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Implementation of Government Policy on Plastic Waste Re-Cycling Methods in Rivers State

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ABSTRACT: This study assessed the status of the implementation of government policy on plastic waste recycling methods in Rivers State. This study adopted a descriptive research design. Research objectives and questions were formulated to help guide the study. The survey method involved the use of a self-administered questionnaire to obtain primary data. Secondary data was obtained from literature review. The sample size was determined using Yamane Taro's statistical method and was calculated to be 400, 440 questionnaires were distributed as a measure to reduce non response bias for the study. Data collected from the answered questionnaires were analyzed using Statistical Package for Social Sciences (SPSS). Results from the study showed that residents were not aware of the existing plastic waste management policies and hence the poor implementation of such in the state. Although respondents exhibited a fair knowledge of plastic waste recycling management methods, they lacked the right attitude to implementing these methods. Open dumps were the most preferred and currently used plastic waste disposal methods. Some of the recommended suggestions appropriate for enhancing the implementation of these policies include: increased level of awareness can be raised by hosting waste management educational events at schools and offices, organizing community projects, publicizing information of existing waste management policies on websites and social media, disposal signposts within a specified walking distance, hosting regular seminars with important stakeholders, improving the accessibility of the recycle bins, incentivizing plastic waste recycling, and the establishment of fines for violators of plastic waste management policies.

KEYWORDS: Waste management methods, Plastic waste management, Waste Re-cycling

I. INTRODUCTION

Plastics are inexpensive, lightweight and durable materials, which can readily be molded into a variety of products that can be used in a wide range of applications. Mass production of plastics started in the 1950s and it has increased 200-fold since then. Currently, the global annual production of plastic is estimated at 300 million metric tons [9], while its global cumulative production is 8.3 billion metric tons [4]. Consumption of plastic in Western Europe and North America has soared to 100 kg per capita, while in Asia, it is approaching 20 kg per capita, with expected rapid growth [17]. Most of the plastic waste is generated in Asia, with America, Japan, and the European Union being the world's largest producers of plastic packaging waste per capita [16]. A major portion of plastic produced each year is used to make disposable items of packaging or other short-lived products that are discarded within a year of manufacture. Over 50% of plastic is used for single-use disposable applications, mainly packaging [11] and [21]. Approximately 5 trillion plastic bags are produced annually [16]. Due to their ubiquitous household and commercial applications, current levels of their use and disposal generate severe environmental problems like clogged drainages exacerbating flood risk, blocked water ways, disruption of economic and social activities, therefore threatening the ecological habitats of plant and animal species. In the same vein, indiscriminate plastic consumption and disposal pose catastrophic impacts on human health. The incessant burning of plastic wastes on landfills results in severe respiratory issues and the propagation of endemic diseases. Animal lifespans are shortened due to indirect consumption of plastic waste. Several approaches have been implemented to curb the growing effects of plastic waste in communities. [1] described plastic waste recycling as the reuse of plastic products to generate funds, thereby preventing non-selective disposal in open dumps and landfills. Oftentimes, these plastics are recycled into useful polymers, tissue papers, composting ingredients, and plastic bricks. Recycling of packaging materials has seen rapid expansion over the last decades in a number of countries. Advances in technologies and systems for the collection, sorting and reprocessing of recyclable plastics are creating new opportunities for recycling, and with the combined actions of the public, industry and governments, it may be possible to divert the majority of plastic waste from landfills to recycling over the next decades. These outcomes of plastic diversification reinforce the importance of plastic recycling as a means to the extensive survival of the ecosystem. Some factors have been identified as possible barriers to the adoption of sustainable plastic waste



management systems in Nigeria: lack of awareness of systems and technologies for plastic waste disposal; inadequate knowledge of policies governing environmental pollution, sanitation and waste management; conflicting designation of roles amongst the stakeholders involved in environmental protection and waste management; and the prolonged implementation of waste management policies, primarily due to the absence of continuity of programs by successive governments. This paper aims to explore the current systems and technology for plastic waste disposal; highlight the existing policies on plastic waste management systems, ascertain public awareness of the existence & implementation of plastic waste management policies, review the effectiveness of these policies with the possibility of initiating new policies from user research, and proffer innovative measures to ensure grassroots implementation of government policy on plastic waste recycling methods in Rivers State.

II. LITERATURE REVIEW

Several scholars have extensively discussed the spread of plastic pollution and the approaches to plastic waste management. Some of the major catalysts of plastic pollution include: extremely rapid increase of plastic production and proliferation in every economic sector due to increase of consumption and relatively low price resulting in the displacement of more sustainable materials; global shift from production of durable plastic to single-use plastic that increase the amount of plastic wastes; epileptic waste management policies at the national level; increasing use of hazardous chemicals in plastic production that constrains closure of the manufacturing loop; and plastic wastes metamorphosing into a globally-traded commodity [4], [13] and [16]. Plastic particle pollutants are found in the air, soil, water, food, blood and presents a threat to human health through dietary exposure to a range of hazardous chemicals such as phthalates, Bisphenol-A, PFC and BFR. Previous works suggested that microplastics were found in human stool and autopsy samples. In a recent news article and for the first time, scientists found tiny pieces of plastics in all levels of the lungs of living humans – upper level, middle level and lower lung regions – indicating that the level of pollution in the lower lungs was the highest compared to other levels. The type of plastics found include plastics used in soft drink bottles, food packaging and bits of machinery. Plastic debris can also affect a variety of species through entanglement, ingestion and chemical contamination resulting in harm or death and biodiversity loss [19], [20] and [3]. Contamination of the environment with plastic debris can have adverse economic effects. Stranded plastic along shorelines impacts tourism due to aesthetic issues reducing tourism revenue, and recreational activities, and leads to economic losses associated with vessel damage, threats to public health, invasive species transport, negatively impact shipping, energy production, fishing, and aquaculture resources. Moreover, plastic bags can block the sewage system causing floods during the rainfalls as observed in Ghana, Bangladesh, Philippines; act as breeding grounds for malaria-carrying mosquitoes; increase the risk of diseases spreading; damage agriculture because of soil pollution and decrease in livestock due to plastic litter digestion, example Kenya [10], [21]; [6] Studies estimate that around 10-20 million metric tons of plastic wastes reach the ocean annually affecting 700-1500 species, including seabirds, turtles, marine mammals and vertebrates, of which 17% have been enlisted in the International Union for Conservation of Nature Red List of Threatened Species [20], [21] and [3]. To put in context, 1 million seabirds and 100,000 marine mammals die every year to indiscriminate disposal of plastic waste [16]. Plastic wastes in the form of plastic bags are quite prevalent and present the most significant impacts on seabirds, turtles, and marine mammals at population and taxa level, because it can be easily mixed up with jellyfish. For example, green turtle mortality due to the ingestion of plastic bags has been reported somewhere in the Philippines [19] and [20]. Ingestion of plastic wastes can affect fertility in female fish, marine ecosystem sustainability and the global fishing industry, which provides 15% of the world's dietary protein [8]. A preliminary estimate of the overall economic impact of plastic wastes on the marine ecosystem is around \$13 billion per year [15], [21] and [18]. \$1.26 billion in the countries of Asia-Pacific Economic Cooperation, with the tourism sector bearing the largest share of the cost there \$622 million [7].

There have been widespread studies on plastic waste management, and the conventional approaches to managing the impact of plastic wastes litters on the environment and human health have been extensively documented: landfilling, incineration and mechanical recycling. According to UNEPs' data, 79% of plastic wastes are discharged to landfills, dumps or the environment, 12% are incinerated and only 9% are recycled. However, almost 12.7 million tons of plastic wastes escapes from landfill sites and floats down drains into the rivers and oceans every year [16] and [14]. While being the least expensive, landfill requires large areas of land, and may lead to the release of hazardous chemicals contained in leachate, greenhouse gas emissions, health threats and the eventual loss of resources. Incineration on the other hand reduces the volume of wastes, demand for landfills, and energy generation, but it is also associated with resource loss, intense pollution of the atmosphere, greenhouse gas emissions, as well as the discharge of toxic ash and slag. Despite these associated drawbacks, several countries favor the inclusion of the incineration approach in their waste management policy program compared to other methods. These techniques of plastic waste management must



however be backed by existential policies that improve the publics' awareness of the permitted methods of plastic waste management. Three strategic enablers of plastic waste recycling methods have been identified: governmental regulation (ban, levies, etc.), market instruments (extended producer responsibility, alternative materials promotion, etc.) and consumers' behavior (raise public awareness etc.). Stakeholders' engagement, evidence-based studies, and economic incentives such as tax rebates, research and development funds, technology incubation, public-private partnerships are some of the public policies that have been implemented by the United Nations Environment Program to encourage the uptake of eco-friendly alternatives. During the past ten years, 1700 NGOs and activists established the anti-plastic movement, "Break Free from Plastic," and initiated a range of national and local campaigns advocating for the reduction of plastic consumption and production through policy development. Recently, the world's leading fast-moving consumer goods companies, plastic packaging producers, global retailers and environmental services companies released the 'New Plastics Economy Global Commitment' to ensure that 100% of plastic packaging can be reused, recycled or composted by 2025[2]. Similarly, several legislations governing waste management has been established in Rivers State, Nigeria to facilitate the utilization of ethical environmental practices in the handling and recovery of plastic wastes. The gross misconduct in the discharge of statutory duties eventuating in indiscriminate disposal, improper plastic waste management, and sustained inefficiencies in the reuse/recycle of plastic wastes in Rivers State has been perceived to worsen the state of human development in the city and its environs. [12] and [5] reported the failures associated with public policy formulation, implementation, assessment, communication and feedback mechanisms. They include a multiplicity of agencies involved in implementation, lack of coordination or communication, delay in implementation, and lack of political will. Other reasons why policies fail in the Nigerian federal system of government include ambiguous policy statement, overambitious policy goals, lack of appropriate technologies for implementation, problems of continuity, commitment to the policy, and corruption. The authors concluded that public policy formulation and implementation in the federal system of government requires effective assessment and communication mechanisms to facilitate public service delivery. In this work, the authors seek to investigate the existing policies governing the implementation of plastic waste recycling methods as a major deterrent to the proliferation of plastic wastes in urban spaces and understand the fundamental determinants of a successful implementation of plastic waste recycling policies. The outcomes from this work may prove significant in the proposal of new policies that could potentially increase the rates of plastic waste collection, increase the capacity to transform plastic wastes into useful resources, and increase the demand for recycled plastics and resins.

III. RESEARCH METHODOLOGY

This study adopted a descriptive research design. The study area is Port Harcourt Metropolis and home to factories and plastic manufacturing firms. The participants for this study comprise of adult residents in Port Harcourt Metropolis. The sample size in this study was determined using Yamane Taro's statistical method. The study sample size was determined to be four hundred (400). Data was collected from the participants using questionnaires. Four hundred and forty (440) questionnaires were distributed manually, approximately 110% of the calculated sample size, to reduce non response bias. Simple Random sampling technique was used in collecting data. Data collected from the answered questionnaires in this study were analyzed both qualitatively and quantitatively using percentages. The questionnaire was structured to reflect possible solutions to the research questions posed by the author, thereby achieving the overarching aim of the research within the specified scope. The results were analyzed in the Statistical Package for Social Sciences (SPSS) using descriptive statistics. and presented in a tabular form.

IV. RESULTS AND DISCUSSIONS

Table 1: What are the current systems and technology for plastic waste disposal methods in Rivers State?

| Questionnaire Items | SD | D | N | A | SA |
|---|---------|---------|---------|----------|----------|
| Gathering and supply of waste to recyclers. Recyclers carry out mechanical or chemical recycling methods on the plastic waste | 38(11%) | 78(22%) | 62(17%) | 116(32%) | 66(18%) |
| Open dump method | - | 73(20%) | - | 187(52%) | 100(28%) |



| | | | | | |
|--|---------|----------|---------|----------|---------|
| Incineration by burning | - | 90(25%) | 53(15%) | 138(38%) | 79(22%) |
| Primary recycling by reusing plastic product in its original state | 50(14%) | 90(25%) | 27(8%) | 127(35%) | 66(18%) |
| Landfill method | 51(14%) | 126(35%) | 40(11%) | 99(28%) | 44(12%) |

(SD – Strongly disagree, D – Disagree, N – Neutral, A – Agree, SA – Strongly agree)

From Table 1 above, after ranking the responses, the result shows that majority of respondents acknowledged the open dump method as the current system for plastic waste disposal methods in Rivers State. Further interview with respondents showed that this option was the most preferred because of the ease of disposal. In order of popularity among respondents, the options ranked from incineration method to primary recycling methods, the supply of plastic waste to either of mechanical or chemical recyclers and landfill methods. In the context of this questionnaire, mechanical recycling refers to the manual sorting, cleaning, drying, cutting and shredding of polymers into granulates, flakes or pellets and further melting to make a new product by extrusion. On the other hand, chemical recycling is the process of chemically converting polymers to monomers or partial depolymerization to oligomers through a chemical reaction. The resulting monomers could be used for new polymerizations to reproduce the original or a related polymeric product. The outcome of this question implies that traditional methods of waste disposal in Port Harcourt are still prevalent despite global consensus to create a circular economy. Consequently, the Reduce, Reuse, Recycle, (3R) method of waste disposal is in its nascent stage in Nigeria. The environmental implications of these widely adopted methods are severe and could possibly induce life threatening situations from inhalation of toxic substances. It is imperative that the environmental agencies propose the modification of existing plastic waste management policies to emphasize the use of recycling methodologies to reduce the number of wastes sent to landfills, reuse wastable products, and recycle wastable products into different end products.

Table 2: Respondents Awareness of the existing waste management / recycling policies

| | SD | D | N | A | SA |
|---|---------|----------|---------|---------|---------|
| I bag my waste because of RIWAMA's policies on waste management. | 67(19%) | 143(40%) | 40(11%) | 41(11%) | 69(19%) |
| I dump my waste at designated waste receptacles because of RIWAMA's policies on waste management. | 90(25%) | 117(33%) | 47(13%) | 52(14%) | 54(15%) |
| I participate in sanitation exercise because of RIWAMA's policies on waste management. | 60(17%) | 116(32%) | 50(14%) | 66(18%) | 68(19%) |
| I keep my environment clean because of RIWAMA's policies on waste management. | 60(17%) | 112(31%) | 53(15%) | 65(18%) | 70(19%) |
| I avoid littering of waste because of RIWAMA's policies which attracts a fine. | 69(19%) | 160(44%) | 42(12%) | 26(7%) | 65(18%) |

(SD – Strongly disagree, D – Disagree, N – Neutral, A – Agree, SA – Strongly agree)

From Table 2, it is evident that majority of the study participants disagreed to all the questions that test the awareness level of the respondents on waste recycling and management policies in Rivers State. The lack of awareness of existing waste recycling and management policies by the respondents implies the poor level of implementation of these policies. Hence, more awareness can be raised by hosting waste management educational events at schools and offices, organizing community projects, publicizing information of existing waste management policies on websites and social media, disposal signposts within a specified walking distance, and hosting regular seminars with important stakeholders such as the chairmen of local councils, youth groups, vigilante groups, market leaders and influential persons in the community.



To obtain information on possible strategies for the efficient implementation of plastic waste management policies in River State, respondents were asked pertinent questions in Table 3

Table 3: Is there anything that you feel Rivers State government can do to create more awareness, make recycling easier and more efficient?

| Suggestions | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|----------------|----------|---------|----------|-------------------|
| More recycle bins | 87(24%) | 159(44%) | 33(9%) | 81(23%) | - |
| Make the recycle bin accessible | 141(39%) | 219(61%) | - | - | - |
| Make plastic waste bins more visible using signs | 120(33%) | 240(67%) | - | - | - |
| Install a monitoring team and fine those who neglect the bins | 66(18%) | 135(38%) | 46(13%) | 77(21%) | 36(10%) |
| Incentives for plastic waste recyclers | 97(27%) | 133(37%) | - | 79(22%) | 51(14%) |

The responses in Table 3 shows that respondents are keen to strengthen the existing methods of plastic waste disposal such as improving the accessibility of the recycle bins, incentivizing plastic waste recycling, and the establishment of fines for violators of plastic waste management policies. While the incentivization of recycling is relatively new in Nigeria, individuals are willing to carry out recycling with the introduction of incentives.

IV. CONCLUSIONS

Result shows a low level of awareness of existing plastic waste recycling and management policies among study participants in River State which has resulted to the current system being used for plastic waste disposal method which is the open dump method because of its ease of disposal. Hence the keenness to strengthen the existing methods.

Public awareness, public participation is essential for an increase in the level of awareness of existing plastic waste recycling and management policies this can be achieved by hosting waste management educational events at schools and offices, organizing community projects, making the recycling bin accessible, visibility of bins using signs, fine those who neglect the bins, incentives for plastic waste recyclers and mounting of signpost and billboards that depicts the policies on plastic waste re-cycling methods in River State.

Further studies should be made in finding out the consistency of Government in improving the policy on plastic waste re-cycling methods in Rivers State.

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