

## **Management of Plastic Wastes on Bonny Water-Ways (Peterside): The Need for Environmental Friendliness in the Era of Climate Change**

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### **Abstract**

*Plastic wastes have become a significant global environmental concern across our environment. The menace concerns ecological activists, climate change advocates, and the general public because of its negative impact on human health, animal wellbeing and climate. The negative impact of this menace has significantly caused environmental degradation in many ways resulting in marine life depletion but also enabling boat mishaps along the waterways and global warming today. Hence, this study focuses on the management of plastic waste in Bonny Island and along a section of the waterways (Peterside), recognizing the urgency to address this issue in the era of the push for environmental friendliness. The aim is to highlight the importance of adopting environmentally friendly space and emphasizing its attendant practices to mitigate the adverse impacts of plastic waste on the ecosystem and human health. This study employs a mixed-methods approach, combining quantitative and qualitative methods. The study will investigate the sources, types, and quantities of plastic waste found in Bonny Island and along waterways (Peterside). Additionally, it will explore the current global waste management practices and policies, while identifying their strengths and weaknesses. It will also provide waste management facilities to harness waste collection and disposal. The findings will reveal how plastic waste poses a significant threat to the inhabitants of Bonny Island and the waterways ecosystem, with detrimental effects on marine biodiversity and the overall health of the ecosystem.*

**Keywords:** *Plastic Waste, Bonny Waterways, Environmental Friendliness, Climate Change, Waste Management.*

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## **Introduction**

Plastic waste management is a crucial discourse due to the numerous tons of Plastic pollutants discarded into the environment. Advocacy on the dangers of plastic waste and climate change is essential. As industrial activities, which began after the Industrial Revolution and intensified in the 1970s, have led to the formation of environmental movements worldwide. The United Nations Environment Program (UNPE) was established in 1972 to manage environmental concerns, develop pollution prevention measures, and protect the planet from pollution. Thus, businesses are now adopting green marketing strategies to promote social corporate responsibility all in the need to harness environmental friendliness.

Hence, this study seeks to address the issue of plastic waste management in the coastal area of Bonny Island, Rivers state, as environmental concerns continue to mount on repurposing and recycling industrialized by-products such as plastic waste. It will examine the management of Plastic waste in the coastal area of Bonny Island, Rivers State which is facing growing challenges in managing plastic waste. This study aims to analyze the current management practices of plastic waste in Bonny, assess their effectiveness, and proffer sustainable solutions that prioritize environmental friendliness. The study outcomes can guide policymakers, environmental agencies, and local communities in formulating effective strategies and policies to combat plastic pollution and protect Bonny Island and along waterways (Peter side) for future generations.

### **Conceptual Clarification**

#### **Plastics Waste Management**

The term plastic waste management describes the methods and techniques applied to manage plastic garbage from the point of generation to disposal. Kofoworola (2007) defines waste management as the organized and systematic channelling of waste through pathways to ensure that they are disposed of in line with acceptable public health and environmental safeguards. The goal of efficient plastic waste management is to reduce the negative effects of plastic waste on the environment by encouraging its safe disposal, reuse, recycling, and reduction. Plastic waste management is the collection, processing, and disposal of plastic waste. It is a complex issue that involves a variety of stakeholders, including governments, businesses, and individuals. Hence, plastic waste management is the efficient and precise conversion of plastic waste into innovative products that are better, environmentally friendly, and cost-effective.

#### **Environmental Friendliness**

The term environmental friendliness describes actions and habits that have little to no negative effects on the environment. It is also referred to as eco-friendly, nature-friendly, and green which posit to laws, guidelines, and policies that reduced, minimal, or no harm to the ecosystem or the environment. Thus, being environmentally friendly means acting in a way that is not harmful to the environment or depletes natural resources, and instead promotes sustainability and conservation. It involves making choices and taking actions that have a positive impact on the environment, both in the short term and long term. Hence, reducing pollution, preserving natural resources, and advancing sustainability are the three main objectives of being environmentally friendly to save the ecosystem for present and future generations.

## Method of the study

### Study area

The study area is Bonny Island, a local government situated at the southern edge of Rivers State in the Niger Delta region of Nigeria near Port Harcourt with a population of about 300,000 people. It lies within latitude  $4^{\circ} 27' 8''$ , longitude of  $7^{\circ} 10' 0''$  and borders the shores of the Southern Atlantic Ocean into which its main River, the Bonny Estuary, finally flows. Bonny Island is surrounded on the west and south by long stretches of beaches (Finima Beach) which thousands visit. The Finima beach is an important tourist area on the right-hand side of the roundabout. It also houses the famous Nigeria liquefied natural gas and other multinational companies such as Shell, Mobil, and Chevron.



Image 1.0: Map showing Niger Delta with Bonny highlighted in Purple.

### Types of data

Primary data will be collected through surveys, interviews, and field observations to gather information on the current state of plastic waste management on Bonny Island and a section of the Waterways (Peter's side). Secondary data will be obtained from relevant literature, reports, and existing studies on plastic waste management and climate change.

### Result of the study

Plastic waste management is the efficient and precise conversion of plastic waste into innovative products that are better, environmentally friendly, and cost-effective. Plastic is one of the most popular materials used all around the world. You name a thing and it's made up of plastic! From shampoo bottles and carry bags to computers and batteries, all have some element of plastic present in them. It is being used so commonly all over the world, the waste generated from the use of the element is enormous.

However, Nigeria generates some 32 million tons of waste per year, of which more than 2.5 million tons is plastic waste. This is a result of its vast and expanding population, urbanization, and rising use of plastic goods. The Oxford University (2010) estimates a generation rate of about 0.1kg per capita per day for Nigeria. The country's disposal, recycling, and general waste

management systems are very inefficient, dealing with both plastic and non-plastic waste, most of which (about 70%) end up in open lands, landfills, drainage channels, beaches, and water bodies. The wide use of plastic by all of us results in a large amount of waste being generated. This waste is often carelessly thrown away on roads or into rivers and streams rather than getting collected at a single location like a dumping ground in the city. However, this waste needs to be disposed of responsibly. That means plastic waste items such as carry bags, straws, chocolate wrappers, and water bottles need to be collected in separate waste bins, segregated as synthetic waste, and handled very carefully by waste management agencies.

Unfortunately, Nigeria and in particular Bonny Island present a waste management system that is characterized by a high dependence on unlicensed waste collectors, a lack of recycling facilities, limited policy, and inadequate infrastructure with Nigeria generating 2.5 million tons of plastic waste annually, while Bonny Island contributing around 600 tons (which forms 10% of the total environmental waste in Rivers state). This is a significant issue, as plastic waste is growing and there are no measures to curb it. According to the survey carried out, Bonny Island is severely faced with the issue of waste disposal as the unlicensed waste collectors are confronted with waste site where this waste cannot be properly disposed of, which will endanger both human beings and animals, as there is no land space where this waste can be dumped properly. Also, for the single fact that it is an island, we are faced with the problem of transporting this waste to the mainland for recycling purposes.

Furthermore, there is the issue around the burning of plastic waste which releases toxic gases like dioxins that severely impact human health. The residents of Bonny Island cannot endure the burning of plastic waste coupled with the gaseous emission from the multinational plants in the business of exploring liquefied natural gas, as these come with great health implications, especially as concerns the human lungs. Also, Plastic waste as observed is synthetic in nature and takes years to decompose, unlike banana peels which break down into simpler substances in a few days. This results in plastic remaining in the environment for over a hundred years, severely impacting the environment. This is illustrated in Table 1.

S/N	Plastic Item	Time taken to degrade (in years)
1	Plastic bag	20
2	Straw	200
3	Cup	450
4	Water bottle	450
5	Toothbrush	500

*Table No. 1: Plastic items take very long to degrade*

Hence, plastic waste has a great implication for human beings and animals such as cows, goats, sheep, dogs, etc. due to its non-biodegradable nature. Animals that live close to the human settlements are directly exposed to the garbage thrown in and around the city which includes plastic waste. These animals cannot differentiate between their food like leaves or grass and plastic waste. So, they tend to eat plastic waste as well. But plastic cannot be digested by living beings and chokes

their digestive systems leading to death. Similarly, the plastics that reach the oceans are also eaten by fish, turtles, crabs and other creatures causing their death. Thus, most times things like broken fishing nets, sheets of plastic and small plastic fragments are ingested by sea animals. There are several cases where underwater creatures get entangled in waste plastic like large nets. The chemicals used in manufacturing plastics also leak out and cause serious health issues like skin diseases, and reproductive and endocrine (hormone-related) disorders in humans.

Meanwhile, it is noteworthy that instead, of allowing this plastic waste to harm human beings and animals, we are allowed to recycle or repurpose these items as they are far from worthless as most materials have great recycling value. It is estimated that made up of 75% of all the waste can be recycled or repurposed. Almost everything we see around us can be recycled, although different materials require different techniques during the process of recycling. Most of the commonly recyclable materials include batteries, biodegradable waste, clothing, electronics, garments, glass, metals, paper, plastics, and a lot more.

Bonny Island and Nigeria by extension face several obstacles to efficient plastic waste management, as this waste, if not managed properly, has numerous ill effects on the environment and living beings. But there are also opportunities and ongoing initiatives to address these problems.

### **Study Approach for Plastic Wastes Management**

There are different conventional methods of plastic waste management practised across the world. However, the study employed the landfilling method for research Purposes.

### **Landfilling**

The term “landfill” refers to all locations and regions where we discard all disposable plastic waste after utilization before being buried beneath the surface of the Earth. The purpose of the landfill arrangement is to provide a safer area for the disposal of plastic waste to safeguard the environment in all its forms. It involves digging a deep hole or dumping in it, filling it with waste, and allowing it to decompose. Thus, while this is a common method, it is considered the least desirable option due to the long degradation time of plastics and the potential for environmental contamination, which implies that the contaminated land will remain inaccessible for a long time. Also, due to the increasing human population and consequential urbanization have led to a scarcity of space for landfills, as landfills take up space that could be used for more profitable activities, like agriculture. This is made worse by the fact that most plastics only moderately degrade. Thus, plastic waste landfilling is the least favoured waste management option today because of growing environmental and public health concerns. The types and quantities of toxic chemicals and their potential for leaching at landfill sites into groundwater is a huge public health issue. As most of these communities rely solely on underground water, hence, “well” water is the most common source of water for many communities. Also, during the rainy season, leachates and other debris are carried by runoffs into nearby communities, causing pollution of open water bodies as well as underground water. Leachate control is a major challenge for the operators of the landfill. Leachates, gases, and unpleasant odours are produced.

However, a properly operated landfill has some advantages. Landfill is one of the cheapest solid waste disposal methods (Harter, 2003). They argued that landfills are particularly beneficial in restoring derelict land, quarries and borrow pits. Nevertheless, a proper management of leachate which is one of the most undesirable by-products of landfill is an essential requirement of a landfill.

If unchecked or ill-managed, leachate seriously pollutes natural water sources. In many developed countries, leachates are collected and treated before being discharged into the environment. Also, a study reveals that contaminants from these dumps can get into the food chain through several means including crops planted several miles from dump sites (Izugbara, & Umoh, 2004). According to the study, several factors - soil type and other environmental factors favour the growth of certain plant species which are palatable to animals especially cattle, goats, and other freely roaming animals. Although, they pose a serious threat to the populace especially when ill-managed.



*Image 2.0: Landfilled with plastic waste in the Long-John area, Abalamabie Bonny Island Rivers State.*

### **Sources of Plastic Waste on Bonny Island and the Waterways (Peter side)**

The sources of plastic waste on the coastal areas of Bonny Island and its waterway are factored into two sources. These sources are classified into land-based sources and ocean-based sources.

#### **Land-based debris**

Land-based sources of plastic debris contribute 80% of marine debris, with densely populated or industrialized areas being major sources. In Nigeria, the widespread use of single-use plastic products, such as plastic bags and food packs, has led to the packaging of drinking water in plastic sachet bags, which are used by the water industry (Aziegbe, 2007). It is noteworthy that sachet water (which is called pure water in Nigeria) has a long history (Mohammed and Dansabo, 2018), as it is believed to have been invented in 1990 by Mrs Victoria Bolanle Oginni (Azuh, 2015). Following this invention, sachet water became a major source of potable water in Nigeria. Although the use of polythene (cellophane) to wrap and sell different consumables is also popular in Nigeria. These plastic wastes fragment into smaller toxic components that eventually pollute the soil and waterways, clogging up the drains, causing water and sewage to overflow, and can then become the breeding grounds for germs and bacteria that spread disease.

Following the above context, Bonny Island and its coastal areas consume 45% of sachet water, partially because pipe-borne water is constructed by multinational companies as part of corporate social responsibilities. Rainwater from the sky is not drinkable and cannot be used for cooking due to emissions. Individuals cannot afford boreholes due to oil pollution. Also, aside from the circle of those who consume sachet water are people who patronage plastic table water, which is very common on the island due to its provision by multinational companies to workers. This sachet of water and plastic table finds its way into the environment. Hence, according to data gathered, the consumption of sachet water, plastic table water and other forms of plastic waste

stands at 80 per cent, this plastic waste is littered around the environment thereby finding its way into the sea around the coastal area of the island. Bonny Island's coastal areas are plagued by plastic waste, sourced from seashore and waterways. Residents, recreational centres (Lamo Beach Recreational Centers and Love Garden Recreational), and fishermen dispose of this waste. Land-based sources account for 80 per cent of plastic waste in coastal areas and along waterways. The beach is another significant environment affected by plastic pollution, as it is often used for visibility by boat drivers.



Image 3.0: *Land-based wastes at coconut estate at Akiama Bonny Island, Rivers state.*

### **Ocean-based debris**

Ocean-based sources account for the remaining twenty per cent (20%) of marine plastic debris, to which commercial fishing is the major contributing human activity. In 1975, the sinking of a fishing fleet resulted in the deposition of 135,400 tons of plastic fishing gear and 23,600 tons of synthetic packaging material into the sea (Cawthorn, 1989). The annual addition of 640,000 tons of discarded fishing gear to the ocean, accounting for 10% of total marine debris, has quadrupled in recent years (Good et al., 2010). Discarded fishing items, like monofilament lines and nylon netting, cause “ghost fishing” by floating at specific sea depths, potentially entangling aquatic organisms (Lozano and Mouat, 2009). There is a significant relationship between the number of ocean-based plastic items found on beaches and the level of commercial fishing (Walker et al., 1997; Cunningham & Wilson, 2003; Ribic et al., 2010). Edyvane et al (2004) also highlighted this relationship by demonstrating a probable link between the reduction of ocean-based plastic debris over ten (10) years and a documented decline in specific inshore fisheries. However, Bonny Coastal Island and its waterways (Peter side) are affected by the above menace highlighted as the study observed that the issue of single-use plastic waste of different forms used by fishermen floats and litter on the shores and into the communities. Most of these fishing gears are lost in the sea, affecting the fishing communities built along the seashore and Bonny Island. We can also Sea currents and waves also contribute to the floating of plastic waste on coastal areas and waterways.



*Image 4.0: Image of plastic waste floating on the shore of the Bonny Sea.*

### **Effect of Plastic Waste on Bonny Island and the Waterways (Peter Side)**

Plastic waste, a non-biodegradable material with toxic pollutants, causes significant environmental harm through water, land, and air pollution, primarily found in enclosed areas and influenced by wind, ocean currents, and human population.

Bonny Island is facing unprecedented environmental effects from plastic waste pollution due to limited land mass and inadequate waste management. The island's groundwater pollution, food chain disruption, animal killings, land pollution, poisonous ability, and air pollution are among the many effects of this issue, highlighting the need for improved waste management systems.

1. **Groundwater Contamination:** Groundwater is water that is present in rocks or unconsolidated materials below the Earth's surface. Groundwater forges a link between surface water systems and the material in Earth's Crust (McConnel, et al, 2010). According to Plummer, et al, (2010) groundwater in its natural state tends to be relatively free of contaminants in most areas. Because it is a widely used source of drinking water, the contamination of groundwater can be a very serious problem. Our drinking water, whether we buy it in bottles or get it out of the tap, originally comes from streams and lakes on Earth's surface or groundwater (McConnel, et al, 2010). The water in Bonny Island is at risk due to plastic and waste leaks, contaminating groundwater supplies and oceans. This has devastating effects on marine species and people consuming fish for nutrients. Bonny Island, with a unique terrane, faces this issue, as residents cannot drink tap water from boreholes sank by multinationals. However, special boreholes are provided and designated for drinking purposes.
2. **Food Chain disruption:** A food chain is a linear sequence of who eats whom in an ecosystem. Most species belong to more than one food chain, especially when they are at a low feeding level (Starr, & McMillan, 2007). An ecosystem consists of one or more communities of organisms interacting with one another and with the physical environment through a flow of energy and a cycling of materials (Starr & McMillan, 2007). According to Starr and McMillan (2007), each species in an ecosystem has its position in a hierarchy of feeding levels/tropic levels. A key factor in how any ecosystem functions is the transfer of energy from one of its feeding levels to another (Starr and McMillan, 2007). Most of the organism in the food chain feeds on plastic waste. Plastic wastes come in different sizes be it large or small. Due to this, the tiniest organism in the world such as plankton, is affected by plastic pollution. When these organisms, being producers, feed on plastics, they become



ingested and poisoned, thereby causing problems for the higher animals, being consumers, who depend on them for food in the food chain. This leads to obstruction in the food chain and ecosystem as a whole. Also, this can cause a lot of ingestion of highly toxic carcinogens and chemicals in plankton, fish, and mainly humans, through the food chain. This situation is not different from what we have observed in Bonny Island, as fishing communities there are seriously affected.

3. **Killings of Animals:** Plastic waste in the environment has led to the death of various animals, including ducks, dolphins, fish, and turtles. These animals become trapped or poisoned by plastic waste, affecting the ecosystem and causing severe injuries. The 2006 report estimated that at least 267 animal species have suffered from entanglement and ingestion of plastic debris, resulting in starvation, predators, and severe lacerations. According to Uwaegbulam, et al, (2018) said that the economic damage caused by plastic waste is vast. Studies reveal that the total economic damage to the world's marine ecosystem amounts to at least three (3) billion dollars yearly. It has also an impact on the tourism, fishing and shipping industries. Thus, Bonny Island is faced with a similar predicament as fishermen lament low catch of fish and other sea foods, thereby affecting their purchasing power.
4. **Land Pollution:** Plastic waste in landfills creates hazardous chemicals, degrading water quality. Plastic can also get stuck on trees, fences, and buildings, posing a risk to animals and potentially causing death. Chlorinated plastic can release harmful chemicals into the surrounding soil, which can then seep into groundwater or other surrounding water sources and also the ecosystem of the world. This can result in serious harm to the species that drink the water. As the toxic chemicals released from plastic wastes on interaction with water seep into the soil, it makes the soil infertile and affects plant growth. However, this menace is seen in areas like Long-John areas where there are landfills, as residents are complaining of the land being polluted and are asking the government to come to their aid.
5. **Poisonous Harm:** Plastic pollution poses a significant threat to animals and human food supplies due to the use of toxic chemicals in plastic production in Bonny Island. Large marine mammals, such as sea turtles, are particularly vulnerable to plastic pollution, as they may contain large amounts of plastic in their stomachs, leading to starvation. Additionally, plastic products like nets can harm or kill marine mammals. The production, storage, use, disposal, and presence of plastics can also be harmful to living things, as toxic chemicals from emissions, fly ash, and burn pile slag can accumulate in animal and plant tissues, posing health risks.
6. **Air Pollution:** It is the presence of chemicals in the atmosphere in concentrations high enough to harm organisms, ecosystems, or human-made materials, or to alter climate (Miller Tyler and Spoolman, 2010). Today, air pollution is a global problem and Bonny Island is experiencing the same; as areas far from the polluting source may be adversely affected as atmospheric circulation moves pollutants freely without regard to political boundaries (Fellman, et al, 2018). Burning plastics in open air, landfills, or incinerators releases toxic chemicals, causing environmental pollution. Discarded plastics contribute to greenhouse gas emissions, affecting both human and animal health, and causing endocrine and respiratory problems when inhaled.

### **Challenges of Managing Plastic Waste on Bonny Island and along Bonny Waterways (Peter side)**

As earlier conceived, Nigeria generates 2.5 million tons of plastic waste annually, with Bonny Island contributing around 600 tons. This is a significant issue, as plastic waste is growing and there are no measures to curb it. According to the survey carried out, Bonny Island alone forms 10% of the total environmental waste in Rivers state, highlighting the challenges in plastic waste management, which are common in many parts of Nigeria. However, some of the challenges faced in Bonny Island and along a section of the waterway (Peter side) include:

1. **Inadequate Infrastructure:** Bonny Island faces challenges in waste collection, sorting, recycling, and disposal due to insufficient infrastructure, including recycling facilities and landfills. The landfill operations, located near a coconut estate, lack leachate collection and treatment facilities. The lowland area's lowland location allows for contaminated water percolation, leading to the production of hydrogen sulfide and other gases. This obnoxious smell, particularly from food wastes with high moisture and organic matter content, is a source of inconvenience for residents and communities. Effective management of odour from decomposing wastes is crucial.
2. **Limited Education and Public Awareness:** Bonny Island faces a lack of public awareness about the environmental impact of plastic waste and the importance of proper waste management practices, leading to improper disposal methods like littering and open dumping. Government officials, residents, and business owners should attend seminars and workshops to learn about recycling and waste disposal and be educated about the impact of plastic pollution on marine life. Individuals can reduce plastic hazards by choosing reusable bags, water bottles, and cups, and refusing microplastic-containing personal care products.
3. **Policy and Regulatory Issues:** Bonny Island and Nigeria by extension have some policies and regulations regarding waste management, but enforcement is often weak. Nigeria's policy on plastic waste management, approved in October 2020, serves as a guide for managing plastic waste. It emphasizes resource efficiency and cleaner production, considering the lifecycle of plastic and the environmental obligation outlined in the 1999 Constitution. The Rivers State government established the Rivers State Waste Management Agency in 2014 to collect, treat, and dispose of waste in the state. However, more comprehensive and strictly enforced regulations are needed to effectively manage plastic waste. The policy serves as a foundation for other laws, regulations, and guidance documents related to plastic waste management. The agency offers a comprehensive waste management strategy, ensuring a safe, healthy, and sustainable environment. It offers modern, efficient, and affordable services, promotes private investments, and ensures access for residents, businesses, organizations, and government departments. However, it has not effectively enforced its policies and programs, with the Bonny Island local government council only focusing on monthly sanitation exercises.
4. **Informal Waste Sector:** A significant portion of waste management in, Bonny Island and Nigeria by extension is handled by the informal sector. While this sector plays a crucial role, it often operates without adequate safety measures, and the workers face health risks. The informal sector cannot also handle large volumes of plastic waste effectively.

5. **Technological Barriers:** Bonny Island has limited access to modern waste management technologies and practices that impede the efficient processing and recycling of plastic waste. Advanced technologies for sorting and recycling are often not available or are too costly.
6. **Market for Recycled Products:** The market for recycled plastic products is not well-developed in Bonny Island, let alone Nigeria as a whole. This reduces the economic incentives for recycling and reusing plastic waste, as there is little demand for recycled materials.
7. **Urbanization and Population Growth:** it is obvious that Bonny Island is experiencing rapid urbanization and population growth thereby increasing the volume of plastic waste generated. This puts additional pressure on an already strained waste management system that is barely existing.

### **Discussion of the study**

The result of the study as the data suggest indicates that Bonny Island generates a significant volume of plastic waste, as dumpsite and the waterways (Peter side) visited show that 80 per cent of the total waste is plastic waste. The study shows a significant impact of plastic waste on Bonny Island and the ecosystem of the waterway, including adverse effects on marine life and water quality. The evaluation of existing management practices reveals gaps and limitations in the current approach. The existing solutions do not address or focus on reducing plastic waste generation through the provision of sustainable waste collection and disposal systems, promoting recycling and reuse, and raising awareness among the local community. The study therefore emphasizes the importance of adopting environmentally friendly practices in managing plastic waste, considering the broader danger of health-related issues and the impact of climate change. Hence, there should be a wide range of stakeholders, including government agencies, private enterprises, non-governmental organizations, and the general public involvement as further buttressed in the recommendations.

### **Recommendation: Toward Potential Solutions**

The scale of the problem of plastic waste is potentially exacerbated by the widespread use of plastic waste, which can compound the problem of plastic pollution in Bonny Island and Nigeria in general. According to Nnaji et al (2014), plastic waste is beginning to pose a serious threat to plastic waste management in Bonny Island and Nigeria by extension. Hence, the call for a holistic approach to the management of plastic waste in Bonny Island is highlighted below:

Firstly, this study recommends urgent funding and infrastructure for waste collection and recycling in Nigeria. Sustained solutions to plastic pollution require political and social will. Infrastructure should include disposal bins, waste trucks, and dump sites with proper facilities and treatment processes to prevent diseases from arising from plastic waste.

Secondly, Designing evidence-based education to raise awareness about plastic pollution is crucial for reducing debris in the marine environment. This can be achieved through town hall meetings, palm fleets, online training courses, and educational video competitions. The media, both traditional and social, plays a significant role in creating awareness and education strategies. Cultural norms around recycling plastic waste can reduce both marine and land plastic pollution. The Nigerian National Policy on Plastics Management, published in January 2020, aims to regulate and control plastic use in Nigeria. It is a domestication of the Basel Convention, which Nigeria is

a signatory to. However, there is little evidence of its implementation, and Nigerian governments and policymakers have not taken serious action. Nigeria and by extension, Bonny local government council should follow the example of other African and Western countries, such as Kenya, South Africa, and Rwanda, in regulating plastic products to address marine and land-based plastic pollution.

Thirdly, the Bonny local government council should regulate single-carrier shopping bags, introduce plastic bag payment, and collaborate with industry for effective waste reduction policies. As Ezeokpube et al (2014), suggest policymakers could introduce interventions to encourage plastic sachet buyback (buyback pack) from users. The Bonny Island local government council could also adopt refillable sachet water packaging, promoting reuse and reducing waste. This initiative, funded by the government and stakeholders, should consider health risks from water shortages and prioritize sustainable alternatives.

Fourthly, Wagner-Lawlor suggests artists can use plastic waste for their works, reducing reckless disposal and uncollected debris. Changes in behaviour by adopting wagner-lawlor opinion are crucial for solving land-based and marine pollution in Bonny Island, as plastic emissions are largely human-induced.

Conclusively, effective plastic waste management requires collaboration between governments, industries, and consumers. Policies and regulations, public awareness campaigns, and sustainable practices are essential to address the growing problem of plastic pollution and protect the environment for future generations. Also, collaboration between government agencies, non-governmental organizations, the private sector, and local communities is crucial to creating an effective plastic waste management system in Bonny Island.

### **Conclusion**

The inadequate waste management practices may have something to do with the low life expectancy in Bonny Island, Nigeria, and the high death rate following short-term diseases. Thus, to protect human health, waste management needs to receive enough attention. The primary supply of drinking water and a valuable resource, groundwater needs to be preserved. Activities that have the potential to jeopardize the security of water resources—surface or groundwater—must receive special attention. Given the prevalence of private boreholes in Bonny Island, leachate treatment and collection should be prioritized because of its toxicity. It is necessary to restrict the current practice of letting leachate easily seep into groundwater. The idea of better air quality must be accepted, and steps should be taken to prevent pollutants from entering the food chain through soil contamination. Through improved soil, water, and quality, better waste management is likely to improve residents' overall quality of life. The lifespan of the house could eventually expand as a result of better waste management.

### **Contribution to Knowledge**

The management of plastic waste on Bonny Island and along waterways is crucial for the preservation of the local ecosystem and the mitigation of climate change impacts. This study has greatly contributed to the existing body of knowledge by providing insights into the current state of plastic waste management on Bonny Island and along the Bonny waterways (Peter side) and has proposed sustainable and well-thought-out solutions that prioritize environmental friendliness. The findings of this study will inform policymakers, environmental organizations, and the local

community in developing effective strategies to combat plastic waste pollution and promote a more sustainable future.

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