous LGA in Rivers State after Obioakpor LGA. As the state capital, the city has diverse population of Igbo, Ikwerre but also includes the Ogoni and Ijaw. The city is particularly noted for its linguistic diversity.

The economy of the city and the entire Rivers State is dominated by the booming petroleum industry and some manufacturing companies and construction companies with significance presence of numerous informal businesses like roadside mechanics, painters, food vendors, carpenters, bricklayers, plumbers, furniture makers etc. Rainfall is generally seasonal, variable, as well as heavy, and occurs

between the months of March and October through November. The wet season peaks in July, lasting more than 290 days. The only dry months are January and February which have little to no effect. For Port Harcourt, temperatures throughout the year are relatively constant with little variation throughout the course of the seasons. Average temperatures are typically between 25 and 28 °C (77 and 82 °F). Some parts of the state still receive up to 150 mm (6 in) of rainfall during the dry period. Relative humidity rarely dips below 60% and fluctuates between 90% and 100% for most of the year.



Port Harcourt

Figure 1 Map of River State Showing the 23 Local Government Areas

This urban area's plastic waste management is the subject of the research, which aims to investigate public participation, creative methods, and policy responses. Port Harcourt is one of the most important commercial and industrial centres in Nigeria, and its high plastic use and obvious environmental degradation due to plastic pollution make it an ideal case study for a region-specific investigation of plastic waste issues. The study's findings will be more relevant and applicable because this localized technique makes sure the data is reflective of the city's actual population's experiences, problems, and attitudes. Regardless of gender, level of education, or ethnicity, the target demographic consists of people from all walks of life and all types of jobs. Anyone whose life is touched by plastic waste in any way whether directly or indirectly includes market vendors, locals, municipal employees, environmental officers, students, company owners, and so on. The study seeks to provide comprehensive insights into public engagement and sustainable waste management techniques by collecting a wide range of perspectives.

2.3 Population, sampling technique, Sample Size determination and Sources of Data

According to Harrison (2018), a study's population is the set of people, organizations, or other things that a research study aims to gather information from. People living in and having a vested interest in the Port Harcourt metropolitan area in Rivers State, Nigeria, make up the study's population. Based on

projection of population of Port Harcourt LGA from 2006 census the current population is projected at 3.45 million

Multi-stage sampling technique was used in this study and it involve two main stages explained as follows; Purposive sampling technique was used to select five communities in Port Harcourt LGA. These communities were selected because they most populous communities where over 80% of the commercial and industrial activities that generate over 90% of the plastic waste in study area. Random sampling techniques was used to select respondents from different household who are living the sampled communities and perceived to have ideas on the solid waste management particularly plastic wastes. The five communities sampled for the study are Diobu, Borokiri, Bundu-Ama, D-line and Azubie Town. These communities are sampled because they are the most populated communities in Port Harcourt LGA.

The sample size was determined by applying the equation presented below by Taro Yamane. This equation is used because it is suitable for study with population greater than 10,000 and it is also very simple, straightforward and does not require much variables or parameter. Using the equation developed by Taro Yamane, the sample size of a population should be achieved at confidence level of 95% and significant level of 0.05:

$$n = \frac{N}{1+N(E^2)} \quad (1)$$

Where N is the population size = 3.45 million, e is the level of precision or significance level = 0.05, Hence, the sample size is 400. This sample size was equally distributed among the five communities selected for the study which implied that each community received a sample size of 80 respondent see Table 1

Table 1 Names of the Sampled Communities for the study and the assigned respondents

S/n	Name of sampled Community	Number of assigned respondents
1	Diobu,	80
2	Borokiri,	80
3	Bundu-Ama,	80
4	D-line	80
5	Azubie Town	80

The study involved the use of both primary and secondary data. The primary data sources included the use of structured questionnaire in collecting information from respondents. The collection of primary data, obtained directly from stakeholders via surveys and interviews, provides direct and precise information on individual experiences of waste management within Port Harcourt. Secondary data, such as pre-existing papers or empirical research, serves to provide a contextual framework for the findings. Collectively, these sources provide a more comprehensive examination, providing verification for the original data while guaranteeing that the research is based on well-established knowledge. Hence, the primary data was sourced from distributed questionnaires while secondary data was sourced from journal publications, conference proceedings, internet search using google and MSN search engines.

2.4 Instruments for Data Collection

The study adopted a survey method for data collection using questionnaire as instrument for the data collection. The question items were structured in a manner that allows for easy quantification and comparison of responses. Examples of such formats include checkboxes, Likert scales, and yes/no questions. This technique is very efficient in assessing the management of waste plastics in Port Harcourt. It facilitates the systematic quantification of subjective experiences and opinions. The research instrument was titled “Public Participation and Sustainable Management of Plastic Waste in Port Harcourt Nigeria:” and has three sections:

Section A: Demographic Information: Collects demographic information from respondents, including their age, gender, marital status, level of education and profession This facilitates demographic grouping analysis and population segmentation.

Section B: Public Awareness and participation: This section determines the patterns of behaviour and areas where participation is lacking by measuring levels of awareness, public involvement, present practices, and perceived barriers.

Section C: Sustainable management strategies: This section seek to obtain perspective of the respondents on the availability of five-sustainability dimensions namely social, economic, environmental, institutional and technical factors that enhance sustainable management of plastic waste

A print version of this questionnaire was distributed to sampled residents of Port Harcourt. The questionnaires were distributed on a one-on-one basis with a time frame of at three months. The questionnaire comprised of items that were rated on a 5-point Likert scale, as well as questions on demographic data of the workers. The survey/data collection process took a period of three weeks. In 5-point Likert scale, the analysis of the response of the respondents were based on setting a criterion (C) for rejecting or accepting the overall response and the criteria is calculated as follow

$$C = \frac{1+2+3+4+5}{(5)} = \frac{15}{(5)} = 3.00 \quad (3.2)$$

This means that when average or weighed average is greater than 3.00, the respondents agree or accept the construct, when average or weighed average is less than 3.00, the respondents disagree or reject the construct and when average or weighed average is 3.00 the respondents are undecided.

2.5 Method for Data Analysis

The Statistical Package for the Social Sciences (SPSS) software was utilized by the researcher to analyse and present the results in a tabular form. Descriptive statistics comprising of simple percentages and weighted average were used to investigate the level of public participation and sustainable management strategies while regression analysis was used investigate the impact of public participation on sustainable plastic waste management strategies. Regression analysis were done with a P value of less than 0.05 being regarded statistically significant

3.0 Results and Discussions

3.1 Respondents Sociodemographic Characteristics

Table 2 showed the summary of the sociodemographic characteristic of the study respondents in the study areas. On age distribution of the residents in the study area. The results showed that majority of the resident numbering 138(36.80%) were between age 26-35, followed by people who are between age 18 to 25 who are 107 (28.53%) while the least are people of over 40 years old who are just 55 covering (14.67%). This result on age distribution shows that most of the people in the sampled communities are young adults. The distribution of the resident based on their sex revealed that 176 people which represents 46.93% of the sampled people were males while majority were female and account for 199 sampled respondents (53.07%). This results on distribution of residents in the communities based on their sex revealed that the residents are predominately female. This is within the domain of expectation because there are more female than male in the general population figure of Port Harcourt On educational qualification, the results revealed that majority of sampled residents have first degree certificate 205, (54.66%), followed by people with master's degree certificate (85, 22.67%) and people with O-level certificates 78, (20.82%) and while the least are people with Ph.D. 7 (1.86%). However, there was no people sampled for the study without any forms of certificate. This result showed that most of the people in the communities are educated. On the profession of the respondents, the results revealed that majority of the field workers are civil servants 195 (52.00%) followed by people who are traders (25.33%) and those who are politicians 67, (17.87%) while the least are people or resident who are self-employed 18, (4.80%). The results suggest that most of the people in the communities are civil servants and traders Lastly, marital status, the results revealed that most of the people are married 282, (75.20%), 90 (24.00%) workers are single while only 3 (0.80%) workers were divorced

Table 2 Summary of sociodemographic characteristic of the respondents in the Study area

Socio Demographics	Range	Frequency (n=375)	Percentage (%)
Age	18 – 25	107	28.53
	26 – 35	138	36.80
	36- 45	75	20.00
	above 45	55	14.67
Sex	Male	176	46.93
	Female	199	53.07
Educational Qualification	Ph.D.	7	1.86
	Masters	85	22.67
	First Degree	205	54.66
	O-level	78	20.82
Profession	Traders	95	25.33
	Civil Servants	195	52.00
	Politician	67	17.87
	Self-employed	18	4.80
Marital Status	Married	282	75.20
	Single	90	24.00
	Divorced	3	0.8

3.2 The level of public participation in management of plastic waste in Port Harcourt.

In this study, the level of public participation in management of plastic waste in Port Harcourt was operationalized using public willingness behaviour, public environmental cognition and public environmental emotion. The results of the descriptive analysis carried out to investigate the level of public willingness behaviour in management of plastic waste in Port Harcourt as shown in Table 3 revealed that there is good public willingness behaviour among the resident of Port Harcourts as regards to plastic waste management. This is linked to presumed willingness of the residents to segregate plastic waste from other solid waste in order to assist in plastic reuse and recycling, the presumed willingness of the residents to buy material made from plastic waste recycling, the ability of the residents to encourage plastic waste management by reusing plastic waste, burning and selling plastic waste to recyclers and lastly the ability of the residents to encourage plastic waste management by burning non-re-useable plastic waste and selling plastic waste to recyclers.

The outcome of study findings aligned with the works of Hao et al (2024) who carried out study to examine ways of enhancing agricultural plastic waste management in China with Insights from public participation. They opined that identifying whether the public is willing to pay for agricultural plastic waste management (APWM) and clarifying the decisions' driving pathways to explore initiatives for promoting their payment intentions are essential to address the dilemma confronting APWM. Their result showed that the people hold generally positive and relatively strong willingness to pay and use materials made from APWM; The implications of this findings extend to encouraging government policies to encourage production of material using plastic waste because public willingness to pay for materials made from plastic waste can enhance waste management

Salsabila et al (2023) carried out study with the primary objective of investigating the behavioural patterns and levels of public engagement in waste management practices within the context of Indonesia. They opined that the issue of waste management is a significant and unresolved one that continues to be prioritized by the government. This finding suggests a deviation from the outcomes of other research undertaken in recent decades, which posit that community engagement plays a major role in addressing waste management challenges. The findings of the study indicate that individuals' behaviour has a significant role in shaping their inclination toward participating in waste management initiatives throughout various urban areas in Indonesia.

Table 4 shows descriptive analysis carried out to investigate the level of public environmental cognition in management of plastic waste in Port Harcourt. The outcome showed that resident of the communities in Port Harcourt have good environmental knowledge and cognition plastic waste management. This is attributed to their understanding of the seriousness and environmental and health consequences of plastic waste pollution, understanding of the implications of the non-biodegradable nature of most plastic materials, understanding of the best way to dispose plastic which is either burning or recycling and understanding of the fact that proper plastic waste management is not just important but necessary for environmental and health concerns.

The findings of this study did not align with the works of Ugbong et al. (2024) who assessed the impact of plastic recycling, as suitable innovation for plastic waste management, on environmental sustainability in Nigeria's urban centers. Their results showed there is low public awareness of the environmental and health consequences of poor management of plastic waste and poor infrastructure for management of plastic waste,

Table 5 show descriptive analysis carried out to investigate the level of public environmental emotion as concerns management of plastic waste in Port Harcourt. The results revealed that that there is high level of emotion on environmental effect of poor plastic waste management among the residents of the sampled communities in Port Harcourt. This is linked to the people feeling when they observe plastic waste littered around roads and clog waterways and gutters, people feeling towards risk level of the environment due to condition of plastic waste management in the community, people feeling when seeing other peoples or neighbours dispose their plastic waste carelessly and people expressing their willingness to sacrifice their time and energy to unclog plastic waste and dispose then properly by either burning or selling to recyclers. Overall, the results showed that there is high level of public participation in management of plastic waste in the study.

The outcome and findings of the study aligned with the work of Amasuomo et al (2019) who carried out study to investigate the rate of participation in sustainable waste and environmental management activities in Abuja, The questions were designed to gather data on demographics of the participants, their awareness and attitude to sustainable waste management, the barriers preventing public participation in a sustainable solid waste management and measures that can encourage public participation in sustainable waste management in Abuja. The study revealed that there is high level of public participation an awareness in the study area, however, other measures that can encourage public participation in sustainable waste management programs in the area were provision of recycling collection points, enforcement of laws and policies, the development of effective policies and regulatory framework

Table 3; The level of public willingness behaviour in plastic waste management among the resident of in Port Harcourt.

S/N	Public Willingness Behavior	SD.	D.	UN	A.	SA	WMS	Remark
1	I am willing to pay for proper plastic waste management in the community	200.00 53.33	150.00 40.00%	25.00 6.67%	0.00 0.00%	0.00 0.00%	1.53	Disagreed
2	I am willing to segregate plastic waste from other solid waste to aid plastic reuse and recycling	0.00 0.00%	0.00 0.00%	15.00 4.00%	160.00 42.67%	200.00 53.33%	4.49	Agreed
3	I can comfortably buy material made from plastic waste recycling	119.00 30.77%	47.00 13.02%	4.00 1.22%	18.00 5.89%	187.00 49.26%	3.29	Agreed
4	I encourage plastic waste management by reusing plastic waste, burning and selling plastic waste to recyclers	115.00 28.25%	50.00 12.28%	4.00 1.22%	27.00 6.66%	210.00 51.59%	3.41	Agreed
5	I encourage plastic waste management by burning non-re-useable plastic waste and selling plastic waste to recyclers	119.00 30.77%	47.00 13.02%	4.00 1.22%	18.00 5.89%	187.00 49.26%	3.29	Agreed
6	I encourage plastic waste management by selling plastic waste to recyclers	172.00 44.33%	142.00 36.93%	0.00 0.00	42.00 12.31%	19.00 6.43%	1.99	Disagreed
Overall Weighted Mean Score							3.01	Agreed

Table 4; The level of public environmental cognition in plastic waste management among the resident of in Port Harcourt

c	Public Environmental Cognition	SD.	D.	UN	A.	SA	WMS	Remark
1	Plastic waste can cause serious environmental pollution and ecological degradation	115.00 28.25%	50.00 12.28%	4.00. 1.22%	27.00 6.66%	210.00 51.59%	3.41	Agreed
2	Plastic waste can cause serious problem to human health	119.00 30.77%	47.00 13.02%	4.00. 1.22%	18.00 5.89%	187.00 49.26%	3.29	Agreed
3	Most Plastic waste are non-biodegradable which means they cannot decay easily and should not be disposed carelessly.	0.00 0.00%	0.00 0.00%	15.00. 4.00%	160.00 42.67%	200.00 53.33%	4.49	Agreed
4	The best way to dispose plastic is by burning or recycling	119.00 30.77%	47.00 13.02%	4.00. 1.22%	18.00 5.89%	187.00 49.26%	3.29	Agreed
5	Proper plastic waste management is not just important but necessary for environmental and health concerns	115.00 28.25%	50.00 12.28%	4.00. 1.22%	27.00 6.66%	210.00 51.59%	3.41	Agreed
Overall Weighted Mean Score							3.58	Agreed

Table 5; The level of public environmental emotion concerning plastic waste management among the resident of in Port Harcourt

	Public Environmental Emotion	SD.	D.	UN	A.	SA	WMS	Remark
1	I feel disturbed when I observe plastic waste littered around roads and clog waterways and gutters	115.00 28.25%	50.00 12.28%	4.00. 1.22%	27.00 6.66%	210.00 51.59%	3.41	Agreed
2	I feel the environment is at a greater risk due to condition of plastic waste management in the community	119.00 30.77%	47.00 13.02%	4.00. 1.22%	18.00 5.89%	187.00 49.26%	3.29	Agreed
3	I am usually uncomfortable seeing people or neighbours dispose their plastic waste carelessly	0.00 0.00%	0.00 0.00%	15.00. 4.00%	160.00 42.67%	200.00 53.33%	4.49	Agreed
4	Sometimes I sacrifice by time and energy to unclog plastic waste and dispose then properly by either burning or selling to recyclers	0.00 0.00%	0.00 0.00%	0.00. 0.00%	75.00 20.00%	300.00 80.00%	4.80	Agreed
Overall Weighted Mean Score							4.00	Agreed

3.3 The level of sustainable waste plastic management among the residents of Port Harcourt

The level of sustainable waste plastic management among the residents of Port Harcourt was operationalized in this study using different dimensions of sustainable waste plastic management, namely, social, economic and environmental dimensions. Table 6 present the summary of the descriptive analysis carried out to investigate the level of social dimension of sustainable waste plastic management among the residents of Port Harcourt. Five questionnaire items were used to operationalize and quantify the respondent on the social dimension of sustainable waste plastic management in Port Harcourt. The results of the descriptive analysis based on these five items revealed that the sampled respondents in the communities agreed to all five items. This is because the weighted mean score of the five items were greater than 3.00 critical score. Also, the overall weighted mean

score of the entire response score is 4.45 which is also greater than 3.00 critical mean implied that majority of the sampled resident in the community agreed that there is high level of social dimension of sustainable waste plastic management in Port Harcourt.

Table 7 present the summary of the descriptive analysis carried out to investigate the level of economic dimension of sustainable waste plastic management among the residents of Port Harcourt. Four questionnaire items were used to operationalize and quantify the respondent on the economic dimension of sustainable waste plastic management in Port Harcourt. The results of the descriptive analysis based on these four items revealed that the sampled respondents in the communities agreed to all four items. This is because the weighted mean score of the four items were greater than 3.00 critical score. Also, the overall weighted mean score of the entire response score is 4.00 which is also greater than 3.00 critical mean implied that majority of the sampled resident in the community agreed that there is high level of economic dimension of sustainable waste plastic management in Port Harcourt.

Table 8 present the summary of the descriptive analysis carried out to investigate the level of environmental dimension of sustainable waste plastic management among the residents of Port Harcourt. Four questionnaire items were used to operationalize and quantify the respondent on the environmental dimension of sustainable waste plastic management in Port Harcourt. The results of the descriptive analysis based on these four items revealed that the sampled respondents in the communities agreed to all four items. This is because the weighted mean score of the four items were greater than 3.00 critical score. Also, the overall weighted mean score of the entire response score is 4.00 which is also greater than 3.00 critical mean implied that majority of the sampled resident in the community agreed that there is high level of environmental dimension of sustainable waste plastic management in Port Harcourt.

These descriptive analyses carried out to investigate the level of social, economic and environmental dimension of sustainable waste plastic management among the residents of Port Harcourt revealed that there is high level of social, economic and environmental, institutional and technical dimension of sustainable waste plastic management in Port Harcourt. This is attributed to the fact that Port Harcourt is an urban area with substantial number of enlightened and educated resident who understand all dimension and features of sustainable plastic waste management

The outcome agreed with the works of Pambudi et al (2025) who carried out study toward promoting circular plastic waste management by addressing community perspective on five sustainability dimensions namely social, economic, environmental, institutional, and technical. They collected questionnaires from 1000 respondents using from Jakarta, Bekasi, Bandung, Depok, Tangerang, and Bogor, respectively. The questionnaires revealed disparities in five sustainable dimensions, analysed using paired t-tests, multiple linear regression, and binary logistic regression. The study discovered that reducing plastic waste is the main focus for transitioning to circular plastic waste management and their findings highlighted the importance of considering technical, institutional, and social dimensions in promoting sustainability and public participation in circular plastic waste management.

Table 6 Social dimension of sustainable waste plastic management in Port Harcourt

c	Social Dimension			SD.	D.	UN	A.	SA	WMS	Remark
1	Sustainability	ensured	waste	0.00	0.00	20.00.	40.00	315.00	4.79	Agreed
	workers' occupational health and safety			0.00%	0.00%	5.33%	10.66%	85.01%		
2	Sustainability	reduced	excessive	0.00	0.00	200.00.	100.00	75.00	3.66	Agreed
	workload for waste workers			0.00%	0.00%	53.33%	26.67%	20.00%		
3	Sustainability	encourages	plastic	0.00	0.00	15.00.	160.00	200.00	4.49	Agreed
	waste segregation among workers and residents		waste	0.00%	0.00%	4.00%	42.67%	53.33%		
4	Sustainability	encourages	plastic	0.00	0.00	0.00.	75.00	300.00	4.80	Agreed
	waste reuse and recycling			0.00%	0.00%	0.00%	20.00%	80.00%		
5	Sustainability	discourages	excessive	0.00	0.00	15.00.	160.00	200.00	4.49	Agreed
	dependency on plastic packed goods			0.00%	0.00%	4.00%	42.67%	53.33%		
Overall Weighted Mean Score									4.45	Agreed

Table 7 Economic dimension of sustainable waste plastic management in Port Harcourt

c	Economic Dimension			SD.	D.	UN	A.	SA	WMS	Remark
1	Sustainability	ensures	that	0.00	0.00	15.00.	160.00	200.00	4.49	Agreed
	product from recycled plastic waste are affordable			0.00%	0.00%	4.00%	42.67%	53.33%		
2	Sustainability	ensures	that	119.00	47.00	4.00.	18.00	187.00	3.29	Agreed
	products from recycled plastic waste are cost effective compare to other product			30.77%	13.02%	1.22%	5.89%	49.26%		
3	Sustainability	ensures	that	115.00	50.00	4.00.	27.00	210.00	3.41	Agreed
	products from recycled plastic waste have quality competitiveness with other product			28.25%	12.28%	1.22%	6.66%	51.59%		
4	Sustainability	ensures	that the	0.00	0.00	0.00.	75.00	300.00	4.80	Agreed
	supply chain of products from recycled plastic waste are steady and can maintain its market share			0.00%	0.00%	0.00%	20.00%	80.00%		
Overall Weighted Mean Score									4.00	Agreed

Table 8 Environmental dimension of sustainable waste plastic management in Port Harcourt

c	Environmental Dimension	SD.	D.	UN	A.	SA	WMS	Remark
1	Sustainability ensures that the people are aware of the environmental impact of plastic waste	0.00 0.00%	0.00 0.00%	20.00. 5.33%	40.00 10.66%	315.00 85.01%	4.79	Agreed
2	Sustainability ensures that the people are encouraged to reduce and reuse plastic waste	0.00 0.00%	0.00 0.00%	15.00. 4.00%	160.00 42.67%	200.00 53.33%	4.49	Agreed
3	Sustainability ensures that the people are aware of potential plastic waste pollutants in rivers and oceans	0.00 0.00%	0.00 0.00%	0.00. 0.00%	75.00 20.00%	300.00 80.00%	4.80	Agreed
4	Sustainability ensures that the people are aware of the health and environmental impact of microplastic	0.00 0.00%	0.00 0.00%	15.00. 4.00%	160.00 42.67%	200.00 53.33%	4.49	Agreed
Overall Weighted Mean Score							4.64	Agreed

3.4 Impact of public participation on stainable plastic waste management in Port Harcourt

Table 9 present that results of multilinear regression analysis for the impact of public participation (PP) and its constructs namely publics environmental cognitions (PEC), publics environmental emotions (PEE) and publics willingness behaviour (PWB) on sustainable plastic waste management in Port Harcourt. The results showed that public participation and its constructs have positive and significant impact on sustainable plastic waste management. This is because the regression model p-value equal to 0.000 which is less than 0.05 significant level. The R-square value of 0.301 which means that 30.1% in the sustainable plastic waste management in Port Harcourt is due to variable or change in the public participation towards plastic waste management in the area while the other 69.9% were as a result of change in other indicators or factors that affect sustainable plastic waste management that were not discussed or included in this current study.

Table 9 also present regression coefficient for public participation and its constructs as predictors of sustainable plastic waste management in Port Harcourt. The results revealed that the regression coefficient of public environmental cognition (PEC), public environmental emotion (PEE) and public willingness behaviour (PWB) are 0.119, 0.105 and 0.352 respectively while the regression coefficient of public participation as a single indicator is 0.719. and their various p-values are 0.034, 0.042, 0.000 and 0.000 respectively which are all less than 0.05 significance level. These results on regression coefficient means that a unit increase or decrease in public environmental cognition, public environmental emotion and public willingness behaviour among the residents of the study area would trigger a 0.119, 0.105 and 0.352 increase or decrease in sustainable plastic waste management with overall 0.719 increase or decrease in sustainable plastic waste management due to overall impact of all the constructs of public participation. The results on p-values implied that all the constructs of public participation have significant impact on sustainable plastic waste management in Port Harcourts. Hence the first null hypotheses which states that “The level of public participation has no

significant impact on the sustainable waste plastic management in Port Harcourt” is rejected while the alternate hypotheses which stated that “The level of public participation has significant impact on the sustainable waste plastic management in Port Harcourt’ is accepted.

Table 9; Multi-linear regression analysis on the impact of public participation on sustainable plastic waste management in Port Harcourt.

Independent Variables		Regression coefficient	Std. Error	R-square	t-value	P-value
1	(Constant)	2.255	0.348	0.307	6.488	0.000
	PEC	0.119	0.056		2.122	0.034
	PEE	0.105	0.051		2.041	0.042
	PWB	0.352	0.056		6.272	0.000
	PP	0.719	0.058		12.311	0.000

a. Dependent Variable: SPWM

These findings aligned with the works of Hao et al (2024) who carried out study to examine ways of enhancing agricultural plastic waste management in China with Insights from public participation. They opined that identifying whether the public is willing to pay for agricultural plastic waste management (APWM) and clarifying the decisions’ driving pathways to explore initiatives for promoting their payment intentions are essential to address the dilemma confronting APWM, their findings revealed that respondents have positive and relatively strong payment willingness towards plastic waste management and the respondents’ attitude, subjective norm and perceived behavioural which are public participation factors positively correlated with their payment intentions which is a sustainable plastic waste management indicator in economic dimension,) environmental cognition and environmental emotion ((environmental dimension) .

The outcome also aligned with the work of Salsabila et al. (2021) who carried out study aimed at comparing factors that influence the solid waste management (SWM) in Indonesia and the Philippines. They adopted qualitative approach to analyse literatures selected related to SWM during 2000-2020. The results showed that governance (policy making) and participation (public participation) become the main factors that affect the status of solid waste management as it is mentioned in most of the previous studies in the Philippines different with the previous studies in Indonesia.

4.0 Conclusions

The impact of public participation on sustainable plastic waste management in Port Harcourt has been investigated. Based on the outcome of this study, it was concluded that there is high level of supposed public participation in plastic waste management in terms of public environmental cognitions, environmental emotions and willingness behaviour which implies that residents of Port Harcourt have good level of awareness and willingness to engage in plastic waste management but government enforcement policies are weak. Social, economic and environmental dimensions of sustainable plastic waste management are achievable in Port Harcourt which implies that with substantial level of government commitment and public participation, there will be sustainable plastic waste management in the Port Harcourt. Lastly, public participation factors have positive and substantial impact on

sustainable plastic waste management. in Port Harcourt which implies that improvement in public participation initiatives towards plastic waste management would results to substantial improvement in sustainable plastic waste management in Port Harcourt.

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