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## **SOURCES AND COMPOSITION OF THE MARINE DEBRIS IN NIGERIA COASTAL CITIES**

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### **ABSTRACT**

The study examined the prevalence of back pain among casual dockworkers in Nigerian ports. With a sample size of 440 dispersed to residents of coastal cities and 389 retrieved, achieving a retrieval rate of 88.4%, a cross-sectional study design was used. The researcher created a questionnaire that was used to gather data. An accuracy coefficient of 0.76 was attained using the Cronbach alpha reliability method. The research hypothesis was tested using analysis of variance and SPSS version 26.0 was used to facilitate data analysis. Findings indicate that the shoreline, entertainment events, food-related waste, plastic and paper bags, etc. are all contributors to marine debris in Nigeria's coastal waters. Other factors were ocean/waterway operations that led to the loss of pallets, nets, lines, ropes, and traps. The coastal cities of Nigeria, including Lagos, Port Harcourt, and Calabar, are home to diverse marine ecosystems and face substantial challenges associated with marine debris. Urbanization, inadequate waste management systems, and anthropogenic activities contribute to the accumulation of marine debris in coastal areas. Understanding the sources and composition of marine debris is crucial for effective management and conservation efforts. Efforts to mitigate marine debris in Nigeria's coastal cities should involve a multi-faceted approach: Improving waste management infrastructure, including collection, recycling, and disposal systems, is crucial. Raising public awareness and promoting responsible waste disposal practices can help reduce the influx of land-based debris into marine environments. Enforcing regulations against illegal dumping, littering, and the use of single-use plastics can help reduce marine debris at its source. Implementing penalties and fines for non-compliance can act as a deterrent. Educating coastal communities, fishermen, and tourists about the impacts of marine debris is essential. Encouraging community-led clean-up campaigns and providing alternative, environmentally friendly options can foster behavioural change.

**Keywords:** Marine Debris, Nigeria Coastal Cities, Shoreline, Entertainment Events, Food-Related Waste.

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## INTRODUCTION

Marine debris is produced in Nigeria's coastal cities due to a variety of circumstances. Notably, poor waste management practices, both on land and at sea, are a major contributor to the buildup of trash in the marine environment. The main sources of marine debris that contaminate the coastal zones include household garbage, industrial runoff, and poor disposal techniques (Adeyeye et al., 2018). The issue is also exacerbated by tourism-related activities, such as beachgoers who leave behind trash (Oyewo & Shola, 2020).

In Nigeria's coastal cities, marine debris has a variety of compositions and contains a sizable amount of plastic garbage. Due to their numerous uses, durability, and slow decomposition rates, plastics make up a significant portion of marine litter (Adeyeye et al., 2018). A sizable portion of marine debris is made up of discarded single-use plastics such as bottles, bags, and packaging materials. Fragments from larger plastic products also add to the pollution (Chukwudi et al., 2019). A significant amount of the debris in coastal waters is also related to fishing, such as abandoned nets and lines (Adeyeye et al., 2018).

Although it is obvious that marine debris exists in Nigeria's coastal cities, in-depth studies describing the precise sources and makeup of this material are rare. The causes and makeup of marine debris are not fully understood by existing research, which mostly concentrates on general marine pollution and waste management techniques (Oyewo and Shola, 2020). To guide efficient waste management methods and policy interventions, there is a pressing need for a focused inquiry that identifies the many sources of marine debris and describes its composition.

It is essential to comprehend the origins and makeup of marine debris in Nigeria's coastal cities to develop sustainable waste management practices and conservation initiatives. Stakeholders can develop targeted solutions to reduce the issue and maintain the health and integrity of the marine environment by identifying the main causes and the type of trash. By providing information on the nature and sources of marine debris, this study aims to close the knowledge gap and aid in the preservation and sustainable management of Nigeria's coastal ecosystems.

## CONCEPTUAL/THEORETICAL FRAMEWORK

Theoretical concepts and theories from the domains of environmental science and waste management are incorporated into the theoretical framework for comprehending the sources and make-up of marine debris in Nigeria's coastal cities. This methodology intends to investigate both the composition of the marine debris observed along the Nigerian coastline and the underlying factors that lead to its formation and accumulation. Theoretical concepts and theories from the domains of environmental science and waste management are incorporated into the theoretical framework for comprehending the sources and make-up of marine debris in Nigeria's coastal cities. This methodology intends to investigate both the composition of the marine debris observed along the Nigerian coastline and the underlying factors that lead to its formation and accumulation.

**Theory of Improper Waste Management:** According to the incorrect waste management theory (Adeyeye et al., 2018), ineffective waste disposal procedures and a lack of effective waste management systems greatly contribute to marine debris. The lack of waste management

facilities causes plastic and other non-biodegradable wastes to proliferate in coastal areas, eventually making their way into the marine ecosystem.

**Theory of Plastic Pollution:** According to the notion of plastic pollution, the composition of marine debris is significantly influenced by the widespread use of plastics, especially single-use plastics (Chukwudi et al., 2019). Plastics are a persistent and common component of marine litter because they are strong, light, and resistant to deterioration. The hypothesis emphasizes how important it is to look at the amount and variety of plastic garbage in Nigeria's coastal cities.

**Theory of Tourism Impact:** According to the hypothesis of tourist impact, marine debris can be considerably impacted by tourism-related activities (Oyewo & Shola, 2020). As a result of littering and inappropriate trash disposal, beachgoers, tourists, and recreational activities near the shore can contribute to the buildup of marine debris in the surrounding ecosystem.

**Theory of Industrial Runoff:** According to the hypothesis of industrial runoff, businesses located close to coastlines may discharge pollutants, particularly plastic trash, into neighbouring bodies of water. This hypothesis emphasizes the significance of looking into how industries contribute to marine trash production in Nigeria's coastal cities.

**Theory of Fishing Gear Abandonment:** According to the hypothesis of fishing gear abandonment, improperly discarding fishing equipment including nets and lines greatly contributes to marine debris (Adeyeye et al., 2018). This hypothesis highlights the importance of researching whether and how fishing gear trash affects coastal ecosystems.

**Integration of Theories:** The aforementioned theories are integrated into the theoretical framework to fully understand the origins and make-up of marine debris in Nigeria's coastal cities. This methodology tries to identify the key contributors to marine debris in the research area by taking into account the interactions between inappropriate waste management, plastic pollution, tourism impact, industrial runoff, and fishing gear abandonment.

## **EMPIRICAL REVIEW**

The existing research on the origins and makeup of marine debris in Nigeria's coastal cities has been analyzed and synthesized in this empirical review. This study is to provide a thorough overview of the present level of knowledge on the topic by evaluating the pertinent literature, identifying trends, and highlighting research gaps for further exploration.

### **Sources of Marine Debris in Nigeria Coastal Cities**

The sources of marine debris in Nigeria's coastal cities have been the subject of several studies, with a focus on the significance of insufficient waste management procedures. In Nigeria, Adeyeye et al. (2018) carried out a thorough investigation of marine litter and determined that inappropriate garbage disposal was the main cause of marine debris. They emphasized how inadequate waste management practices lead to significant plastic and other non-biodegradable garbage entering coastal waters. It has also been established that tourism-related activities contribute to marine garbage. In Lagos, Nigeria, Oyewo and Shola (2020) studied beach litter and discovered that plastic waste is a substantial source of litter on beaches. To handle the spike

in garbage during the busiest tourist seasons, the study underlines the necessity for stronger waste management infrastructure.

### **Composition of Marine Debris in Nigeria's Coastal Cities**

Plastic items make up the majority of the marine garbage in Nigeria's coastal cities. In their investigation of microplastics in marine ecosystems, Chukwudi et al. (2019) found that a significant fraction of the marine trash in the area is made up of plastic. They discovered that single-use plastics, like bags, bottles, and packing supplies, were significant sources of marine debris. Adeyeye et al. (2018) also identified fishing-related gear as a substantial component of marine debris in their study on marine litter in Nigeria. A sizable amount of the debris discovered along the beaches consisted of lost, abandoned, or discarded fishing nets and lines that posed entanglement hazards to marine life.

Despite the important contributions made by the evaluated studies, there are significant research gaps that call for additional studies. The absence of thorough investigations on microplastic pollution in Nigeria's coastal cities is a significant research gap. To completely comprehend the prevalence, distribution, and effects of microplastics on marine ecosystems and human health, more research is necessary, even if Chukwudi et al. (2019) made some mention of the issue. Furthermore, there is a lack of research on the pollution caused by shipping and industrial activity-related marine debris in Nigeria's coastal cities. Understanding how these sectors specifically contribute to the issue of marine litter would give key insights for focused responses.

### **METHODS**

An exploratory case study was used as the research approach to examine the origins and make-up of marine debris in Nigeria's coastal cities. To get a deeper grasp of the subject matter, an exploratory case study entails a thorough analysis and examination of a particular occurrence or topic within its real-life context (Yin, 2018). This method is ideal for investigating intricate and varied environmental issues, such as marine debris, in a particular geographic area.

**Study Design:** The study will concentrate on a few Nigerian coastal cities, taking into account things like their geographic location, population density, and levels of commercial and tourist activity. A representative sample of several coastal areas will be included in the case study, allowing for a thorough analysis of the sources and makeup of marine debris.

#### **Data Collection:**

**Field Surveys:** To gather first-hand information, field surveys will be carried out throughout the selected cities' beaches. The types and amounts of marine debris discovered on beaches and shorelines will be visually evaluated and recorded by researchers. This information will provide light on the makeup of marine debris and its geographic spread.

**Waste Characterization:** The various forms of debris present will be identified and quantified using representative samples of marine debris gathered during field surveys. To identify the quantities of plastics and microplastics in the overall composition of marine debris, the waste

characterisation procedure will comprise sorting and categorizing items with an emphasis on plastics and microplastics.

**Stakeholder Interviews:** Interviews with important parties will be undertaken, including locals, waste management officials, tourism industry representatives, and fishermen. These interviews will offer useful details about the causes of marine debris, waste management procedures, fishing-related activities, and the influence of tourists, assisting in the comprehension of these causes.

**Data Analysis:** Quantitative methods were used to examine the data gathered from stakeholder interviews, trash classification, and field surveys. To identify the most common types of debris, quantitative information, such as the percentage of plastics and microplastics in marine debris, will be statistically evaluated.

### Research Analysis

Table 1: Distribution of questionnaires within the sampling frame

S/N	State	Coastal City/ Riverine Area	Distributed	Retrieved & Usable	Retrieved (%)
1	Lagos	Apapa	34	29	6.59%
2	Ondo	Ilaje	45	38	8.64%
3	Ogun	Abeokuta	28	24	5.45%
4	Delta	Warri	139	127	28.86%
5	Akwa-Ibom	Ibena	12	9	2.05%
6	Cross River	Calabar	94	86	19.55%
7	Rivers	Bonny	33	26	5.91%
8	Bayelsa	Yenagoa	55	50	11.36%
	<b>Total</b>		<b>440</b>	<b>389</b>	<b>88.41%</b>

The total number of participants in this study was 440 (or 440). This number is based on the following breakdown, each of which corresponds to one of the eight sample frames used in the study: the cities of Yenagoa, Apapa, Ilaje, Epe, Warri, Ibena, Calabar, and Bonny. As a result, 440 questionnaires were given out to respondents by the population size for the pertinent frame: Most questionnaire distributions were made to Warri (139, or 28.86%), next to Calabar (94, or 19.55%). The distribution for Ibena is the smallest of any frame, with only 12 (2.05%) survey replies. 410 of the 440 distributed survey replies were ultimately collected, making up 93.18% of all questionnaires sent out. After removing damaged questionnaires and those having a predominance of false responses, 389 questionnaires—or around 88.41% of the total distributed—were used for data analysis. Table 2 provides a summary of the data cleaning process, and Figure 1 shows it visually.

Table 2: Summary of Data Cleaning

Questionnaires	Frequency	Percentage
Administered	440	100.00%
Retrieved	410	93.18%
Usable Copies	389	88.41%
Missing + Unusable	51	11.59%

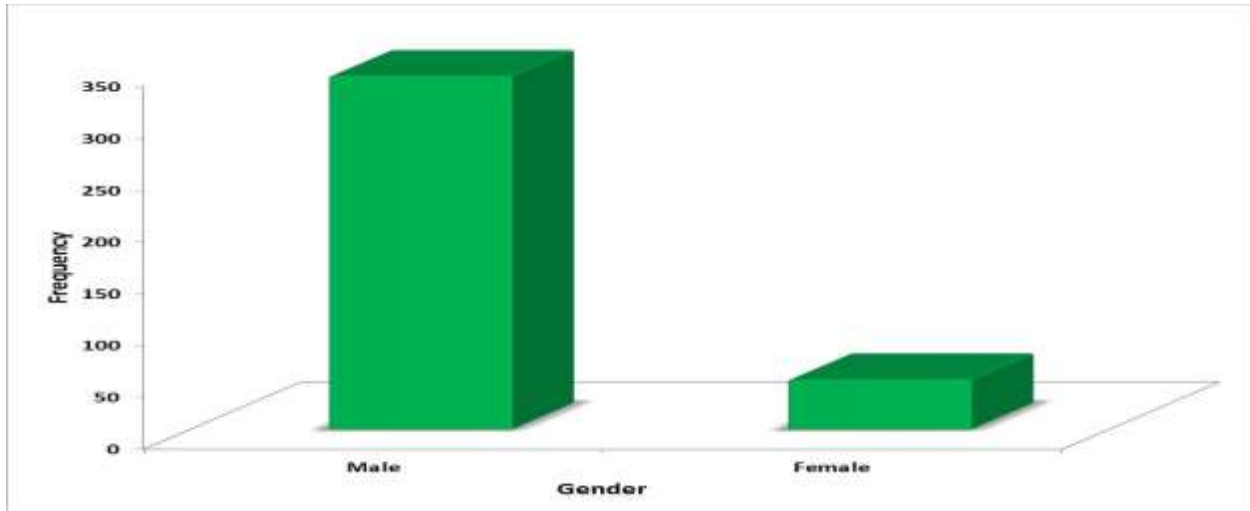


Figure. 2: Gender of Respondents

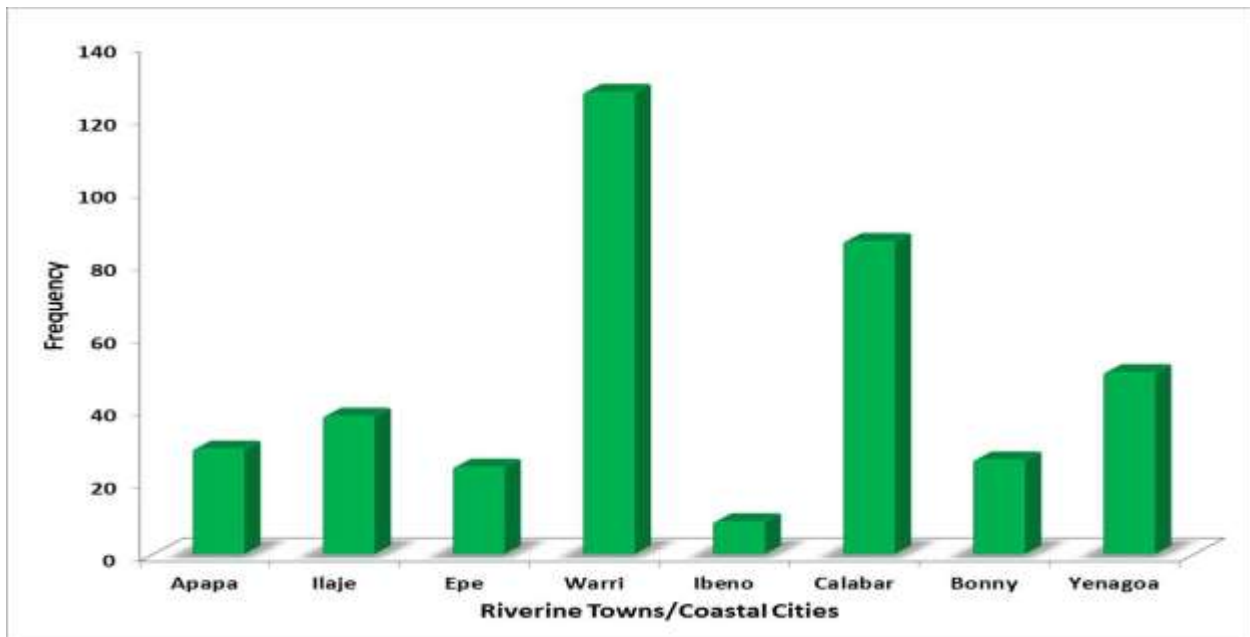


Figure 3: Riverine City/Coastal Town

The figure above displays the distribution for the coastal towns and riverine cities in the study area. As can be seen, the largest frequency is 127, or 32.6% of the participants, who are from Warri. The following city is Calabar, where the average rate is 86 (22.1%). The lowest frequency is from Ibeno, with 9 respondents (2.3%).

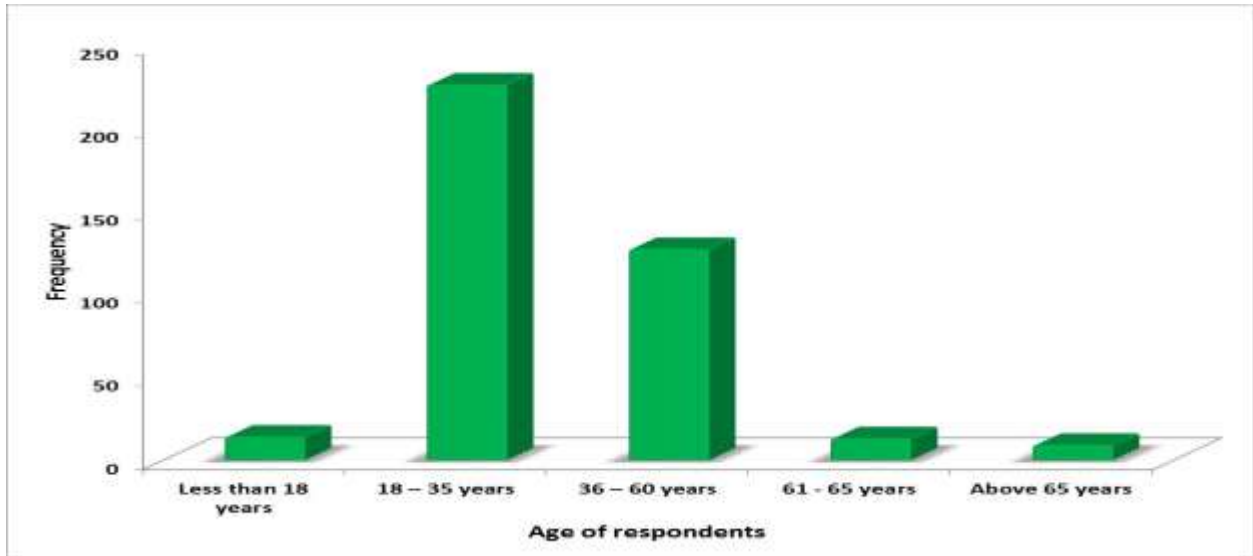


Figure 3: Age of respondents

The distribution of marital status in Figure 3. shows that there are more married participants than single ones, as indicated by the average number of 240, or 61.7%, of participants. There are 131 (33.7%) singles in the area. Eight (2.1%) people are the fewest number of divorced people. Figure 3 above shows the age distribution of the respondents. 226 respondents, or 58.1%, are under the age of 35, which is the largest group of respondents. The next group is made up of 127 (32.6%) people who are between the ages of 36 and 60. Nine (2.3%) people over the age of 65 make up the lowest frequency.

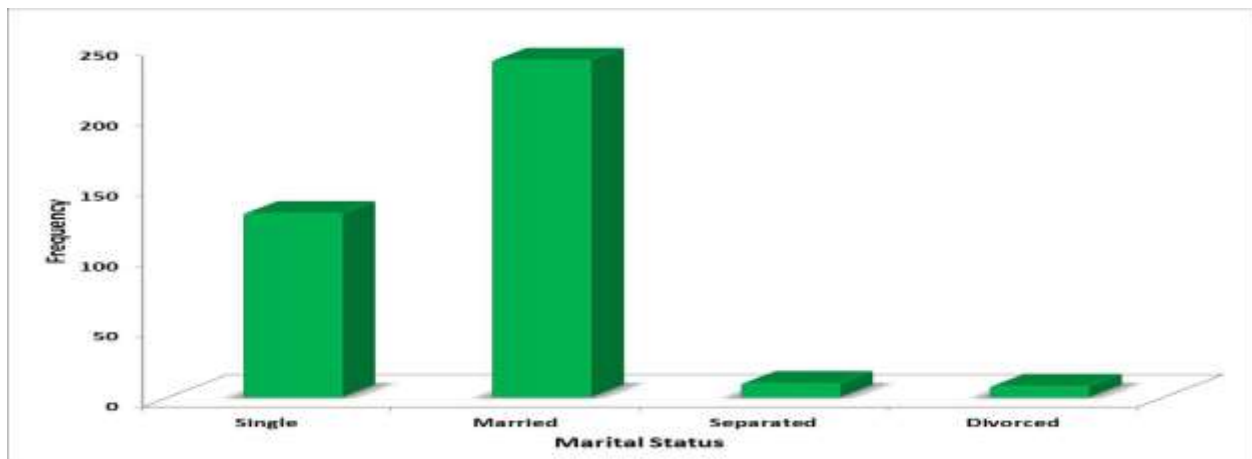


Figure 5: Marital Status of Respondents

Table 4: Sources and Composition of Marine Debris

	<b>N</b>	<b>Mean</b>	<b>Std. D.</b>
1. Shoreline and recreational activities (food-related debris, plastic and paper bags etc) are sources of marine debris in Nigeria's coastal waters.	389	3.620	0.633
2. Ocean/waterway activities (pallets, nets, lines, rope, traps, etc.) are sources of marine debris in Nigeria's coastal waters.	389	3.324	0.752
Smoking-related activities (filters, lighters, tobacco packaging etc.) are sources of marine debris in Nigeria's coastal waters.	389	2.784	1.093
3. Dumping activities (appliances, batteries, building materials, etc.) are sources of marine debris in Nigeria's coastal waters.	389	3.013	1.071
4. Medical/personal hygiene (Condoms, diapers, syringes, etc.) are sources of marine debris in Nigeria's coastal waters.	389	3.311	0.978
<b>Grand Mean</b>		<b>3.210</b>	<b>0.966</b>

### Research Hypotheses One: Difference in sources and composition of marine debris

H<sub>01</sub>: There is no significant difference in the sources and composition of marine debris between the Nigeria coastal states;

We looked to see if there were any notable differences in the sources and make-up of marine debris between coastal cities and riverine towns. To do this, we must use the statistical tool known as an analysis of variance (ANOVA) to compare the mean values of the sources and composition of marine debris from each study location.

Table 5: ANOVA result on the sources and composition of marine debris

<b>Source of Variation</b>	<b>SS</b>	<b>Df</b>	<b>MS</b>	<b>F</b>	<b>P-value</b>	<b>F crit</b>
Between Groups	38.810	7	5.544	42.156	0.000	2.034
Within Groups	50.109	381	0.132			
Total	88.919	388				

### INTERPRETATION OF RESULTS

The table 5 above shows the results of the analysis of variance. The F-distribution table's critical value, calculated at  $\alpha = 0.05$  with a d.f.N. of 7 and a d.f.D. of 381, is 2.034. Since the calculated F ( $= 42.156$ ) is more than the threshold value ( $= 2.034$ ) and the p-value ( $= 0.000$ ) is lower than ( $= 0.05$ ), we hence reject the null hypothesis. Following is a summary of the result: Between riverine settlements and coastal cities in Nigeria, there are major differences in the sources and composition of marine debris. Or to put it another way, the mean varies between at least two coastal cities. The research will then conduct a posthoc analysis using Tukey HSD to pinpoint where the disparities are since the means of the sources and the make-up of the riverine towns and coastal cities differ greatly. It will be simpler to categorize the coastal cities into unified categories as a result. In the Table below, three groups—each of which contains homogeneous subsets of riverine towns/coastal cities are indicated together with the overall results of the Tukey HSD. The first group has four members, the second has three, and the third has three. This confirms what was already suspected: there are three distinct groups of marine debris, each with



unique sources and compositions. The origins and chemistry of marine debris are higher in the third group, more moderate in the second group, and lower in the first group, according to group means.

Table 6: Homogenous subsets of sources and composition of marine debris

S/N	1	2	3
1.	Bonny	Apapa	Warri
2.	Ibena	Warri	Ilaje
3.	Calabar	Ilaje	Epe
4.	Yenagoa		

## CONCLUSION

The study's conclusions provided insight into the intricate and varied nature of marine debris in Nigeria's coastal cities. According to the study, poor waste management procedures significantly contribute to the buildup of marine trash. Given that single-use plastics make up a sizable fraction of marine trash, the existence of plastic waste has become a serious concern. Long-term dangers to marine life and coastal ecosystems are posed by the persistence of plastics in the marine environment. Tourism-related activities were also shown to be a source of marine debris, with beachgoers' improper garbage disposal adding to the pollution. Additionally, it was discovered that industrial activity in and near coastal communities' discharges pollutants, including plastic trash, through runoff, exacerbating the problem of marine debris.

A research hole regarding microplastic pollution in Nigeria's coastal cities was also revealed by the study. Future studies are required to thoroughly examine the types, prevalence, and distribution of microplastics in the marine environment as well as any potential effects on marine life and public health. The study emphasizes the significance of adopting focused waste management strategies, enhancing recycling habits, and putting regulations to decrease single-use plastics into place to address the sources and composition of marine debris in Nigeria's coastal cities. To effectively combat the problem of marine trash and advance sustainable coastal development and marine conservation, cooperation between government agencies, local communities, and the commercial sector is crucial. Overall, the study contributes to our understanding of the environmental challenges faced by the region and informs evidence-based solutions for efficient management of marine debris and conservation efforts by offering valuable insights into the sources and composition of marine debris in Nigeria's coastal cities.

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