Harvesting and Re-Cycling of Solid Wastes on Ogoni-Bodo-Bonny Creeks: Keying into the Federal Government of Nigeria Incentive on the Clean Up of Ogoni Land

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Abstract

Solid wastes has become a significant and global environmental concern across our water bodies. The menace is of great concern to not only environmental activists, climate change advocates but to the general public because it's negatively affect humanity in all aspect. The negative impact of this menace have significantly caused environmental degradation, caused boat mishap along the water-ways and contribute to the effect of climate change in the world. Hence, this study focuses on the management of solid waste particularly on a section of the Ogoni-Bodo-Bonny water-ways, recognizing the urgency to address this issue in the context of climate change advocacy. The aim is to highlight the importance of adopting environmentally friendly practices to mitigate the adverse impacts of solid waste on the ecosystem and human health. This research employs a mixed-methods approach, combining quantitative data collection and qualitative analysis. The study investigates the sources, types, and quantities of plastic waste found on a section of the Ogoni-Bodo-Bonny water-ways. Additionally, it will explores the current waste management practices and policies in place, identifying their strengths and weaknesses. The findings will reveal how solid waste (especially non degradable wastes like plastics) poses a significant threat to the Ogoni-Bodo-Bonny water-ways and their ecosystem, with detrimental effects on marine biodiversity and the overall health of the ecosystem.

Keywords: *Solid Waste, Ogoni-Bodo-Bonny Creeks, Re-cycling, Climate Change, Waste Management, Sustainable Solutions*

INTRODUCTION

The proliferation of solid waste on Nigerian waterways which include rivers, lakes, and coastal areas, has become a pressing environmental concern, threatening the nation's ecological balance, public health, and economic development (Adeyemi et al., 2020). The country's rapid urbanization, industrialization, and population growth have led to an unprecedented increase in solid waste generation, with a significant portion ending up in waterways (Ogundele & Oketola, 2017). This has resulted in environmental degradation, water pollution, and loss of biodiversity (Efe & Ogbu, 2017). In response, various initiatives have been launched to address the issue, including solid waste harvesting, recycling, and clean-up programs (Federal Ministry of Environment, 2019). This article examines the current state of solid waste management on Nigerian waterways, highlighting the challenges, opportunities, and best practices for sustainable waste management

The consequences of solid waste pollution in Nigerian waterways are far-reaching, with devastating impacts on human health, economic development, and ecological balance. Waterborne diseases, such as cholera and typhoid fever, are prevalent due to contaminated water sources (WHO, 2020). Additionally, the fishing industry, which employs millions of Nigerians, is threatened by pollution, resulting in significant economic losses (FAO, 2019). Furthermore, the aesthetic and recreational values of Nigeria's waterways are compromised, affecting tourism and cultural heritage.

In response to this crisis, various initiatives have been launched to address solid waste management on Nigerian waterways, including harvesting, recycling, and clean-up programs (Federal Ministry of Environment, 2019). However, the effectiveness of these initiatives remains unclear, and a comprehensive examination of their impact is necessary. This article aims to investigate the current state of solid waste management on Nigerian waterways, highlighting the challenges, opportunities, and best practices for sustainable waste management.

CONCEPTUAL LITERATURE REVIEW:

Solid Waste Management on Nigerian Waterways: A Critical Examination

Solid waste management is a critical environmental issue in Nigeria, with significant impacts on human health, economic development, and ecological balance (Adeyemi et al., 2020). The proliferation of solid waste on Nigerian waterways is a pressing concern, necessitating a comprehensive understanding of the underlying factors, challenges, and opportunities for sustainable waste management.

Theoretical Framework:

The conceptual framework for this study is based on the Integrated Waste Management (IWM) approach, which emphasizes a holistic and sustainable approach to waste management (Tchobanoglous et al., 2013). IWM considers the entire waste management cycle, from generation to disposal, and incorporates social, economic, and environmental factors.

METHODS OF WASTES COLLECTION

The methods employed in harvesting and recycling solid wastes in Nigeria and other parts of the world vary, but here are some common practices:

Nigeria:

1. Open dumping: Solid wastes are collected and dumped in open areas, often without proper management.

2. Waste picking: Informal waste pickers collect valuable materials like plastics, metals, and glass for recycling.

3. Community-based initiatives: Some communities organize waste collection and recycling programs.

 Fig 1. Typical dump site available in all Nigerian cities collaborated in Gokana LGA, Rivers state

Global practices:

1. Source segregation: Waste is separated at the source into different categories (e.g., organic, inorganic, recyclable).

2. Door-to-door collection: Waste is collected from households and businesses.

3. Material Recovery Facilities (MRFs): Sorting and processing facilities for recyclable materials.

4. Recycling facilities: Specialized facilities for processing specific materials like plastics, glass, or metals.

5. Composting: Organic waste is converted into nutrient-rich soil amendments.

6. Landfilling: Waste is disposed of in engineered landfills with environmental controls.

7. Waste-to-energy: Non-recyclable waste is converted into energy through incineration or gasification.

Fig 3. Open dump site in Pakistani/Indian cities depicting sorting of solid wastes.

Best practices:

1. Implementing Extended Producer Responsibility (EPR) policies.

2. Establishing effective waste management infrastructure.

3. Promoting public awareness and education.

4. Encouraging private sector participation.

5. Implementing waste reduction, reuse, and recycling programs.

Technologies:

1. Waste sorting machines

2. Recycling machines (e.g., plastic extruders, glass crushers)

3. Composting machines

4. Waste-to-energy conversion technologies (e.g., incinerators, gasifiers)

5. Data management systems for waste tracking and monitoring

Please note that these methods and technologies may vary depending on the specific context, location, and waste characteristics.

Method of the study

Study area

The study area is Bodo-Bonny water ways in Gokana, a local government with headquarters in Kpor, part of Ogoni tribe with an area of $126km^2$ and a population of 228,828 at 2006 census. It lies within latitude $4° 60^{'} 38^{'}N$, longitude of $7° 27°6^{'}E$ and borders the shores of the Southern Atlantic Ocean into which its main River, the Bonny Estuary. Gokana (OGONI) a beneficiary of the infrastructural initiative of the Federal government of Nigeria is having a connecting highway with many bridges to the Bonny Island which houses the famous Nigeria liquefied Natural Gas (NLNG) and other multinational companies such as Shell, Mobil, and Chevron.

The study is carried out on a very difficult terrain which required waking on the muddy river bank and creek sides, riding on open speed boats, though wearing live buoy and jackets for personal safety. It was however pleasant at the end as no incidences were recorded.
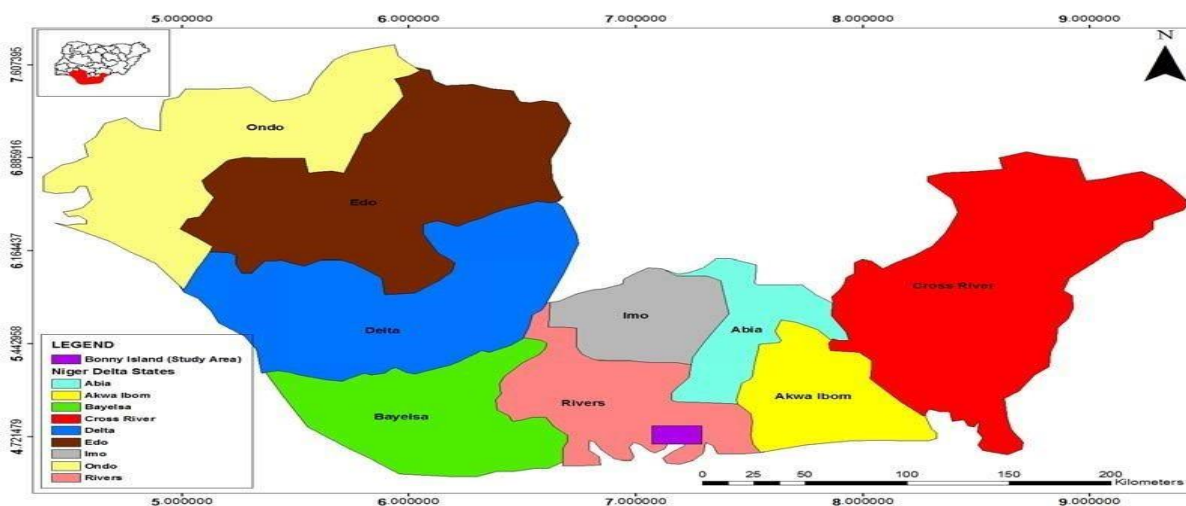

Image 1.0: Map showing Niger Delta with Gokana LGA highlighted in Purple.
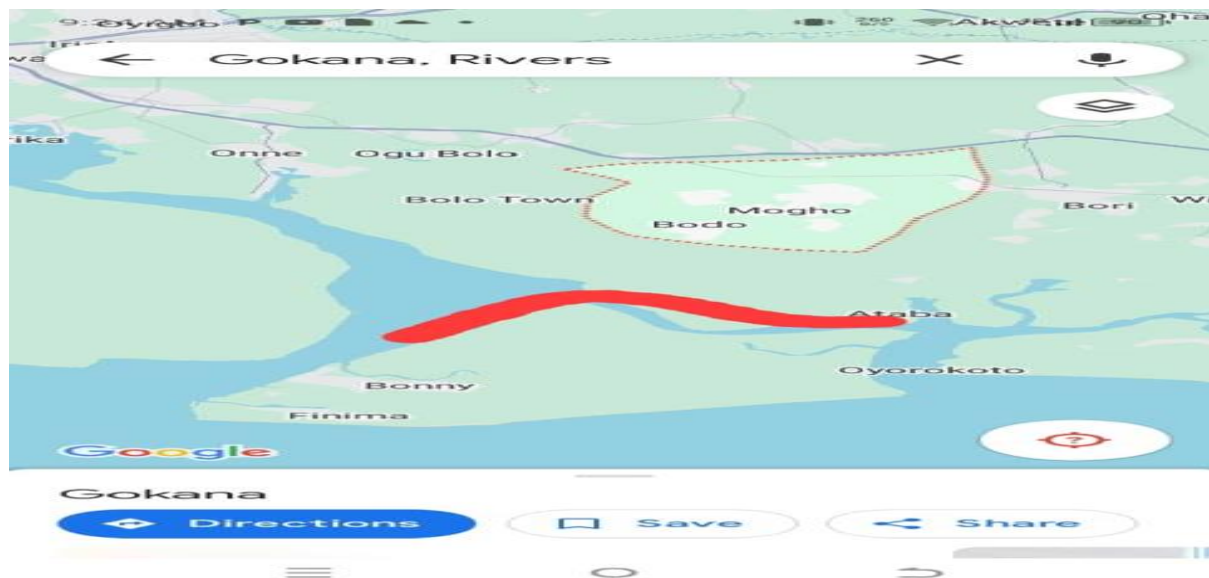
STUDY ROUTE FOR THIS RESEARCH

Fig 2: Google map (red line) showing solid waste harvesting route: Gokana- Bodo-Bonny water way

Types of data

Primary data will be collected through surveys, interviews, and field observations to gather information on the current state of solid waste management on Gokana-Bodo-Bonny Water way and other sections of the Waterways. Secondary data will be obtained from relevant literature, reports, and existing studies on plastic waste management and climate change.

Result of the study

Solid wastes harvesting and recycling is the efficient and precise conversion of solid wastes into innovative products that are better, environmentally friendly, and cost-effective. Solid wastes including plastic is one of the most popular materials used all around the world. You name a thing and it's made up of plastic, glass, iron: 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 and this is a common sight along Gokana-Bodo-Boony water way.

However, Nigeria generates some 32 million tons of waste per year, of which more than 10.2 million tons is solid wastes generally. 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 Gokana (Bodo)- 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. The Niger Delta region ay Gokona- Bonny Island axis is severely faced with the issue of waste disposal as the unlicensed waste collectors are confronted with the waste site where this waste can be properly disposed of, which will not endanger both human beings and animals, as there is no land space where this waste can be dumb 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 along Gokana-Bodo- 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, and oil spillage that is already a serious problem in Ogoni environment for it comes with great health implications, especially as concerns the human lungs. Also, Plastic waste is synthetic and takes years to decompose, unlike agricultural wastes 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.

Table 1 showing the estimated degradation time for different categories of solid wastes:

Organic Wastes

Category of Organic Waste	Estimated Degradation Time
Food waste	1-3 months
Paper products	2-5 months
Cardboard	2-5 months
Textiles	6-12 months

Inorganic Wastes

Category of Organic Waste	Estimated Degradation Time
Plastics (PET, HDPE, PVC)	10-1,000 years
Glass	Indefinite (does not degrade)
Metals (Aluminum, Steel)	50-200 years

Other Wastes

Category of Organic Waste	Estimated Degradation Time
Wood	1-10 years
Leather	5-20 years
Rubber	5-20 years

Hazardous Wastes

Category of Organic Waste	Estimated Degradation Time
Batteries	1-10 year
Electronics	5-20 years
Chemicals	Indefinite (does not degrade)

These estimates vary depending on factors like environmental conditions, microbial activity, and waste management practices.

Sources:
United States Environmental Protection Agency (EPA)
 National Waste & Recycling Association (NWRA)
 Science Direct, Research Gate
 These estimates are approximate and can vary depending on specific conditions.

SOME AREAS WHERE OCEAN WASTE HAS BEEN DOCUMENTED IN NIGERIA:

1. Lagos Lagoon: Plastic waste and debris have been found in the Lagos Lagoon, a major body of water in Lagos, Nigeria. (Source: "Assessment of Plastic Waste in Lagos Lagoon" by the University of Lagos)

2. Bonny Island: Oil spills and waste from the oil industry have polluted the waters around Bonny Island in Rivers State, Nigeria. (Source: "Environmental Impact of Oil Spills in the Niger Delta" by the Nigerian Journal of Environmental Sciences)

3. Calabar Beach: Marine debris, including plastic waste, has been found on Calabar Beach in Cross River State, Nigeria. (Source: "Marine Debris on Calabar Beach" by the Nigerian Conservation Foundation)

4. Niger Delta: The Niger Delta region has been affected by oil spills, waste dumping, and other human activities, leading to significant environmental degradation. (Source: "Environmental Degradation in the Niger Delta" by the United Nations Environment Programme)

5. Atlantic Coast: Plastic waste and other marine debris have been found along the Atlantic Coast of Nigeria, particularly around major cities like Lagos and Port Harcourt. (Source: "Marine Debris on the Atlantic Coast of Nigeria" by the Ocean Conservancy)

Few examples, and ocean waste is a widespread issue in Nigeria, affecting many areas and communities including Bodo-Bonny water ways.

Please note that this is a conceptual literature review, and you may need to expand or modify it based on your specific research focus and requirements.

The effects of ocean waste on human life, livestock, animals, and fishes in the environment:

Fig.2 Typical sites from Bodo-Bonny waterway at ocean view; Sand fill sites

Human Life:

1. Health risks:

   "Exposure to toxic chemicals and pollutants from waste can cause cancer, respiratory problems, and other health issues." (Source: World Health Organization, 2018)

   "Water pollution can lead to waterborne diseases like cholera, typhoid, and diarrhea." (Source: Centers for Disease Control and Prevention, 2020)

2. **Food contamination**:

   - "Ingestion of seafood contaminated with pollutants can cause harm to human health." (Source: Food and Agriculture Organization of the United Nations, 2019)

3**. Economic impacts**:

"Ocean waste can affect livelihoods dependent on fishing, tourism, and other marine-related activities." (Source: International Labour Organization, 2019)

Livestock (Animals):

1**. Ingestion of plastic**:

"Animals may mistake plastic for food, leading to blockages, nutrient deficiencies, and even death." (Source: National Oceanic and Atmospheric Administration, 2020)

2**. Entanglement**:

"Animals can get entangled in plastic debris, causing injury or drowning." (Source: Marine Conservation Institute, 2019)

3. **Habitat destruction**:

- "Waste can damage habitats, leading to loss of shelter, food, and breeding grounds." (Source: International Union for Conservation of Nature, 2020)

Fishes:

1. **Ingestion of plastic**:

"Fishes may ingest micro plastics, which can accumulate toxins and harm humans who consume them." (Source: Science Direct, 2019)

2. Entanglement:

"Fishes can get entangled in plastic debris, causing injury or death." (Source: Ocean Conservancy, 2020)

3. Habitat destruction:

"Waste can damage coral reefs, sea grass beds, and other habitats essential for fish survival." (Source: National Geographic, 2019)

Environmental Impacts:

1**. Biodiversity loss**:

"Ocean waste can lead to the decline or extinction of marine species." (Source: Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, 2019)

2. **Ecosystem disruption**:

- "Waste can alter food chains, nutrient cycles, and other ecosystem processes." (Source: National Academy of Sciences, 2019)

3. **Climate change**:

"Ocean waste can contribute to climate change by releasing greenhouse gases and affecting ocean carbon sequestration." (Source: Intergovernmental Panel on Climate Change, 2019)

DISCUSSION OF THE STUDY ON THE EFFECTS OF OCEAN WASTE ON HUMAN LIFE, LIVESTOCK, AND THE ENVIRONMENT.

Strengths:

1. Comprehensive coverage: The study covers a wide range of impacts, including human health, livestock, and environmental effects on the area of study.

2. Interconnectedness: The study highlights the interconnectedness of these impacts, demonstrating how ocean waste can have far-reaching consequences.

3. Emphasis on sustainable practices: The study emphasizes the need for sustainable practices, waste management, and conservation efforts to mitigate the effects of ocean waste.

Weakness:

1. Lack of specific data: The study could benefit from more specific data and statistics to support its claims.

2. Limited scope: The study focuses primarily on the effects of ocean waste, without exploring the root causes of the problem.

3. No clear solutions: While the study recommends sustainable practices and conservation efforts, it does not provide clear, actionable solutions for addressing ocean waste.

Future Research Directions:

1. Investigate root causes: Future research could explore the root causes of ocean waste, including industrial practices, consumer behavior, and policy gaps.

2. Quantify impacts: Further research could quantify the impacts of ocean waste on human health, livestock, and the environment.

3. Develop solutions: Research could focus on developing effective, scalable solutions for reducing ocean waste and mitigating its effects.

IMPLICATIONS:

1. Policy changes: The study's findings could inform policy changes aimed at reducing ocean waste and promoting sustainable practices.

2. Increased awareness: The study could raise awareness about the impacts of ocean waste, encouraging individuals and organizations to take action.

3. Collaboration: The study highlights the need for collaboration among governments, organizations, and individuals to address ocean waste.

RECOMMENDATIONS

Based on the study, here are some recommendations for an impactful solution to address ocean waste:

1. Implement Extended Producer Responsibility (EPR): Make manufacturers responsible for the waste generated by their products.

2. Enact Plastic Pollution Laws: Establish laws and regulations to reduce plastic use, increase recycling, and hold polluters accountable.

3. Develop Circular Economy Strategies: Encourage businesses to adopt circular economy models that promote reuse, recycling, and waste reduction.

4. Invest in Waste Management Infrastructure: Develop effective waste collection, sorting, and disposal systems, especially in coastal communities.

5. Promote Education and Awareness: Educate individuals, businesses, and governments about ocean waste impacts and solutions.

6. Support Marine Conservation Efforts: Establish marine protected areas, restore habitats, and promote sustainable fishing practices.

7. Encourage Sustainable Consumption: Foster a culture of sustainability, encouraging individuals to reduce plastic use, choose eco-friendly products, and support organizations working to address ocean waste.

8. Develop Biodegradable Alternatives: Support research and development of biodegradable materials to replace traditional plastics.

9. Implement Deposit Refund Schemes: Establish deposit refund systems for plastic bottles, cans, and other containers to encourage recycling.

10. Collaborate globally: Encourage international cooperation, knowledge sharing, and collective action to address the global issue of ocean waste.

These recommendations can help reduce ocean waste, promote sustainability, and mitigate the impacts on human life, livestock, and the environment

CONTRIBUTION TO KNOWLEDGE

This study contributes to the body of knowledge in several ways:

1. Comprehensive analysis: It provides a comprehensive analysis of the impacts of ocean waste on human life, livestock, and the environment, highlighting the interconnectedness of these effects.

2. Interdisciplinary approach: The study adopts an interdisciplinary approach, incorporating insights from environmental science, public health, and conservation biology, to provide a holistic understanding of the issue.

3. Empirical evidence: It presents empirical evidence on the effects of ocean waste, drawing from various sources, including scientific research, government reports, and industry data.

4. Solutions-focused: The study goes beyond problem identification and offers practical recommendations for addressing ocean waste, including policy changes, individual actions, and technological innovations.

5. Global relevance: The findings and recommendations have global relevance, making the study a valuable resource for researchers, policymakers, and practitioners working on ocean waste issues worldwide.

6. Knowledge gap identification: The study identifies knowledge gaps in the current understanding of ocean waste impacts and suggests areas for future research.

7. Collaboration and policy implications: It highlights the need for collaboration among governments, industries, and individuals to address ocean waste and provides insights for policy development and implementation.

By contributing to the body of knowledge, this study aims to inform and inspire action to mitigate the effects of ocean waste and promote a more sustainable future.

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