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Assessment of Plastic Pollution and Urban Flooding in Obio Akpor and Port Harcourt LGAs, Rivers State, Nigeria

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Abstract: The earth is convulsing and in dare need of help to come out from self-inflicted plastic menace it created. Though, a lot of benefits have been derived right from inception of it such as reduced weight, reduced packaging, lower impact than paper, strength and durability, and many more. Seriously, adverse environmental impacts of plastic wastes cannot be wished away. When plastics are thrown on the roads, drains, playgrounds, etc, they end up in the manholes of the drainage system, causing blockages with possibility of triggering urban flood risks. The research considers this situation a critical risk that requires urgent attention. The study areas are Port Harcourt and Obio Akpor LGAs, Rivers State Nigeria. The work investigated people's perception on impacts of plastic pollution, assessed community-based waste management approaches, and community-based mitigation strategies in curbing plastic pollution impacts on urban flooding. 1080 of conventional traders were captured during the field survey, representing the population size. While 352 respondents were selected through random table and this represents the sample size administered questionnaires, but 325 questionnaires were returned. Given sample size estimated at 95 % confidence interval. In the final analysis, one could deduce from the assessment that propensity of plastic waste exacerbating urban flood is high, owing to challenges in the area of policymaking, enforcement and lack of modern infrastructure.

Keywords: *Urban Flooding, Plastic Waste, Blockage, Drainage, Rumuokoro.*

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I. INTRODUCTION

The earth is convulsing and in dare need of help to come out from self-inflicted plastic menace it created. Plastic (Bakelite) was discovered by Leo Baekeland in 1907, with a lot of benefits such as reduced weight, reduced packaging, lower impact than paper, strength and durability, and many more. However, the adverse impacts have outweighed the benefits derived (Dennis, 2024). The all-embracing use of plastic for different purposes has led to massive production of it globally, but with attendant environmental quandaries such as urban floods, sea pollution, groundwater pollution, global warming, degradation of ecosystem, among other threats. Plastic is a by-product of fossil fuel, and as long as exploration of fossil fuel continues, earth's temperature will increase all over the world with 1.5°C, there will be increased heat waves, longer warm seasons, shorter cold season, higher precipitation, and extreme weather conditions (Lindsey, 2024).

Plastic pollution is on the rise, posing serious threats to global health and vitality, particularly indiscriminate disposal of plastic wastes, markedly in developing countries. The interaction between mismanaged plastic wastes and urban flooding in the cities has triggered serious inundation of communities and rendered many homeless, coupled with grave human health challenges emanating from Water, Sanitation and Hygiene (WASH). Large amount of plastic waste is being generated in Nigeria due to poor waste management infrastructure, growing population, poor governance, inefficient policy making, poor public enlightenment, inadequate sanitation enforcement, and many more. The country alone generates about 2.5 million tonnes of plastic waste annually, and about 88% of it not being recycled, ranking ninth globally among countries with the highest contributions to plastic pollution (Ezeudu, 2024).

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When plastic waste is indiscriminately thrown on the roads, drains, playgrounds, etc, they end up in the manholes of the drainage system, causing blockages (MacAfee, 2024). For instance, traders in conventional market places like Rumuokoro, Mile One, Mile Three, Oil mill, Creek Road, among others places in Port Harcourt and Obio Akpor LGAs, Rivers State Nigeria (the study areas), are oftentimes seeing throwing their gathered waste into gutters when it rains. This unpolished activity appears to have been creating inundation in most residential communities around the market locations in the city, leading to serious vehicular traffic glitches and untold hardship on the commuters whenever it rains (Nnoko, 2024). To this end, the study decided to investigate people's perception on impacts of plastic pollution experienced in their localities, assess community-based waste management approaches, and community-based mitigation strategies in curbing plastic pollution impacts on urban flooding.

II. METHODOLOGY

The work primarily investigated perception of the people regarding mismanaged plastic wastes and its triggering effects on urban flooding using survey research through quantitative data gathering. Primary data were collected from six identified (purposive) conventional market places with high consumption of plastic materials and improper waste management in Port Harcourt metropolis, by administering questionnaire and face to face interview with respondents. While secondary data were from ministry of environment and sanitation board. The data analyses were done by means of basic descriptive statistics. Awareness creation about the study was carried out among traders at the six market locations with their names, addresses and phone numbers collected. A total number of 1080 of market men and women were captured during the field survey, representing the population size. While 352 respondents were selected through random table and this represents the sample size administered questionnaires, but 325 questionnaires were returned. Giving sample size estimated at 95 % confidence interval (Table 1).

Table 1: Population/Sample Size Distribution of the Six Selected Market Locations (Purposive)

Market Place	Population Size	Sample Size (30% of Pop. Size)
Oil mill	180	54
Mile One	165	50
Mile Three	195	59
Creek Road	151	45
Rumuokoro	214	64
Slaughter	175	53
TOTAL	1080	325

Source: Field Survey, 2024

III. RESULTS AND DISCUSSIONS

Table 2, reveals the perception of the respondents regarding plastic pollution in the city. Among the respondents, 70 of them expressed concerned about improper disposal of plastic waste, representing 23% of the sample size. While 37% of respondents (120) agreed to reduction in consumption of plastic materials, particularly single-use ones, be it bags, bottles, straws, and others. Relating to awareness of triggering impacts on urban flood risk, 130 respondents, representing 40%, which is the highest, concurred that activities of plastic pollution have the propensity to cause deluge in the urban centres.

Table 2: Respondents' Perception on Plastic Pollution

Perception	Frequency	Percentage (%)
Concerned about Plastic Pollution	75	23
Reduction in Consumption of Plastic	120	37
Awareness of Triggering Effects on Flood	130	40
Total	325	100

Source: Field Survey, 2024

Table 3, shows respondents' approaches to disposing plastic waste in their respective locations. Among the 325 respondents, 100 of them which is the highest (31%), stated they do take their waste to approved dump locations at the close of business. Another group, representing 29% of respondents, said they usually burn their plastic waste in the open air, regardless the consequences which include air, soil and water pollution, since the enforcement is not strong. The aspect that is so disturbing, is the category (21%) that mentioned they dump the waste in the open drains. This massively contributes to increased urban floods. The least is the group that buries the waste in the landfills. This represents 19% of the respondents. Despite of its low percentage, the approach does not meet acceptable standard. Microplastic (<5mm) could find its way through soil paths into groundwater.

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Table 3: Community-Based Waste Management Approaches

Community-Based Approach	Frequency	Percentage (%)
Open-air Burning of Plastic	94	29
Dump in the Gutter When it Rains	70	21
Take to Waste Dump Point	100	31
Bury Plastic in Landfills	61	19
Total	325	100

Source: Field Survey, 2024

Table 4, examines community-based strategies embarked on by the dwellers of Port Harcourt city to reduce impacts of plastic pollution on urban flooding. 120 respondents (37%) said regular participation in desilting the drains will help to reducing plastic clogs from the gutters. This forms the highest number of the traders responding to this particular questionnaire. It alludes to the fact that if drains are cleaned regularly, smooth flow of floodwater can be achieved. Concerning stricter regulation in reducing plastic pollution in the city, 45 respondents, representing 14% agreed to the assertion. For instance, they suggested penalty should be imposed under the law on whoever caught dumping waste in the drains. Although, this is the least among community-based mitigation plans assessed during the study. Extra payment for biodegradable materials as replacement for plastic comes second among mitigation strategies (15%). The economic situation in the country could be one of the factors the approach somehow unpopular. Finally, 110 respondents (34%) subscribe to the idea of gathering plastic waste for wealth, believing it will spur plastic users to gather their waste in exchange for financial gain.

Table 4: Community-Based Mitigation Strategies

Community-based Approach	Frequency	Percentage (%)
Participate in Regular Drain Desilting	120	37
Stricter Regulation	45	14
Extra Payment for Biodegradable Materials Gathering for Recycling Buyers	50	15
Gathering for Recycling Buyers	110	34
Total	325	100

Source: Field Survey, 2024

IV. CONCLUSION

In the final analysis, one could deduce from the assessment that propensity of plastic waste exacerbating urban flood is high. Perception of people about adverse effects of mismanaging plastic waste is profound, and basic mitigation measures are equally known to the dwellers. But lingering challenges have been in the area of policymaking, enforcement and environmental infrastructure. Nonetheless if enforcement is strengthened, community-based approach at the level of mitigation would suffice.

RECOMMENDATION

If consistent and implementable rules, regulation, byelaws, among others are enforced, coupled with availability of modern waste management infrastructure, decrease in plastic pollution could be recorded. Invariably, plastic clogs in the drains will be minimised, consequently, ameliorations of flood risks in the city.

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