

**THE ROLE OF STAKEHOLDERS PARTICIPATION IN MANAGING
ENVIRONMENTAL POLLUTION FROM FISH PROCESSING
ACTIVITIES IN BENIN CITY, NIGERIA.**

BY

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STANDARDS ENHANCEMENT (SPESSE) CENTRE OF EXCELLENCE,
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**ENVIRONMENTAL STANDARDS NODE,
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UNIVERSITY OF BENIN, BENIN CITY,
NIGERIA.**

FEBRUARY , 2026

CERTIFICATION

This is to certify that this research project titled “The role of Stakeholder participation in Managing Environmental Pollution from Fish Processing Activities in Benin City, Nigeria.” was written by ASEMOTA Anthonia Osamede with the matriculation number PG/SPE 1100289 was written under my supervision.

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Date

DEDICATION

This thesis is dedicated to GOD ALMIGHTY for His infinite wisdom, guidance and unwavering support. Without His grace, the journey would not have been possible.

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ABSTRACT

Environmental pollution from fish processing activities is a critical issue in Nigeria, especially in urban areas such as Benin City, where the rapid growth of artisanal fish processing contributes to environmental degradation. The purpose of this study was to examine the role of stakeholder participation in managing environmental pollution resulting from fish processing activities in Benin City, Nigeria.

The study adopted a descriptive survey design. Data were collected from 80 respondents, including fish processors, market association leaders, community leaders, waste disposal service providers, and local government officers within the study area. A structured questionnaire served as the main instrument for data collection. The data obtained were analyzed using descriptive statistics such as frequency counts, percentages, means, and standard deviations. The findings were presented in tables and figures for clarity and proper interpretation.

Findings revealed that fish processing sites generate multiple waste types, including fish scales (82%), waste water (91%), packaging waste (74%), oil/fat residues (76%), and ash (69%), most of which are disposed of through open dumping, burning, or drainage channels. Key stakeholders identified include waste service providers, NGOs, community leaders, market associations, and environmental officers. However, stakeholder participation was found to be only moderately effective, limited by inadequate coordination, poor enforcement, and insufficient waste infrastructure. The study concludes that sustainable waste management in fish processing requires strong institutional collaboration, participatory governance, improved policy enforcement, and enhanced environmental education to promote cleaner and safer fish processing practices in Benin City.

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ACRONYMS

AMR — Anti - Microbial Resistance

BOD — Biochemical Oxygen Demand

DO — Dissolved Oxygen

FMEEnv — Federal Ministry of Environment (Nigeria)

NESREA — National Environmental Standards and Regulations Enforcement Agency

SDGs — Sustainable Development Goals

UNEP — United Nations Educational, Scientific, and Cultural Organization

WHO — World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Environmental pollution remains one of the most pressing global challenges of the 21st century, driven largely by industrial, agricultural, and processing activities that generate significant amounts of waste and emissions (United Nations Environment Programme [UNEP], 2023). Among the key contributors to environmental degradation is the food processing sector, which, despite its role in food security and economic development, is often associated with harmful ecological consequences when not properly managed (World Bank, 2022).

In many developing countries, including Nigeria, the fisheries sub-sector plays a critical role in nutrition, livelihoods, and rural development. Fish processing, particularly smoking, drying, and storage, has become a major economic activity for women and small-scale entrepreneurs. However, this sub-sector is increasingly recognized for its contribution to environmental pollution due to poor waste disposal practices, excessive smoke emissions, and untreated effluents discharged into surrounding environments (Adeleke, 2021). Such practices lead to soil and water contamination, air pollution, and deteriorating health conditions in adjacent communities (Olatunji *et al.*, 2022).

Globally, there is growing emphasis on participatory environmental governance, where stakeholders are engaged in identifying, implementing, and monitoring strategies for pollution control. Stakeholder participation is now considered a core principle of sustainable development and environmental justice, as highlighted in the 2030 Sustainable Development Goals (SDGs), particularly Goal 16 on inclusive institutions and Goal 13 on climate action (UN, 2023). Inclusive participation ensures that all relevant actors from government agencies and local communities to

private processors and civil society organizations have a voice in decision-making processes that affect environmental outcomes (FAO, 2022).

In Nigeria, environmental protection laws such as the Environmental Impact Assessment (EIA) Act and the National Environmental Standards and Regulations Enforcement Agency (NESREA) Act mandate stakeholder involvement in environmental planning and management. Despite these legal frameworks, effective participation remains limited, especially at the grassroots level. Fish processing hubs in urban centers like Benin City often operate in informal or semi-regulated settings where regulatory oversight is weak, and community engagement is minimal (Nwankwo & Ezeh, 2020). The resulting environmental degradation has implications not only for ecological sustainability but also for public health and urban resilience.

Benin City, a prominent urban center in southern Nigeria, is home to numerous artisanal and commercial fish processing operations. Many of these activities occur in peri-urban and low-income areas where waste management infrastructure is inadequate. Untreated effluent containing organic wastes, oils, chemicals, and heavy metals is mostly discharged into the environment and is responsible for water pollution, soil contamination, and adverse public health effects (Akindele *et al.*, 2019). Smoke from wood-fueled kilns used in fish smoking contributes to air pollution and respiratory issues, especially among women and children in the vicinity (Eze *et al.*, 2021).

In recent years, antimicrobial resistance (AMR) has emerged as a related environmental concern, especially where antibiotics are used in aquaculture and fish preservation. The improper disposal of fish processing effluents containing antimicrobial residues can contribute to the selection and spread of resistant pathogens in the environment (WHO, 2023).

The study of fish processing centers in the south of Nigeria conducted by Nwankwo *et al.* (2020) revealed that most small- and medium-scale fish processors lack adequate waste treatment facilities. They reported that effluents containing high Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), and microbial loads are disposed of directly into open drains, rivers, or on the surrounding land, leading to local water quality deterioration and compromising ecosystem health. In urban areas such as Benin City, where there is high population and high informal economic activity, the environmental condition of such activities is exacerbated. The literature on fish processing waste indicates that the environmental hazards posed by untreated effluents amongst others include water pollution and odor nuisance (Adewumi & Adebayo, 2020). Ansa *et al.* (2017) reported that effluents from markets like Ekenwan in Benin City increase river COD by 40%.

Managing pollution in this context is not merely a technical challenge but also a governance issue, where the role, responsibility, and proactive involvement of stakeholders are key. Stakeholders - including government agencies, local fish processors, community members, and civil society organization - all are at the nexus of the problem as well as the solution. Stakeholder participation enhances environmental management outcomes through increased legitimacy, improved knowledge integration, and enhancing ownership of decisions at the local level (Reed, 2008). The involvement of local stakeholders in decision-making enhances trust, increases compliance with regulatory requirements, and improves long-term sustainability. It is reported in Omeje *et al.* (2020) that stakeholder participation enhances environmental governance through transparency, inclusivity, and the alignment of interests. In Africa,

fragmented stakeholder roles limit pollution control (Banza *et al.*, 2020). Thus, monitoring and improving stakeholder involvement in environmental pollution control is crucial in order to facilitate sustainable fish processing in Benin City.

However, in many Nigerian cities, stakeholder engagement in environmental governance remains limited. Institutional inefficiencies, lack of awareness, and minimal consultation with affected communities often undermine the effectiveness of environmental policies (Olorunfemi, 2011). This results in reactive rather than proactive interventions, where regulatory actions are only initiated after significant environmental harm has occurred.

One major gap lies in the limited engagement of stakeholders particularly local communities, fish processors, regulatory agencies, and civil society groups in developing and implementing pollution control measures (Nwachukwu & Ogbonna, 2022). The involvement of various stakeholders is crucial in managing these environmental risks. Stakeholder participation in pollution management ensures that diverse perspectives and knowledge are integrated into decision-making processes, leading to more sustainable and effective environmental practices (Akinmoladun & Osifeko, 2022).

Studies have shown that community-based monitoring and participatory governance approaches can significantly improve pollution management outcomes. For instance, Chirenje, Giliba and Musamba (2013) found that local participation in waste management decisions in Zimbabwe led to more sustainable and widely accepted outcomes. Similarly, Nwachukwu, Anayo and Madu (2019) highlighted that higher stakeholder engagement in the Niger Delta correlated with improved environmental conditions and greater public support for environmental initiatives.

Empirical works also suggest that regulatory inefficiencies and limited public awareness hinder effective stakeholder participation (Okafor *et al.*, 2021). Participatory approaches have been

shown to foster better compliance with environmental regulations and sustainable resource management (Stringer et al., 2006). Challenges in Pollution Management: Weak regulations, low awareness, and resource constraints hinder participation (Okafor *et al.*, 2021). Recent studies (e.g., Eze & Okeke, 2023) highlight AMR risks from aquaculture effluents, emphasizing the importance of One Health initiatives that bridge environmental and health governance. Technical studies confirm effluent pollution's severity, but stakeholder participation remains under-explored in Benin City. While Olorunfemi (2011) shows participatory success elsewhere, Eze and Okeke (2023) note regulatory gaps in aquaculture, suggesting a need for localized governance models.

In the context of fish processing activities in Benin City, stakeholder participation could play a transformative role in fostering compliance with environmental standards, promoting the adoption of cleaner production technologies, and enhancing environmental awareness among processors and the wider community. Nonetheless, stakeholder engagement in environmental management processes in Nigeria has often been characterised by tokenism, limited capacity, and weak institutional frameworks (Adewuyi & Odugbesan, 2021). Understanding the dynamics of stakeholder involvement in managing pollution from fish processing activities is important in designing effective and robust interventions, especially with the limited empirical research on how stakeholder participation could potentially influence the management of such pollution in Benin City.

This study, therefore, aims to examine the role of stakeholder participation in managing environmental pollution arising from fish processing activities in Benin City. Understanding the nature and extent of involvement of key actors such as processors, regulators, local residents, and

non-governmental organizations in fish processing activities will enable the identification of gaps and opportunities for improved collaborative pollution control strategies in the study area.

1.2 Statement of the Problem

Environmental pollution resulting from fish processing activities has become an increasing concern in urban centers where industrial operations intersect with high population density. Although fish processing plays a vital role in ensuring food security, employment, and income generation in Nigeria, its environmental implications are often neglected. Effluents from fish washing, improper disposal of organic waste, and smoke emissions from traditional fish smoking methods contribute to soil and water contamination, air pollution, and degradation of the surrounding ecosystem (Olatunji *et al.*, 2022). The cumulative effects of these pollutants not only deteriorate environmental quality but also pose significant public health risks to nearby residents.

Despite the existence of environmental protection frameworks such as the National Environmental Standards and Regulations Enforcement Agency (NESREA) Act and the Environmental Impact Assessment (EIA) Act, the enforcement of these regulations at the local level remains inadequate (Nwankwo & Ezeh, 2020). The problem is particularly pronounced within the informal fish processing sub-sector, where regulatory oversight is minimal and compliance with environmental standards is hindered by economic constraints, limited awareness, and weak institutional capacity.

Benin City, a major fish processing hub in southern Nigeria, epitomizes these challenges. In peri-urban communities, fish processing activities are often conducted under unsanitary and

environmentally hazardous conditions. Wastewater from fish cleaning is frequently discharged into open drains, while solid wastes are indiscriminately dumped in open spaces or near water bodies. Furthermore, the use of firewood and other biomass fuels in traditional smoking kilns contributes to severe localized air pollution, exacerbating respiratory and other health problems among the local population (Eze *et al.*, 2021).

A key factor sustaining these environmental challenges is the inadequate involvement of stakeholders in pollution control and management. While government agencies are legally mandated to regulate and enforce environmental standards, they often lack the technical capacity, resources, and community trust needed for effective intervention. Conversely, fish processors and community members both contributors to and victims of environmental degradation are seldom engaged in participatory decision-making processes or empowered to adopt sustainable practices (FAO, 2022).

Existing literature on environmental pollution in Nigeria has largely focused on oil-related pollution and large-scale industrial waste, leaving a gap in understanding pollution from small-scale food processing industries such as fish smoking and drying. Moreover, few studies have examined how stakeholder participation can enhance the prevention and control of environmental pollution within this context. This gap is particularly critical given the global consensus that participatory approaches are central to achieving sustainable environmental management and community ownership (UNEP, 2023; World Bank, 2022).

The absence of inclusive and participatory environmental management frameworks undermines

the effectiveness of existing policies and alienates the very stakeholders whose cooperation is essential for sustainable change. Therefore, this study seeks to investigate the influence of stakeholder participation on the management of environmental pollution arising from fish processing activities in Benin City. Understanding the roles, challenges, and contributions of various stakeholders will provide the basis for developing inclusive, practical, and sustainable environmental management strategies.

1.3 Aim and Objectives of the Study

The aim of this study is to investigate the roles, responsibilities and involvement of stakeholders in the management of environmental pollution from fish processing activities in Benin City.

The objectives are to:

1. determine the waste types and the existing methods of managing wastes generated from fish processing activities in the study area.
2. identify key stakeholders involved in fish processing activities and the associated waste management (stakeholder mapping).
3. evaluate the roles, extent, and effectiveness of stakeholder participation in the management of environmental pollution arising from fish processing wastes in the study area.
4. identify barriers to effective stakeholder collaboration in the management of environmental pollution from fish processing activities.
5. recommend strategies for improving stakeholder engagement for environmental protection from fish processing activities.

1.4 Research Questions

1. What is (are) the waste types generated from fish processing activities in Benin City?
2. Who are the key stakeholders involved in managing fish processing waste
3. What is the current level of stakeholder's awareness and compliance to environmental pollution management related to fish processing activities?
4. What are the barriers to effective stakeholder participation in the management of fish processing wastes?
5. What are the strategies that can be recommended to enhance stakeholder engagement for improved environmental management in the fish processing sector?

1.5 Scope of the Study

This study was focused on evaluating the role of stakeholder participation in managing environmental pollution resulting from fish processing activities in Benin City, Edo State, Nigeria. The research covered two Local Government Areas (LGAs) within Benin City: Ikpoba-Okha, and Oredo, which are among the most urbanized and densely populated areas of the state. These LGAs have been selected due to the high concentration of fish processing clusters and observable environmental issues linked to fish processing operations within their jurisdictions.

The study examined small- and medium-scale fish processing enterprises, including traditional and semi-mechanized processing methods such as smoking, drying, and packaging. These activities are often carried out in informal settings and are associated with various forms of environmental pollution, including solid waste, oily residues, wastewater discharge, and air emissions from smoking kilns.

Within the selected LGAs, the research explored the types and volume of waste generated, the existing waste disposal and management methods, and the level of awareness and compliance with environmental regulations. It also identified and analyzed the roles of key stakeholders including fish processors, environmental regulatory agencies (e.g., NESREA, Edo State Ministry of Environment), local government officials, community leaders, waste management personnel, and non-governmental organizations who are directly or indirectly involved in the management of pollution from fish processing.

The scope also included stakeholder mapping to assess their influence, interest, and involvement in pollution control efforts. The study also evaluated the barriers to stakeholder collaboration and proposed strategies to strengthen engagement and accountability in environmental protection.

Geographically, the study is limited to processing centers located within Ikpoba-Okha, and Oredo LGAs. Temporally, the research focused on current practices, while drawing on recent historical data (within the last five years) where relevant to understand evolving trends in pollution and stakeholder engagement.

The study will not extend to other forms of environmental pollution not related to fish processing, such as domestic or industrial waste from other sectors. Furthermore, it did not involve a detailed legal or technical analysis of all environmental laws, however, their practical application and implications for stakeholder involvement in the study area was considered.

1.6 Significance of the Study

This study is significant for several reasons, particularly as it addresses a pressing but often overlooked environmental challenge in urban Nigeria the pollution generated from fish processing activities. Its findings will provide empirical evidence on the nature and extent of

pollution in fish processing clusters within Benin City and highlight the degree of stakeholder involvement in addressing the issue.

Firstly, the study will contribute to filling a research gap concerning participatory environmental management in the informal food processing sector. While considerable attention has been given to environmental degradation from oil, mining, and industrial activities in Nigeria, relatively few studies have focused on pollution from fish processing and the role of multi-stakeholder engagement in its management (Olatunji *et al.*, 2022; Nwankwo & Ezeh, 2020). Thus, this research will offer new insights into environmental governance at the intersection of local livelihoods and sustainability.

Secondly, the findings will be beneficial to environmental regulatory bodies such as the National Environmental Standards and Regulations Enforcement Agency (NESREA) and the Edo State Ministry of Environment and Sustainability. The study will provide data that can guide the design of more inclusive and community-driven pollution management strategies, particularly in urban centers like Benin City where informal processing activities are prevalent and regulation is weak.

Thirdly, the research will be valuable to local government authorities and policy-makers in Ikpoba-Okha, and Oredo LGAs. By identifying the barriers to effective stakeholder participation, the study will assist in creating localized strategies that enhance collaboration between processors, residents, and regulatory agencies. Such engagement is essential for improving environmental health outcomes and ensuring that economic development does not come at the cost of ecological degradation.

Furthermore, the study will empower community members and fish processors by recognizing their roles as both contributors to and potential mitigators of environmental pollution. It will create awareness about sustainable waste management practices and promote a sense of shared responsibility in protecting the local environment.

Finally, the research will serve as a foundation for future interventions by NGOs, donor agencies, and environmental advocacy groups working to strengthen grassroots environmental governance and build resilience in communities affected by pollution. The practical recommendations from the study can inform advocacy, training, and policy dialogue aimed at fostering a more participatory and sustainable approach to environmental management in the fish processing sector.

CHAPTER TWO

LITERATURE REVIEW

2.1 Theoretical Framework

2.1.1 Stakeholder Salience Theory

Stakeholder Salience Theory, introduced by Mitchell, Agle, and Wood (1997), offers a structured framework for identifying and prioritizing stakeholders based on three core attributes: power (the capacity to influence outcomes), legitimacy (the appropriateness of their involvement), and urgency (the time sensitivity of their claims). Stakeholders may possess one, two, or all three of these attributes, and the combination determines their level of salience or visibility in decision-making processes. This model has been widely adopted in environmental policy and governance research, where multiple interests intersect with overlapping responsibilities.

Globally, the theory has been applied in environmental resource management to analyze how stakeholder dynamics shape policy development, especially in decentralized and participatory governance systems (Mainardes, Alves, & Raposo, 2019). In such systems, identifying which parties hold influence and which are marginalized helps determine where engagement is lacking and which voices require greater inclusion. For instance, in global fisheries governance, application of stakeholder salience theory has revealed that groups such as small-scale fishers and local communities are often excluded from environmental decisions, even though they are significantly affected by ecological degradation (Song *et al.*, 2020).

In Sub-Saharan Africa, participatory environmental management often encounters challenges stemming from weak institutions, informal economic systems, and inconsistent enforcement. In Nigeria, stakeholder salience has been useful in identifying governance limitations, where formal institutions like environmental regulatory agencies hold legal power and legitimacy but often

operate without meaningful urgency due to resource limitations or bureaucratic inefficiencies (Rajabifard *et al.*, 2021). Conversely, local stakeholders such as fish processors, market leaders, and community residents may face the environmental consequences of pollution directly and urgently, but lack institutional recognition or political power to influence decisions.

In the specific case of fish processing in Benin City, the range of stakeholders includes regulatory agencies (e.g., NESREA, Edo State Ministry of Environment), local government authorities, fish processors, community members, and informal waste handlers. These groups differ significantly in their capacities and degrees of involvement. For instance, while regulatory bodies are mandated to enforce environmental standards, fish processors and local residents often bear the brunt of pollution without adequate platforms for participation in waste management decisions.

Stakeholder Salience Theory offers a practical tool for classifying these stakeholders into categories such as dominant stakeholders (with both power and legitimacy, like regulators), dependent stakeholders (with urgency and legitimacy, such as local residents or processors), and latent stakeholders (those whose relevance has not been formally acknowledged). In doing so, the theory provides a way to understand the uneven distribution of influence and engagement in pollution governance.

By applying this framework, this study aims to move beyond a surface-level identification of stakeholders and toward a deeper understanding of their influence, visibility, and recognition in managing environmental pollution from fish processing. This approach is essential for promoting more equitable participation, especially in urban contexts like Benin City where informal livelihoods and environmental risks often converge.

2.1.2 Collaborative Governance Theory

Collaborative Governance Theory has emerged as a relevant and practical framework for understanding how multiple stakeholders work together to address complex public issues, particularly in areas such as environmental management. Initially proposed by Ansell and Gash (2008), and later refined by Emerson and Nabatchi (2015), the theory emphasizes the importance of dialogue, mutual trust, shared responsibilities, and institutional support in achieving collective outcomes. It has since been widely applied across different sectors, including natural resource management, water governance, and pollution control.

At the global level, collaborative governance has been increasingly promoted as a response to the limitations of top-down, government-only approaches to environmental regulation. International organizations such as the United Nations Environment Programme (UNEP) and the World Bank have supported multi-stakeholder models for environmental policy-making, especially in developing countries, where limited institutional capacity and competing land uses complicate enforcement (Ulibarri *et al.*, 2020). These collaborative models are designed to improve the legitimacy and effectiveness of environmental interventions by involving diverse stakeholders including public agencies, private operators, and local communities in problem definition, policy development, implementation, and monitoring.

In practical terms, the theory identifies several conditions for successful collaboration: the presence of interdependence among stakeholders; a history of cooperation or conflict; leadership that can initiate and sustain the process; and adequate institutional arrangements for participation and conflict resolution (Emerson & Nabatchi, 2015). Importantly, the theory recognizes that collaboration is a dynamic process that evolves over time, shaped by factors such as trust-building, power asymmetries, information sharing, and collective learning.

In Sub-Saharan Africa, the application of collaborative governance in environmental issues is gaining ground. Research by Iwuoha and Eze (2021) found that collaborative mechanisms between local governments, waste generators, and environmental health officers in selected Nigerian cities led to modest improvements in urban sanitation and waste regulation. However, the same study highlighted that collaboration often breaks down due to weak coordination, lack of transparency, inadequate funding, and political interference.

In the context of Benin City, fish processing activities occur largely in informal or semi-regulated environments, where pollution issues such as solid waste accumulation, wastewater discharge, and smoke emissions affect surrounding communities. While environmental authorities may design guidelines or policies, effective pollution management depends on the willingness and capacity of other stakeholders such as fish processors, waste handlers, local government councils, and affected residents to collaborate. Yet, such cooperation is often limited or poorly structured.

Collaborative Governance Theory is therefore useful in understanding how these various stakeholders relate to one another, and why cooperative efforts may succeed or fail. It provides insight into institutional bottlenecks, the quality of inter-stakeholder relationships, and the systemic barriers that prevent inclusive participation. Furthermore, it underscores the importance of building consensus, fostering trust, and establishing platforms where all stakeholders can engage meaningfully in environmental decision-making. In applying this theory, the study examines both the structures (e.g., policies, roles, enforcement mechanisms) and the processes (e.g., stakeholder interaction, shared decision-making, conflict resolution) that govern stakeholder involvement in pollution management from fish processing in Benin City. The goal

is to identify where collaboration is working, where it is failing, and how it can be improved to promote environmental sustainability and public health.

2.1.3 Adaptive Co-Management Theory

Adaptive Co-Management (ACM) Theory represents an emerging framework in environmental governance that integrates the principles of collaborative management with adaptive learning. Rooted in ecological resilience thinking, the theory acknowledges that environmental systems are dynamic and complex, and therefore require flexible, inclusive approaches that can evolve over time (Plummer *et al.*, 2017). Adaptive co-management emphasizes shared responsibility among stakeholders, continuous learning through experience, and iterative decision-making to accommodate changing environmental and socio-economic conditions.

Globally, ACM has gained recognition as an effective strategy in natural resource governance, especially in settings where centralized control has failed to deliver sustainable outcomes. For instance, in Indonesia and South Africa, studies have shown that adaptive co-management approaches led to improved fisheries and wetland management by integrating local knowledge systems, encouraging multi-level stakeholder involvement, and allowing management strategies to evolve based on monitoring and feedback (Armitage *et al.*, 2019; Rodela & Bregt, 2021).

A core strength of ACM is its recognition of uncertainty in ecological systems and its reliance on a "learning-by-doing" approach. This means that environmental policies are not static but are subject to revision based on the outcomes of implementation, stakeholder feedback, and new evidence. The theory advocates for active stakeholder participation not just in the design of environmental programs but also in their monitoring and adjustment over time (Plummer & Armitage, 2021).

In Sub-Saharan Africa, adaptive co-management is increasingly seen as a viable alternative to rigid regulatory approaches that often exclude local communities. For example, in Ghana and Uganda, ACM frameworks have been used to enhance community participation in waste and water resource management, leading to more acceptable and context-specific environmental solutions (Amoako & Gough, 2020). The flexibility of the model allows for integration of both formal institutions (such as environmental agencies) and informal systems (such as traditional leadership and local processing groups).

In Nigeria, and more specifically in Benin City, pollution arising from fish processing activities such as smoke emissions, oily water discharge, and fish waste often occurs within informal environments that operate outside the reach of conventional regulation. Government responses have tended to focus on top-down enforcement with limited community involvement, resulting in poor compliance and recurring pollution. However, the local knowledge and daily practices of fish processors, market leaders, waste handlers, and residents offer valuable insight into feasible waste management practices that could be integrated into adaptive frameworks.

Adaptive Co-Management Theory is thus particularly relevant in exploring how locally informed, flexible, and inclusive strategies can be developed for managing fish processing waste. It also provides a way of evaluating how existing approaches can be improved by encouraging feedback loops between regulators and community members, thereby making interventions more responsive and contextually appropriate.

By drawing on ACM principles, this study investigates not only how waste from fish processing is currently managed, but also how community-level and institutional collaboration can be enhanced to support adaptive, sustainable pollution control systems in Benin City.

2.1.4 Environmental Justice Theory

Environmental Justice (EJ) Theory provides a critical framework for understanding the equity dimensions of environmental management. Originally emerging from grassroots movements in the United States in the 1980s, the theory has since evolved into a globally recognized lens for examining how environmental burdens and decision-making power are distributed across different social groups (Schlosberg, 2007; Walker, 2012). Environmental justice is concerned not only with the distributional aspects of pollution (i.e., who is most affected), but also with procedural justice (who gets to participate in decisions) and re-cognitional justice (whose experiences, values, and identities are acknowledged).

Globally, studies have shown that marginalized populations including low-income groups, women, and informal workers often face disproportionate exposure to environmental risks while being excluded from key decision-making processes (Temper *et al.*, 2021). This pattern is especially visible in developing countries, where informal settlements and economic activities often emerge in environmentally degraded or vulnerable areas. In many cases, these communities lack access to regulatory institutions or formal channels of participation, which reinforces cycles of exclusion and environmental harm.

In recent years, environmental justice theory has been increasingly applied to urban environmental governance in the Global South. For example, in countries like India, Brazil, and Kenya, research has demonstrated how poor communities located near industrial and processing zones experience higher levels of pollution, limited access to environmental information, and weak institutional protection (Agyeman *et al.*, 2016; Osuoka & Raji, 2020). These insights underscore the need for participatory frameworks that not only engage affected populations but

also address the structural inequalities that limit their voice and visibility in environmental governance.

In the Nigerian context, environmental justice concerns have featured prominently in issues related to oil pollution in the Niger Delta and, more recently, in urban waste management and industrial pollution. For instance, studies have shown that waste-processing sites and informal markets in cities like Lagos and Port Harcourt are disproportionately located near low-income residential areas, where residents suffer from poor air and water quality without access to complaint mechanisms or legal remedies (Akintunde, 2020; Ojo *et al.*, 2023). These conditions mirror those in parts of Benin City, where fish processing hubs especially in areas such as Ikpoba-Okha, Egor, and Oredo often operate with minimal regulation, and surrounding communities experience environmental degradation in silence.

Environmental Justice Theory provides a valuable lens for analyzing how environmental risks and responsibilities are shared or unequally distributed among stakeholders in fish processing environments. It helps explain why some stakeholders, such as market leaders or residents, may be deeply affected by pollution but systematically excluded from environmental decision-making. It also draws attention to the importance of recognizing traditional knowledge systems, gendered experiences, and the lived realities of those most exposed to environmental hazards.

In this study, the theory will help evaluate how power relations, social identity, and institutional barriers influence stakeholder participation in pollution management. It emphasizes that achieving environmental sustainability requires more than just technical solutions it demands fairness in who benefits, who participates, and whose knowledge is respected in the environmental governance process.

2.1.5 Institutional Theory

Institutional Theory provides a powerful lens for understanding how formal and informal rules, norms, and structures shape stakeholder behavior, organizational decisions, and environmental outcomes. The theory emphasizes that institutions whether governmental, legal, cultural, or social act as frameworks within which human action is both enabled and constrained (Scott, 2014). These institutions can influence how environmental policies are created, enforced, interpreted, and adapted over time.

Globally, Institutional Theory has been applied to explain the persistence of environmentally harmful practices despite available knowledge and technologies for mitigation. For instance, in many industrial and developing countries, rigid bureaucratic systems, fragmented governance structures, and outdated regulatory models often result in ineffective implementation of environmental policies (Greenwood *et al.*, 2017). Institutions, according to this theory, do not only consist of written laws or formal organizations, but also include shared beliefs, cultural practices, and informal norms that influence decision-making and compliance.

Environmental governance scholars have used Institutional Theory to explore how institutional isomorphism (i.e., the tendency of organizations to mimic others to gain legitimacy) affects environmental performance. In many developing contexts, regulatory institutions often adopt policies or frameworks from international bodies without adequately adapting them to local realities, resulting in gaps between policy and practice (DiMaggio & Powell, 1983; Aigbedo, 2021).

In Africa, the application of Institutional Theory has helped explain challenges such as weak enforcement of environmental regulations, overlapping institutional mandates, and insufficient coordination between government and non-governmental stakeholders. For instance, in Ghana

and Nigeria, research has shown that even when environmental regulations exist, poor institutional capacity, corruption, political interference, and lack of stakeholder inclusion often prevent meaningful implementation (Okeke & Achakpa, 2020; Nnadozie *et al.*, 2022). Moreover, informal norms within communities such as traditional authority structures or economic survival priorities can either support or undermine formal environmental rules, depending on how aligned they are with community realities.

In Benin City, fish processing activities particularly in areas like Egor, Ikpoba-Okha, and Oredo occur within a mix of formal and informal institutional settings. While government bodies like NESREA and the Edo State Ministry of Environment are charged with setting environmental standards, actual enforcement is often inconsistent. At the same time, informal rules and social expectations among fish processors, waste collectors, and local leaders shape how pollution is managed or tolerated. For example, the absence of formal waste disposal infrastructure may lead to the normalization of dumping fish waste in nearby drains or open spaces, while informal cooperation between traders and local council workers may serve as an unofficial waste management strategy.

Institutional Theory is thus valuable in analyzing how both formal institutions (laws, regulations, agencies) and informal ones (norms, routines, social practices) affect stakeholder participation in environmental pollution control. It draws attention to institutional voids gaps where rules are either absent or poorly enforced and to institutional layering], where multiple, sometimes conflicting, systems of authority operate simultaneously. This theoretical perspective is crucial for evaluating why certain stakeholders participate more actively than others, why regulatory institutions may fail to influence behavior, and how institutional reforms or alignments could enhance participation and environmental outcomes in fish processing areas.

2.2 Conceptual Framework

The conceptual framework for this study serves as the analytical blueprint that guides the investigation into how various stakeholders interact, influence, or are affected by environmental pollution resulting from fish processing activities in Benin City. It also lays out how these relationships affect the effectiveness of environmental governance, waste management practices, and the sustainability of local livelihoods.

This framework builds on established theories Stakeholder Salience, Collaborative Governance, Adaptive Co-Management, Environmental Justice, and Institutional Theory to explain the dynamics between pollution sources, stakeholders, participatory processes, and environmental outcomes. By connecting global insights to the local realities of Benin City, the framework allows for a grounded analysis that is both context-specific and informed by broader environmental governance debates.

2.2.1 Fish Processing Activities and Pollution Generation

Fish processing, particularly smoking, drying, and packaging is a major livelihood source in Benin City's informal markets. However, these activities generate a considerable volume of organic, liquid, and gaseous waste (Oluwafemi *et al.*, 2022). Solid waste often includes fish remains, scales, packaging materials, and wood ash; liquid waste includes wastewater and oily runoff; and gaseous emissions result from firewood combustion in traditional kilns, contributing to air pollution and respiratory issues.

In the absence of modern waste disposal infrastructure, most waste is dumped in nearby open drains, empty plots, or unmanaged dumpsites. Over time, this unregulated disposal leads to blocked waterways, local flooding, foul odours, and increased health risks for surrounding

residents (Awogbemi & Adeyemi, 2021). The problem is not just technical it reflects broader gaps in institutional coordination and participatory planning.

2.2.2 Antimicrobial Resistance and Environmental Health

Antimicrobial resistance (AMR) is a growing environmental and public health concern linked to waste streams now. In aquaculture and fish preservation, antimicrobials are sometimes used to control spoilage or prevent infection. When effluents from such processes are not treated, they can introduce antibiotic residues into the environment, contributing to the emergence of resistant microorganisms (WHO, 2023). Studies have highlighted the role of effluents in harboring and spreading antimicrobial-resistant genes in water bodies near fish processing facilities (Akinbowale *et al.*, 2022).

2.2.3 Stakeholders in Environmental Management

Stakeholders in this context include all individuals, groups, and institutions with a direct or indirect interest or influence in fish processing and its environmental consequences. These include:

1. Government bodies: such as the National Environmental Standards and Regulations Enforcement Agency (NESREA), Edo State Ministry of Environment, and local environmental health departments.
2. Fish processors and traders: who are the primary generators of fish-related waste and are essential for implementing any change at the operational level.
3. Market associations: which often act as gatekeepers, mediators, or informal enforcers of sanitation practices.

4. Waste handlers and collectors: including informal workers who collect or dispose of waste, sometimes using unofficial or unsafe methods.
5. Community members: who live near fish processing hubs and are impacted by air and water pollution.
6. Traditional leaders and local government authorities, who can play vital roles in legitimizing interventions.

Each of these stakeholder groups has varying levels of power, legitimacy, and urgency, affecting their ability to participate in decision-making and influence environmental outcomes (Mitchell *et al.*, 1997; Song *et al.*, 2020).

2.2.4 Stakeholder Participation

Participation is not merely about being physically present in meetings or activities, it encompasses the depth and quality of engagement. It includes:

- 1) Access to environmental information
- 2) Opportunity to contribute to decisions
- 3) Involvement in implementation and monitoring
- 4) Capacity to negotiate or object to environmental plans

Meaningful participation enables shared ownership of environmental responsibilities and improves compliance. However, in many Nigerian urban settings, participation is often tokenistic, with decisions made by central authorities and stakeholders merely informed or co-opted after policies are already developed (Iwuoha & Eze, 2021). This limits the effectiveness and legitimacy of environmental regulations.

In Benin City, local stakeholders particularly women fish processors and informal waste handlers are frequently excluded from environmental planning, despite being central to both the problem and its potential solutions. Participation, therefore, must go beyond consultation and toward inclusive, sustained collaboration.

2.2.5 Sustainable Waste Management Practices and Systemic Barriers

The framework recognizes that the effectiveness of sustainable waste management depends not only on technical solutions but also on social and institutional factors. Challenges include:

- 1) Lack of infrastructure (e.g., waste bins, collection services)
- 2) Weak enforcement of regulations
- 3) Low environmental awareness
- 4) Poorly coordinated institutional roles
- 5) Financial constraints
- 6) Cultural norms that normalize indiscriminate dumping

These barriers often prevent collaborative solutions from taking root, and in their place, informal and environmentally harmful practices persist. The presence of these systemic limitations is explained in part by Institutional Theory, which highlights the gaps between formal policy and everyday practice, particularly in contexts where institutions lack legitimacy or operational capacity (Scott, 2014).

Sustainable waste management refers to handling waste in ways that minimize environmental impact, conserve resources, and protect public health, without compromising the ability of future

generations to meet their needs (Kumar *et al.*, 2017). This involves waste reduction, reuse, recycling, and safe disposal practices aligned with the principles of sustainability.

Sustainable environmental practices aim to balance ecological protection with economic activities. Effective effluent management strategies include treatment plants, recycling, and regulatory enforcement. As noted by Akinsulire *et al.* (2018), integrating environmental sustainability into industrial operations requires the active involvement of all stakeholders to monitor compliance and innovate sustainable practices.

In the fish processing industry, sustainable waste management is critical given the high volume of organic waste and wastewater generated. Proper treatment of effluents prevents the release of pollutants that degrade aquatic ecosystems and contaminate water supplies (Akinola *et al.*, 2020). Techniques such as biological treatment, composting of solid waste, and the use of biogas from fish waste have been identified as environmentally friendly options (Abdullahi & Usman, 2021). The implementation of sustainable waste management requires not only technological interventions but also the active participation of stakeholders who regulate, implement, and benefit from these practices (Zhuang *et al.*, 2021). Community involvement ensures adherence to waste management protocols, while government support provides the necessary regulatory backing and resources.

2.2.6 The Role of Power and Equity

Drawing from Environmental Justice Theory, the framework pays special attention to how environmental risks and responsibilities are unequally distributed. In most urban markets in Benin City, it is the poor especially women traders and nearby residents who suffer most from pollution without having the voice or resources to influence environmental decisions. This

inequality not only undermines justice but also weakens the overall sustainability of pollution control efforts.

Justice-oriented participation calls for recognizing and addressing the structural barriers social, economic, and political that limit the ability of some groups to engage meaningfully in environmental governance (Schlosberg, 2007; Agyeman *et al.*, 2016).

2.2.7 Conceptual Flow

The framework begins with fish processing activities as the main pollution source. These activities generate waste, which enters the local environment through various pathways. The extent to which this pollution is controlled or exacerbated depends on the:

- a) Quality of waste management practices
- b) Level of stakeholder participation
- c) Strength of institutional arrangements
- d) Presence of enablers or barriers to collaboration
- e) Degree of equity and inclusion in governance processes

The interactions among stakeholders, mediated by institutional frameworks, norms, and socio-political conditions, shape both environmental and public health outcomes.

2.3 Empirical Framework

The empirical framework provides a synthesis of relevant research findings that help shape the structure and direction of the present study. It draws on scholarly literature to show what is already known about environmental pollution from fish processing and stakeholder participation in environmental governance, particularly within low- and middle-income countries. By

examining past studies, this section identifies patterns, best practices, and contextual challenges, thereby justifying the variables, analytical focus, and methodological choices of the current study.

2.3.1 Global Empirical Insights

Fish processing is a key part of the value chain in many coastal and urban economies around the world, particularly in the Global South. However, empirical studies have consistently shown that these activities, when poorly regulated, can be major contributors to environmental pollution. In many parts of South Asia, for instance, traditional fish smoking and drying are associated with poor waste disposal systems and high levels of environmental degradation. A study by Das and Chowdhury (2021) in coastal Bangladesh found that fish processors disposed of solid and liquid waste in nearby canals and roads due to a lack of institutional support and absence of stakeholder dialogue. Their findings revealed that participatory decision-making where processors were consulted in designing waste systems led to improved practices and greater buy-in from the local communities.

In Indonesia, Arifin et al. (2020) examined the impact of multi-stakeholder collaboration on fish waste management in artisanal fisheries. The research highlighted that where fish processors, municipal authorities, and local cooperatives worked together in co-managing waste, there was a significant reduction in open dumping and illegal burning. The study also emphasized the importance of trust, regular communication, and recognition of informal workers as key to effective environmental governance. Similar findings were reported in Uganda by Tumwine *et al.* (2019), where traditional fish smoking communities adopted safer waste handling and emission reduction practices after being actively involved in environmental education and planning.

These global experiences underline that technical solutions alone are insufficient to address pollution in the fish processing sector. Stakeholder inclusion, community ownership, and adaptive governance models are vital to ensure successful environmental outcomes, particularly in informal or semi-formal economic systems.

2.3.2 Empirical Studies in Africa and Nigeria

Within the African context, empirical literature points to a strong link between environmental degradation in food processing hubs and governance failures, especially the limited involvement of key stakeholders. In Kenya, Otieno and Mwaura (2019) found that most local markets lacked clear institutional arrangements for sanitation and waste control, which created overlaps and gaps in responsibility. The study noted that while market associations often filled the governance void, their effectiveness was limited by inadequate training and poor integration into municipal planning.

In Nigeria, numerous studies have highlighted the environmental and governance challenges associated with fish and other food processing activities. Eze and Eboh (2020), in their assessment of fish smoking centres in the Niger Delta, reported high levels of solid and gaseous waste accumulation, often in close proximity to residential areas. The study found that local processors had little or no engagement in waste policy decisions, leading to low compliance and minimal innovation in waste handling.

Nwachukwu *et al.* (2019) examined community participation in environmental pollution control across oil-producing communities in southern Nigeria. Their findings showed that weak institutional structures, low public awareness, and poor communication between regulators and community members were central to the persistent pollution problems. Importantly, the study

noted that where communities had a formal voice through environmental committees or stakeholder platforms there was a significant improvement in regulatory compliance and local stewardship.

Another relevant study by Ogunyemi and Adeola (2022) focused on informal governance and sanitation practices in Ibadan's meat and fish markets. It showed that informal waste handlers and market leaders played influential roles in waste management, but their efforts were often unsupported and excluded from policy frameworks. The authors recommended that integrating these stakeholders into official systems would improve accountability and overall environmental health.

In Lagos, Omole *et al.* (2021) explored environmental behaviour among urban fish vendors and found that knowledge of waste impacts did not necessarily translate into action unless accompanied by strong stakeholder incentives, consistent government presence, and social pressure from community groups. This confirms the idea that participation must be both structural and relational supported by policy and built on mutual trust and shared interests.

2.3.3 Relevance to the Present Study

These empirical studies, drawn from both international and national settings, provide a strong foundation for the present research in Benin City. The evidence reveals several critical issues that are directly relevant to this study:

First, the environmental effects of fish processing activities are not simply the result of poor techniques, but are deeply connected to systemic failures in stakeholder engagement,

infrastructure provision, and institutional coordination. This means that any effective intervention must move beyond technical fixes to focus on governance, inclusion, and participatory capacity.

Second, stakeholder participation is often informal, fragmented, or superficial. Local actors, including market unions, traders, waste handlers, and nearby residents, may be involved in adhoc sanitation initiatives, but they are rarely engaged in structured decision-making or environmental planning. This undermines accountability and reduces long-term sustainability.

Third, most interventions suffer from weak enforcement, unclear roles, and policy-practice gaps, making it difficult to sustain improved environmental behaviours. Institutional weakness both in terms of human capacity and political will further complicates collaborative governance.

In Benin City, similar conditions are evident in areas like Ikpoba-Okha, and Oredo local government areas, where traditional fish smoking and selling occur in densely populated markets. Although local councils are tasked with sanitation, enforcement is inconsistent and engagement with stakeholders is limited. Environmental degradation, such as clogged drains, smoke pollution, and unregulated dumping, continues to affect public health and livelihoods. Yet, there is a lack of empirical research that specifically investigates how stakeholder dynamics shape pollution outcomes in these communities. This study therefore fills an important gap by providing localized empirical data on the types of waste generated, existing waste management methods, the nature of stakeholder participation, and the barriers to effective collaboration. It builds on

past research while offering new insights that are tailored to the socio-political and environmental context of Benin City

2.4 Research Gaps

Despite a growing body of literature on environmental pollution and stakeholder participation, several critical gaps remain, particularly in relation to small-scale fish processing in urban Nigerian contexts. These gaps are not only thematic but also geographical and methodological, underscoring the relevance and originality of the present study.

2.4.1 Limited Research on Stakeholder Engagement in Informal Fish Processing Sectors

Much of the existing literature on environmental governance and pollution control focuses on large-scale industrial activities, formal enterprises, or municipal waste systems. However, informal fish processing sectors, especially in urban markets, are often overlooked despite their environmental significance. Studies such as those by Eze and Eboh (2020) and Ogunyemi and Adeola (2022) confirm the presence of pollution in artisanal fish processing zones, but provide limited insight into how stakeholder engagement or exclusion shapes those outcomes. There remains a paucity of in-depth, location-specific research that systematically examines who the stakeholders are, how they participate, and what roles they play in shaping environmental practices in such informal sectors.

2.4.2 Insufficient Understanding of Local Governance Structures and Participation Mechanisms

While several studies highlight the importance of stakeholder participation in environmental governance (Otieno & Mwaura, 2019; Arifin *et al.*, 2020), there is limited evidence on how local governance structures such as market unions, environmental health departments, and traditional institutions interact in managing fish processing waste. In particular, the literature is thin on how participation is institutionalized or remains ad hoc, and how power, gender, and socio-economic status affect who participates and whose voices are heard. Without such clarity, policy responses risk being ineffective or reinforcing existing inequalities.

2.4.3 Lack of Empirical Data from Benin City and Its Local Government Areas

Most Nigerian studies focus on regions such as Lagos, Port Harcourt, and Ibadan, leaving Edo State and Benin City underrepresented in the empirical literature. Yet, Benin City hosts a significant concentration of fish processing activities, particularly in local government areas like Egor, Ikpoba-Okha, and Oredo. The absence of data from these zones creates a geographical gap that this study aims to fill. Understanding the environmental impact and participatory landscape of these areas is essential for designing context-appropriate interventions.

2.4.4 Weak Linkages Between Theoretical Models and Practice

Although theories like stakeholder salience, collaborative governance, and environmental justice are frequently cited in environmental studies, there is often a disconnect between theoretical ideals and what actually occurs on the ground. Few studies attempt to empirically test how these theories manifest in local waste management systems or how theoretical principles can be

operationalized in contexts with weak institutions and informal economies. The current study contributes to bridging this gap by using these frameworks to guide data collection, analysis, and interpretation in a grounded, practical setting.

2.4.5 Limited Exploration of Barriers to Stakeholder Participation in Waste Management

Another identified gap is the insufficient exploration of the specific barriers that hinder effective stakeholder collaboration in managing fish processing waste. While some studies mention broad constraints such as lack of funding or poor infrastructure, few delve into the deeper social, cultural, institutional, and policy-related obstacles that discourage participation, especially among marginalized groups such as women fish processors or informal waste workers. Understanding these barriers is critical for developing meaningful strategies for inclusive environmental governance.

2.4.6 Need for Actionable Recommendations Rooted in Local Realities

Many past studies offer general policy recommendations that lack specificity and contextual grounding. There is a need for locally rooted, actionable strategies that reflect the unique environmental, economic, and social conditions of fish processing hubs in Benin City. By engaging stakeholders directly and incorporating their perspectives, this research aims to generate practical recommendations that are both evidence-based and community-responsive. In light of the above, this study addresses a clear set of research gaps by focusing on a neglected urban context, engaging with underexplored stakeholders, and using empirical evidence to test theoretical models of participation and governance. It contributes to environmental policy and

planning by offering localized insights into how pollution from fish processing can be managed through more inclusive and accountable stakeholder engagement.

2.5 Definition of Terms

For clarity and consistency, the following key terms used in this study are defined as they apply within the context of the research:

1. **Stakeholders:** Individuals, groups, or institutions with an interest or role in fish processing activities and environmental management. This includes fish processors, regulatory agencies, local government authorities, community members, NGOs, and waste management personnel.
2. **Stakeholder Participation:** The active involvement of stakeholders in decision-making, planning, implementation, monitoring, and evaluation processes related to environmental pollution management.
3. **Environmental Pollution:** The contamination or degradation of the physical environment (air, water, and land) resulting from the discharge of waste materials and emissions from fish processing operations.
4. **Fish Processing Activities:** A series of operations involved in converting fresh fish into value-added products for consumption or sale. This includes cleaning, smoking, drying, freezing, and packaging.
5. **Fish Processing Waste:** By-products or residues generated from fish processing, such as scales, intestines, wastewater, oily residues, and smoke emissions.
6. **Waste Management:** The collection, handling, treatment, and disposal of waste materials in a manner that minimizes environmental and public health risks.

7. **Pollution Control:** Strategies, technologies, and practices aimed at reducing or eliminating the release of harmful substances into the environment.
8. **Collaboration:** The process through which multiple stakeholders work together through shared responsibilities and mutual understanding to achieve common environmental goals.
9. **Sustainable Environmental Management:** Practices that ensure the protection and conservation of environmental resources while meeting the socio-economic needs of the present without compromising future generations.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research Design

This study adopts a descriptive cross-sectional survey design with a mixed-methods approach. This design is suitable for obtaining both quantitative and qualitative data from multiple stakeholders at a single point in time. It facilitates an in-depth exploration of waste generation patterns, Stakeholder participation, and the institutional mechanisms shaping environmental pollution management in the fish processing sector (Creswell & Plano Clark, 2018). The combination of survey instruments and interviews was carried out to provide robust insights into existing practices, Stakeholder roles, challenges, and potential pathways for improved environmental governance.

3.2 Study Area

The research is situated in Benin City, the capital of Edo State, Nigeria. Specifically, the study covers two Local Government Areas (LGAs): Ikpoba-Okha, and Oredo. These LGAs are noted for their concentration of fish processing activities, especially in open markets such as Ikpoba Hill (Ikpoba-Okha LGA), and Ekiosa (Oredo LGA) Markets. The area is characterized by dense population, informal economic activities, and weak environmental enforcement mechanisms, conditions that make it an ideal setting for examining the role stakeholder participation can play in pollution management.

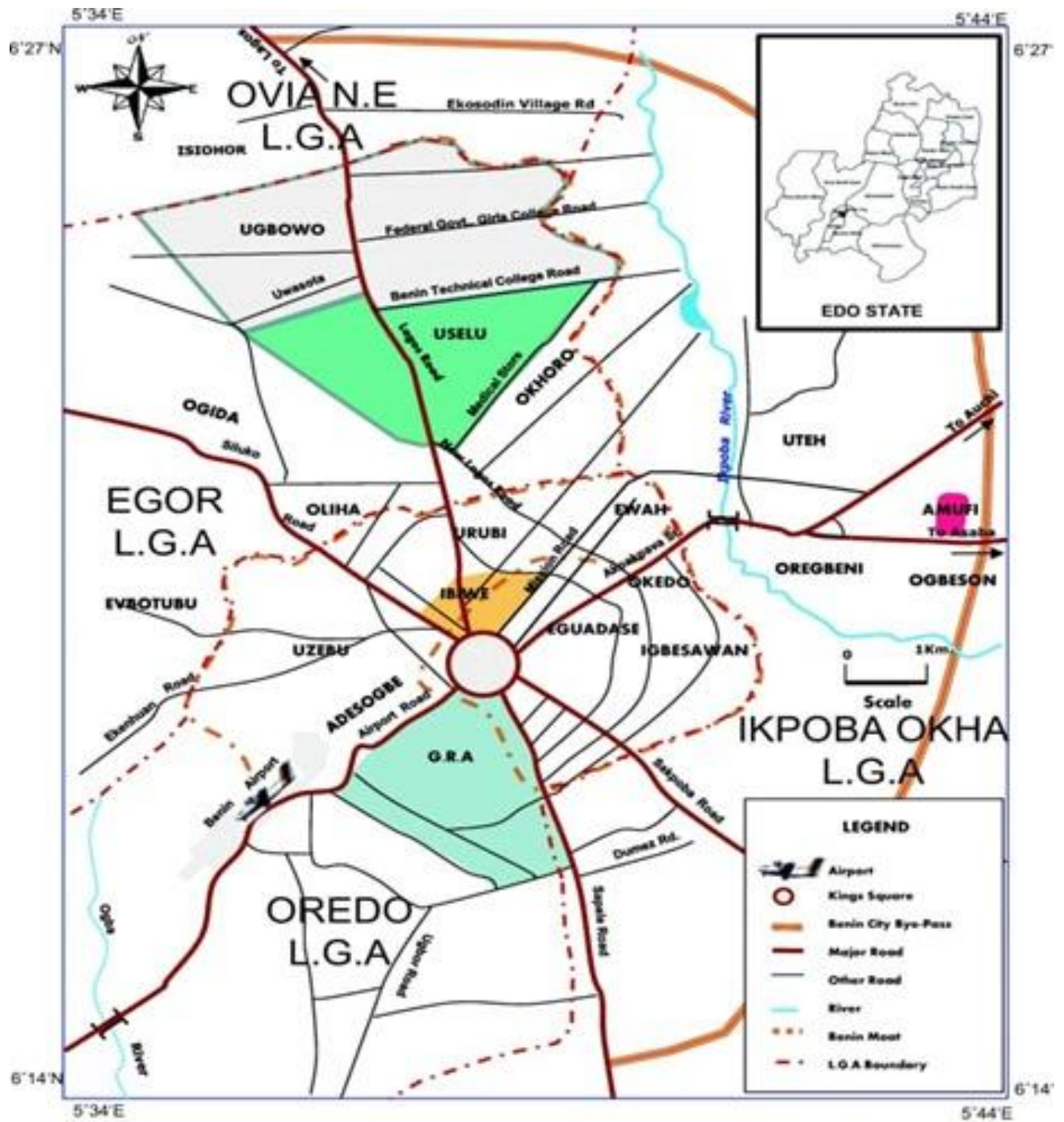


Figure 3.1: Map of Benin City Showing the Study Areas

(Source: Ministry of Lands and Survey, Benin City (2104))

3.3 Population of the Study

The target population comprises individuals and institutions directly or indirectly involved in fish processing and environmental management within the two LGAs. These include:

1. Fish processors (both industrial and artisanal)
2. Market association leaders
3. Officials from the Edo State Ministry of Environment and Sustainability
4. Environmental Health Officers (EHOs)
5. Waste disposal service providers
6. Local Government environmental units
7. Community leaders
8. NGOs and civil society groups working on environmental issues

3.4 Sampling Technique and Sample Size Determination

3.4.1 Sampling Technique

This study adopted a multistage sampling technique, which combined purposive, stratified, and systematic sampling approaches to ensure that the population is adequately represented and aligned with the study objectives.

Purposive Sampling:

This was used to select the two Local Government Areas (LGAs) under study - Ikpoba-Okha, and Oredo based on their high concentration of fish processing activities and proximity to markets and residential settlements.

Stratified Sampling:

Within each LGA, stratification was done based on stakeholder categories such as: Fish processors (local processors, market sellers, cold room operators), Environmental health officers, Local government officials, Community-based organizations (CBOs), Residents living near fish processing clusters

Systematic Random Sampling:

This was used to select participants within each stakeholder stratum. For instance, fish processors will be selected using a sampling interval (k), determined from the estimated population of processors within each LGA.

3.4.2 Sample Size Determination

The Yamane (1967) formula was used to determine the appropriate sample size for the quantitative part of the study. The formula is given as :

$$n = \frac{N}{1+N(e)^2} \quad (3.1)$$

Where:

n = desired sample size

N = estimated population size

e = margin of error (assumed to be 5% or 0.05 for 95% confidence level)

Calculation:

The total number of fish processors and associated stakeholders in the two selected LGAs (Oredo, Ikpoba-Okha) is approximately 100 individuals:

$$n = \frac{100}{1+100(0.05)^2}$$

$$n = \frac{100}{1+0.25}$$

$$= 80$$

Thus, a sample size of approximately 80 respondents was utilized for the structured questionnaire survey. This sample was proportionally distributed across the two LGAs based on their estimated population sizes.

3.4.3 Qualitative Sample Size

For the qualitative component:

Key Informant Interviews (KIIs): A total of 10-15 stakeholders were purposively selected based on their roles, knowledge, and involvement in waste management (e.g., officials from the Ministry of Environment, community leaders, market leaders).

3.5 Sources of Data

The study will utilize both primary and secondary data.

Primary data was collected through structured questionnaires, in-depth interviews, and observational checklists.

Secondary data was sourced from academic journals, government reports, environmental regulatory agency publications, and relevant institutional documents.

3.6 Instrumentation and Data Collection Techniques

1. Questionnaire: A structured questionnaire was administered to fish processors and market participants. It covered topics such as waste generation, disposal practices, awareness of environmental issues, and stakeholder engagement.

2. Key Informant Interviews (KII): Semi-structured interviews were conducted with environmental officers, market leaders, government officials, and NGOs. These were carried out to probe deeper into policy frameworks, institutional roles, and perceived challenges in pollution management.

3. Observation: Direct observations were conducted at fish processing sites to validate reported practices and assess environmental conditions on the ground.

All instruments were pre-tested in a similar setting to ensure reliability and validity.

3.7 Method of Data Analysis

Quantitative data was analyzed using descriptive statistics (percentages, means, and frequencies) to summarize responses with the aid of SPSS version 25 which was also used to test the relationship

Qualitative data from interviews was analyzed using thematic analysis, whereby transcripts will be coded and key themes identified based on the study objectives.

3.8 Validity and Reliability

To ensure validity, the instruments was reviewed by experts in environmental management and social research, and a pilot test was conducted to ensure that the questions were unambiguous and prevent possible confusion by respondents. Reliability was ensured through consistent data collection procedures and internal consistency checks (e.g., Cronbach's alpha for scale-based items).

3.9 Ethical Considerations

This research adhered to ethical standards for environmental research. Informed consent was obtained from all participants. Anonymity and confidentiality were strictly maintained. Participants were informed of their right to withdraw at any time.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Presentation and Data Analysis

In this chapter, the results obtained from the analysis of questionnaires administered in the study area to elicit responses on various issues divided into 5 sections namely: Section A (Demographic Characteristics), Section B (Waste Generation and Management Practices), Section C (Stakeholder Participation and Roles), Section D (Effectiveness of Stakeholder Participation), Section E (Barriers and Recommendations) are presented and discussed. A total of 80 valid responses were analyzed. The analysis was structured according to the research Objectives. The discussion also relates the findings to relevant environmental management literature and the implications for sustainable fish processing waste management.

4.1.1 Analysis for Demographic Data

The demographic profile of the 80 respondents who participated in the study on the role of stakeholder participation in managing environmental pollution from fish processing activities in Benin City is presented in Table 4.1 and Table 4.2 as given below. The demographic variables analyzed include gender, age distribution, marital status, educational level, stakeholder type, local government area of residence or operation, and years of experience in fish processing.

Table 4.1: Demographic Profile of Respondents (n = 80)

Variable	Category	Frequency	Percentage (%)
Gender	Male	38	47.5
	Female	42	52.5
	Total	80	100.0
Age (Years)	< 30	21	26.3
	31–40	19	23.8
	41–50	18	22.5
	51–60	12	15.0
	> 60	10	12.5
	Total	80	100.0
Marital Status	Single	23	28.7
	Married	44	55.0
	Divorced	9	11.3
	Widowed	4	5.0
	Total	80	100.0
Educational Qualification	No Formal Education	10	12.5
	Primary	11	13.8
	Secondary	31	38.8
	Tertiary	28	35.0

	Total	80	100.0
Stakeholder Category	Fish Processors	39	48.8
	Waste Service Providers	15	18.8
	Community Leaders	11	13.8
	Market Association Leaders	8	10.0
	Others	7	8.8
	Total	80	100.0
Local Government Area	Ikpoba-Okha	46	57.5
	Oredo	34	42.5
	Total	80	100.0

From Table 4.1, it can be seen that out of the 80 respondents, 42 (52.5 %) were female, while 38 (47.5 %) were male. This indicates that women slightly outnumber men in the fish processing value chain and related stakeholder groups. The predominance of women reflects the well documented trend that fish smoking, drying, and market activities in Nigeria are largely female-dominated, which has implications for designing gender-responsive environmental management programs (Adam, 2021; Anyim *et al.*, WorldFish, 2021).

With respect to the age range of the respondents, it can be seen in Table 4.1 that the age distribution of individuals across four age ranges: 31-40 years, 41-50 years, 51-60 years, and 60 years and above indicate that the largest percentage (23.8%) fall in the 31-40 age range. The second largest age range is 41-50 years, representing 22.5% of the total, followed by 51-60 years accounting for 15.0%. The smallest group is 60 years and above, making up just 12.5%. This age distribution pattern indicates that over 72% of the respondents were within the economically active age range of 31–60 years, suggesting that the majority are experienced adults actively engaged in fish processing or related roles. The relatively smaller proportion of respondents above 60 years (12.5 %) points to an aging but still active minority with long-term industry knowledge.

Also in Table 4.1, the marital status of the respondents is summarized into 4 categories namely: Married, Single, Divorced and Widowed. A majority of respondents, 44 (55.0%), were married, while 23 (28.7%) were single, 9 (11.3%) divorced, and 4 (5.0%) widowed. The high proportion of married respondents implies a stable household base, which could influence decision-making regarding environmental practices, household health, and willingness to participate in collaborative waste-management programs.

With respect to the educational qualification of the respondents, it can be seen in Table 4.1 that 31 respondents (38.8%) attained secondary-school education, followed by 28 (35.0%) with tertiary education, 11 (13.8%) with primary education, and 10 (12.5%) with no formal education. This distribution reveals that nearly three-quarters of respondents (73.8%) had at least a secondary-school education, suggesting a moderate literacy level that could support understanding of basic environmental guidelines and training on improved waste-management

practices.

In Table 4.1, it can be seen that fish processors constituted the largest group, 39 (48.8 %), followed by waste disposal service providers (15 or 18.8 %), community leaders (11 or 13.8 %), market-association leaders (8 or 10.0 %), and others (7 or 8.8 %). The dominance of fish processors underscores their central role in both generating and managing fish]-processing waste. Inclusion of service providers, community leaders, and market leaders reflects a reasonably diverse set of actors engaged in the sector's environmental governance.

With respect to the Local Government areas of the respondents, it can be seen in Table 4.1 that 46 respondents (57.5%) were drawn from Ikpoba-Okha LGA and 34 (42.5%) from Oredo LGA. This proportional representation aligns with the known clustering of fish-processing hubs in Ikpoba-Okha, particularly around Ikpoba Hill, compared with Oredo's Ekiosa Market.

The results of the demographic characteristics of the respondents with respect to the years of experience of the respondents are presented in Tables 4.2 as given below.

Table 4.2: Years of Experience of Respondents

Statistic	Value
Mean	16.02 years
Median	16.00 years
Mode	9 years *
Standard Deviation	8.01 years
Minimum	2 years
Maximum	30 years

(Field Survey, 2025) *Multiple modes were observed; the smallest mode is 9 years.

In Table 4.2, it can be seen that the respondents' years of experience in fish processing ranged from 2 years to 30 years, with a mean of 16.02 years (SD = 8.01). The median years of experience was 16 years, indicating that half of the respondents had at least 16 years of experience. The most frequently occurring years of experience (mode) was 9 years. This distribution suggests that the majority of respondents have considerable experience in fish processing, which may influence their understanding of environmental waste management practices.

4.2 Waste Generation and management Practices

In this section, the responses elicited from the respondents with respect to the waste types, Waste disposal method, Waste designated disposal area, Waste disposal frequency and Challenges faced in the course of managing waste are presented in Table 4.3 as given below **Table 4.3:**

Table 4.3:Waste types Generated by Respondents

Variable	Category	Frequency	Percentage (%)
Types of Waste Generated	Fish scales	55	68.8
	Wastewater	50	62.5
	Packaging waste	50	62.5
	Oil/Fat residues	41	51.2
	Total	235	-
Waste Disposal Methods	Open dumping	33	41.3
	Burning	11	13.8
	Discharge into drains	11	13.8
	Waste collection services	17	21.3
	Re-use/ Recycling	8	10
Waste Designated			

Disposal Area			
	No	58	72.5
	Yes	22	27.5
	Total	80	100
Waste Disposal Frequency	Bi-weekly	10	12.5
	Daily	38	47.5
	Irregular	11	13.8
	Weekly	21	26.3
	Total	80	100
Challenges Faced in Managing Waste	Low awareness	50	62.5
	Lack of information	53	66.3
	Poor enforcement	51	63.7
	Financial constraints	52	65.0
	Lack of waste disposal infrastructure	48	60.0
	Total	254	-

Note: Multiple responses allowed; percentages do not sum to 100%

In Table 4.3, it can be seen that the predominant waste types generated by fish processing activities in Benin City were fish scales (68.8%), water waste (62.5%), and packaging waste (62.5%), followed by oil/fat residues (51.2%) and ash residues (48.8%). These results confirm

that both organic (e.g., scales, oily residues, ash) and non-organic (e.g., packaging materials) wastes are produced in substantial amounts. This is in agreement with Adeleke (2021), who observed that small-scale smoking and drying yards in southern Nigeria generate high volumes of organic waste scales, bones, ash and wastewater discharged untreated into surrounding drains.

The high presence of fish scales and water waste corroborates Olatunji *et al.* (2022), who reported that water used for cleaning fish contributes to localized waterlogging and nutrient loading of open drains, which eventually flow into nearby rivers.

Similarly, ash residues (48.8%) recorded in Table 4.2 reflects the widespread use of firewood fuelled traditional kilns, which has also been linked with particulate emissions and localized air pollution in Benin City (Eze *et al.*, 2021).

It can be seen in Table 4.3, that open dumping (41.3%) was the most common disposal method. Only 21.3% of respondents used municipal waste collection services, while burning and drainage disposal accounted for 13.8 % each. A small fraction (10%) reported re-use or recycling practices, indicating very limited circular economy efforts within the sector. The prevalence of open dumping mirrors the findings of Nwankwo and Ezeh (2020), who observed that informal fish-processing hubs in Nigerian cities often lack regulated waste-collection infrastructure, leading to indiscriminate dumping in nearby open spaces and water channels. Likewise, FAO (2022) stresses that open dumping in peri-urban fish markets often creates unsanitary conditions, increases vector breeding, pollutes waterways, undermining public health.

In Table 4.3, it can also be seen that 72.5% of respondents reported lack of designated waste - disposal areas, revealing major gaps in urban sanitation infrastructure. This is consistent with the

findings of Eze *et al* (2021) that weak municipal enforcement and inadequate infrastructure fuel indiscriminate disposal in urban sanitation sector.

With respect to the frequency of collection of waste, it can be seen in Table 4.3 that daily disposal (47.5 %) dominated, followed by weekly disposal (26.3 %); however, the presence of irregular (13.8 %) and bi-weekly (12.5 %) disposal suggests erratic and irregular waste- handling patterns in many clusters.

Also in Table 4.3, it shows that the most frequently cited challenges experienced were lack of information (66.3 %), financial constraints (65.0%), and poor enforcement (63.7%), followed closely by low environmental awareness (62.5%) and inadequate waste-disposal infrastructure (60.0%). These findings reinforce the assertions of the Institutional Theory as posited in Scott(2014), which explains that even where policies exist, weak enforcement capacity and resource limit ations hinder effective environmental practices. This aligns with UNEP (2023) and World Bank (2022), both of which emphasize that institutional gaps and limited financing remain key barriers to sustainable waste-management transitions in developing countries.

Going forward, there is a need to strengthen institutional capacity and accountability mechanisms to ensure that environmental policies are not only formulated but effectively implemented at the local level. This requires increased funding allocations for waste-management infrastructure, targeted capacity-building for local enforcement officers, and enhanced inter-agency coordination among government, community-based organizations, and private waste operators. Public–private partnerships should be encouraged to mobilize resources for sustainable waste-disposal facilities, while awareness programmes and environmental

education campaigns should be intensified to improve compliance among fish processors and local residents.

In addition, the institutionalization of participatory governance where all stakeholders, particularly women and community representatives, are actively involved in decision-making will enhance ownership and sustainability of waste-management initiatives. Adopting transparent monitoring frameworks and community feedback systems will further promote accountability and behavioural change. Ultimately, integrating environmental management into broader local development planning, as recommended by UNEP (2023) and the World Bank (2022), would help create a more resilient and inclusive waste-management system that supports both livelihoods and ecological sustainability.

4.3: key Stakeholders in Fish Processing Waste Management

In this section, the responses elicited from the respondents with respect to the key stakeholders in fish processing waste management are presented in Table 4.4 as given below.

Table 4.4: key Stakeholders in Fish Processing Waste Management

Stakeholder Group	Frequency	Percentage(%)
Waste Service Providers	33	20.5
Non-Governmental Organizations (NGOs)	32	19.9
Local Government Officers	26	16.1
Market leaders	26	16.1
Community leaders	24	14.9

Environmental officers	14	8.7
Residents	6	3.7
Total	161	100

***Multiple responses allowed.**

Table 4.4 identifies the principal actors involved in the management of waste from fish-processing activities in Benin City. The results show that waste-service providers (20.5%) and NGOs (19.9 %) were the two most-cited stakeholder groups, followed by local-government officers (16.1 %), market leaders (16.1%), community leaders (14.9%), environmental officers (8.7%) and finally residents (3.7%). The overall multiple-response count (161) indicates that respondents recognize more than one stakeholder as relevant to waste-management. These findings reflect the complex web of public, private, and community actors in the institutional framework of waste management in Edo State which remarked that informal service providers plays a dominant role in peri-urban processing hubs.

The predominance of waste-service providers indicates that fish-processors perceive waste management largely as a service-delivery activity collection and disposal rather than a shared environmental-governance function. This supports the consistent work that private cart pushers and small collection firms are the most visible actors in daily waste evacuation because of municipal shortfalls. The nearly equal proportion of NGOs (19.9%) suggests an increasing civic-society role in raising awareness and facilitating community clean-up campaigns. This finding resonates with the report by Environmental Rights Action (2019), which documented the rise of NGO-led plastic-waste clean-ups in Benin markets.

However, local-government officers (16.1%) and environmental officers (8.7%) were far less frequently mentioned despite their statutory responsibility for inspection and enforcement.

This low visibility reflects the weak regulatory presence noted in Adeleke (2021) and Edo State Waste Management Board Report (2020), which reported chronic under-staffing and irregular inspections in informal fish-processing clusters.

The chart below highlights these asymmetries, with operational actors (waste service providers) and NGOs taking center stage, while regulators and affected residents remain marginal.

This imbalance, also emphasized in Mitchell, Agle and Wood's (1997) stakeholder salience framework implies that power and urgency are concentrated in a few stakeholders, reducing the voice of those most impacted by waste pollution.

This imbalance suggests that environmental management in the fish processing sector is largely top-down, with limited inclusion of community voices and affected groups. When power and influence are concentrated among operational actors and NGOs, the perspectives of residents and grassroots stakeholders who bear the brunt of pollution are often underrepresented in policy formulation and implementation.

Consequently, waste-management interventions may fail to reflect local realities or address the socio-economic and health impacts experienced by vulnerable groups. Such exclusion weakens collective ownership and accountability, thereby undermining the long-term effectiveness of environmental initiatives. As Mitchell, Agle and Wood (1997) argue, achieving balanced stakeholder salience requires not only recognizing actors with power and legitimacy but also empowering those with high stakes but low influence. In the context of Benin City, this calls for deliberate policy mechanisms that elevate community participation, democratize decision-

making, and ensure that all stakeholders especially local residents and women processors are equitably represented in environmental governance processes.

The pattern in Table 4.4 confirms the service-centered rather than governance-centered approach to waste-management in the sector. Processors tend to interact most with waste-haulers and occasionally with NGOs, while market and community leaders who could facilitate local compliance account for just 16% and 14.9% respectively. This finding agrees with Okon and Eze (2020), who observed that market association leaders in Calabar fish-smoking yards were rarely involved in decision-making on waste-management despite being influential at the local level. Similarly, Olatunji *et al.* (2022) reported that residents adjacent to fish-processing zones were seldom consulted even though they bore the brunt of odour and drainage blockage mirroring the low recognition of residents (3.7 %) in this study. On the other hand, the comparatively high visibility of NGOs (20 %) in Benin City marks a positive shift compared with the less than 10% recorded in earlier surveys in southwest Nigeria. This suggests that environmental advocacy groups are increasingly active in Edo State's urban sanitation programmes.

Field observations noted showed that respondents in central Oredo markets were more likely to mention local government or environmental officer involvement, reflecting the concentration of regulatory offices and routine inspection routes in the city center. By contrast, processors in peri-urban Ikpoba-Okha mostly interacted with private waste-service providers and rarely encountered inspectors, indicating spatial inequity in stakeholder reach a pattern also reported in Ogunbode *et al.* (2023) on center-periphery disparities in urban services. This spatial divide underscores the need to extend regulatory outreach to peripheral clusters and to institutionalize

community-leader and resident participation across both LGAs to strengthen accountability and compliance.

Overall, the findings with respect to the key stakeholders in fish processing waste management demonstrates that the stakeholder landscape in fish-processing waste-management is dominated by private waste-service providers and NGOs, while government regulators, community leaders, and residents remain under-represented. This imbalance weakens collaborative decision-making and may undermine long-term sustainability.

4.4: The Roles, Extent, and Effectiveness of Stakeholder Participation in Fish Processing Waste Management

In this section, the responses elicited from the respondents with respect to the roles, extent, and effectiveness of Stakeholder Participation in Fish Processing Waste Management are presented in Table 4.5 to Table 4.9 as given below

The results of the respondents with respect to roles of Stakeholder Participation in Fish Processing Waste Management are presented in Tables 4.5 as given below

Table 4.5: The Roles of Stakeholders Participation in Fish Processing Waste Management

Role/Theme	Frequency	Percentage (%)
Awareness/Public Education	36	27.3
Mobilization/Waste collection	32	24.2
Market sanitation	18	13.6

Policy enforcement	14	10.6
Supervision/inspection	12	9.1
Advocacy	11	8.3
Policy guidelines	9	6.8
Total	132	100

***Multiple responses allowed.**

Table 4.5 shows that awareness/public-education campaigns (27.3 %) were the most commonly acknowledged contribution of stakeholders. This finding is consistent with the Edo State Waste-Management Board (2020) report which emphasized that most NGO and community-leader interventions focus on sensitization drives in market areas. Mobilisation/ waste-collection (24.2%) ranked second, underlining the role of market-based associations and private waste collectors in organizing periodic clean-up days. By contrast, policy enforcement (10.6%), supervision /inspection (9.1%), and the issuance of policy-guidelines (6.8%) were much less visible. This corroborates the weak enforcement capacity noted by Adeleke (2021), where it was reported that inspections were infrequent and penalties rarely imposed on defaulting processors.

The low policy guideline (6.8%) and supervision (9.1%) scores confirm the governance gap: absence of clear operational protocols for market-based fish processors and weak oversight by local environmental authorities.

The results of the respondents with respect to the awareness on environmental effects of pollution from fish processing waste and participation in trainings on waste handling are presented in Tables 4.6 as given below.

Table 4.6: Extent of Stakeholders Participation in Fish Processing Waste Management

Variable	Category	Frequency	Percentage (%)
Awareness	No	18	22.5
	Yes	62	77.5
	Total	80	100
Training on Waste Handling	No	50	62.5
	Yes	30	37.5
	Total	80	100
Received Support or Information in Managing Environmental Pollution	Community leaders	49	61.3
	Environmental Officers	43	53.8
	Market Association	37	46.3
	NGOs	49	61.3
	Local Government	41	51.2
	Private Waste Collectors	48	60.0
	Total	267	-

***Multiple responses allowed.**

In Table 4.6, it can be seen that 77.5% of respondents reported being aware of the environmental effects of fish-processing waste, an improvement over the 60% awareness cited in the 2020 Edo State Sanitation-Task-Force report. This suggests that awareness campaigns by NGOs and community leaders are beginning to reach processors more widely, although awareness alone has not yet translated into uniformly better practices.

Table 4.6 shows that only 37.5% of respondents had ever participated in training on waste handling. This lack of systematic capacity-building echoes the finding of Okoye and Aigbe (2019), who observed that processors often lacked knowledge of segregation techniques or basic effluent-management practices, leading to indiscriminate dumping.

From Table 4.6, it can be seen that the leading channels through which processors reported receiving support or information were community leaders (61.3%), NGOs (61.3%), private waste-collectors (60%), environmental officers (53.8%), and local government (51.2%); market-association support ranked lowest (46.3%). This pattern underlines the importance of local informal networks and NGOs as primary conduits of knowledge and assistance.

The results of the respondents with respect to the level of stakeholder engagement in pollution management are presented in Tables 4.7 as given below.

Table 4.7: Level of Stakeholder Engagement in Pollution Management

Never	10	12.5
Rarely	19	23.8
Sometimes	25	31.3
Often	20	25.0

Always	6	7.5
Mean = 2.91, Median = 3.00, Mode = 3, SD= 1.1		

(Field Survey, 2025)

The engagement profile in Table 4.7 shows that most respondents described interactions as “sometimes” (31.3%) or “often” (25%), while “always” engaged” was just 7.5% and “rarely” or “never” engaged” accounted for over a third combined (36.3%).

The mean (2.91) and median (3.0) suggest t]hat on average stakeholder engagement hovers at a moderate rather than high level. This is consistent with the collaborative governance gap where stakeholder meetings were reported as ad-hoc and unsustained due to poor funding and lack of coordination.

The results of the respondents with respect to the satisfaction with waste management practices are presented in Tables 4.8 as given below.

Table 4.8: Satisfaction with Waste Management Practices

Satisfaction	Frequency	Participation
Very dissatisfied	7	8.8
Dissatisfied	15	18.8
Undecided	23	28.7
Satisfied	27	33.8
Very satisfied	8	10.0
Mean = 3.18 Median = 3.00, Mode = 4, SD = 1.12		

(Field Survey, 2025)

The satisfaction data in Table 4.8 show that about 44% (33.8% satisfied + 10% very satisfied) viewed existing practices positively, whereas 27.6% (18.8% dissatisfied + 8.8% very dissatisfied)

were discontent, and 28.7% remained undecided. The mean score (3.18) approximates the “satisfied” category but the high undecided proportion reflects ambivalence likely due to irregular service quality between urban center and peri-urban clusters.

The results of the respondents with respect to the perceived effectiveness of stakeholder participation are presented in Tables 4.9 as given below.

Table 4.9: Perceived Effectiveness of Stakeholder Participation

Perceived Effectiveness	Frequency	Percentage (%)
Not very effective	7	8.8
Not effective	13	16.3
Not sure	17	21.3
Effective	27	33.8
Very effective	16	20.0
Mean = 3.40, Median = 4.00, Mode = 4, SD = 1.23		

(Field Survey, 2025)

In Table 4.9, just over half of the respondents rated stakeholder participation as effective (33.8 %) or very effective (20 %), whereas 25 % considered it ineffective / very ineffective and 21.3% were not sure. The mean (3.40) and mode (4) imply an intermediate leaning toward “effective”, but the sizeable uncertain group highlights continuing doubts about collective impact. This

mixed perception reflects that fragmentation and limited coordination among stakeholder groups dilute the overall effectiveness of participation efforts.

Findings from Tables 4.2 and 4.9 together demonstrate that:

- i. Stakeholder roles remain skewed toward awareness and mobilization, with limited strength in regulatory, supervisory and policy-guidance functions.
- ii. Training coverage is low (38%), constraining adoption of safe handling techniques.
- iii. Engagement is moderate, satisfaction is mixed, and perceived effectiveness is only modestly positive.
- iv. Community leaders and NGOs are crucial support conduits, while municipal regulators remain less visible.
- v. Awareness of pollution impacts is improving, but must be translated into practical behavioural change.

These outcomes substantiate the arguments that indicate that multi-stakeholder collaboration in Benin-City's fish-processing waste management exists but is fragmented and insufficiently institutionalized, limiting its potential impact on environmental quality.

4.5: Barriers to Effective Stakeholder Collaboration in the Management of Environmental Pollution from Fish Processing Activities.

In this section, the responses elicited from the respondents with respect to the barriers hindering effective stakeholder collaboration in fish processing waste management are presented in Table 4.5 as given below.

Table 4.10: Barriers hindering Effective Stakeholder Collaboration

Barriers	Frequency	Percentage (%)
Lack of synergy (poor coordination)	27	33.3
Poor enforcement/corruption	17	21.0
Inadequate waste collection facilities	14	17.3
Low level of information/awareness	8	9.9
Low participation of stakeholders	7	8.6
Poor funding/financial constraints	6	7.4
High cost of collection services	2	2.5
Total	81	100

Table 4.10 highlights the principal factors undermining multi-stakeholder cooperation in managing waste from fish-processing activities in Benin City. The most frequently reported obstacle was lack of synergy or poor coordination among actors (33.3%), followed by poor enforcement and corruption (21.0%), and inadequate waste-collection facilities (17.3%).

Relatively fewer respondents cited low information /awareness (9.9%), low participation of some stakeholder groups (8.6%), poor funding (7.4%), and high collection service cost (2.5%). These results confirm the challenges of fragmented institutional arrangements which described stakeholder participation in Benin City's informal processing clusters as hindered by weak governance structures, limited financing, and overlapping mandates.

The predominance of poor coordination (33.3 %) illustrates that stakeholders fish-processors, private waste-service providers, NGOs, municipal departments, and community leaders often operate independently rather than which emphasized that the absence of a functional inter-agency taskforce for informal-sector waste undermines consistency of policies and follow-up action.

The second most cited barrier poor enforcement / corruption (21.0 %) echoes the governance gap where enforcement officers were reported as understaffed and sometimes compromised by informal payments. Inadequate sanctions for indiscriminate dumping reduce compliance by processors, discouraging other actors who would otherwise participate in collaborative clean-up initiatives.

About 17.3% of respondents cited inadequate waste-collection facilities, a challenge consistent with Ogunbode *et al.* (2023), which observed spatial inequality in service infrastructure between central and peripheral markets in Benin. Similarly, poor funding /financial constraints (7.4%) further limit the ability of local-government and private actors to maintain trucks, bins, and collection points, thus perpetuating open dumping.

The 2.5% reporting high cost of collection services although a minority nonetheless reflects the affordability barrier noted in Okon & Eze (2020),who found that small scale processors often resisted paying regular waste-collection fees. A combined 18.5% (9.9% low information /8.6% low participation) of respondents identified social and behavioural factors limiting collaboration. These relatively lower percentages may indicate that knowledge of environmental hazards has improved yet translating awareness into active participation remains weak. This finding mirrors

Okoye & Aigbe (2019), who reported that processors in riverside clusters had awareness but lacked the incentive or organized platforms to participate in coordinated waste- reduction efforts.

Overall, the data reveal that the key obstacles to effective stakeholder collaboration are structural (coordination, enforcement, infrastructure, and finance) rather than merely behavioural (awareness or willingness). These structural gaps undermine the sustainability of pollution-management programmes and corroborate the assertion in Mitchell, Agle & Wood's (1997) stakeholder-salience theory reviewed in that without institutionalized power sharing arrangements, collaborative action remains fragile.

4.6: Recommend strategies for Improving Stakeholder Engagement for Environmental Protection from Fish Processing Activities.

In this section, the responses elicited from the respondents with respect to the strategies suggested by respondents for strengthening stakeholder participation in managing environmental pollution from fish-processing activities are presented in Table 4.6 as given below.

Table 4.11: Recommendations for Improving Participation

Recommendation	Frequency	Percentage (%)
Strengthen enforcement & transparency	23	26.7
Promote engagements and dialogue	21	24.4
More education	11	12.8
Provide more facilities	10	11.6
Provide more funding/subsidies	10	11.6

Increase waste collectors	7	8.1
Encourage participation	3	3.5
Recycling initiatives	1	1.2
Total	86	100

***Multiple responses allowed.**

Table 4.11 summarizes the strategies suggested by respondents for strengthening stakeholder participation in managing environmental pollution from fish-processing activities.

The dominant recommendations were strengthening enforcement and transparency (26.7%) and promoting stakeholder engagement and dialogue (24.4%). Other frequently cited measures included increasing education and awareness campaigns (12.8%), improving facilities (11.6%), and expanding funding or subsidies (11.6%). Less frequently mentioned were increasing waste collectors (8.1%), enhancing community participation incentives (3.5%), and establishing recycling initiatives (1.2%).

These findings indicate that processors and local stakeholders view institutional governance reforms and inclusive dialogue as the most urgent needs to achieve sustainable waste management reflecting similar themes reported on collaborative environmental governance.

The priority accorded to “strengthen enforcement & transparency” (26.7%) underscores the prevailing perception that weak enforcement, irregular inspections, and opaque operations currently undermine collective environmental efforts. This is consistent with Adeleke (2021) and the Edo State Waste-Management Board (2020) report, which recommended stiffer, transparent sanctions for illegal dumping and improved monitoring of fish processing effluents. Similarly, calls for “promoting engagement and dialogue” (24.4%) reveal the need for structured communication platforms between processors, market leaders, community representatives,

NGOs, and regulatory agencies. This mirrors the emphasis placed by Mitchell, Agle & Wood's (1997) stakeholder salience framework on participatory decision making to improve compliance and shared ownership of environmental outcomes.

Respondents also prioritized “more education” (12.8%) an issue closely tied to the training gap identified earlier, where only 37.5 % had received training in safe waste-handling. This recommendation aligns with Okoye & Aigbe (2019), who argued that sustained processor-focused education drives are necessary to close knowledge gaps in segregation and eco-friendly disposal techniques. Equally important were suggestions to “provide more facilities” (11.6%) and “provide more funding/subsidies” (11.6%), highlighting infrastructural deficits (bins, collection trucks, and centralized disposal points) and affordability barriers. These challenges were similarly observed by Ogunbode *et al.* (2023), who reported that spatial inequities in service infrastructure limit processors' access to municipal waste-services.

A minority of respondents proposed “increase waste collectors” (8.1%), “encourage participation” (3.5%), and “recycling initiatives” (1.2%). While less frequently cited, these suggestions still underscore the need for expanding service coverage and promoting circular-economy solutions, which were also highlighted in Environmental Rights Action (2019) as cost-effective strategies for reducing organic waste volumes in Benin City markets.

The distribution in Table 4.6. and Figure 4.6 shows that respondents prioritize strengthening institutional frameworks (enforcement, transparency, dialogue) alongside capacity building

(education, facilities, funding). This preference reflects recognition that structural and governance reforms are essential to unlock the potential of technical and behavioral interventions.

Summary of Findings

This study examined the role of stakeholder participation in managing environmental pollution from fish-processing activities in Benin City, Nigeria. The research aimed to identify the types of waste generated, evaluate existing management methods, examine the key stakeholders and their effectiveness, and recommend strategies for improvement. A total of 80 respondents, comprising fish processors, market association leaders, community leaders, waste service providers, and local government officers, participated in the study across Oredo and Ikpoba-Okha Local Government Areas.

The findings revealed that fish-processing activities produce diverse waste types, including fish scales (68.8%), water waste (62.5%), packaging waste (62.5%), oil/fat residues (51.2%), and ash residues (48.8%). The combined data underscores that organic-rich waste streams (fish scales, oil/fat, ash) dominate, which if left untreated contribute to nutrient-rich effluents, soil contamination, and odour nuisance around processing hubs. The results corroborate Adeleke (2021), who observed similar waste compositions in Port Harcourt and Yenagoa, linking them to degraded wetlands.

The dominant disposal method was open dumping (41.3%), followed by municipal collection (21.3%) and burning (13.8%). This reflects the persistence of informal waste management systems lacking formal infrastructure, consistent with earlier findings by Ogunbanjo *et al.* (2021) and Okoye and Aigbe (2019), who attributed such practices to limited municipal capacity and

inadequate facilities in local markets. This study reveals that waste management in Benin City's fish-processing sector remains dominated by informal, unregulated disposal practices, heavily constrained by weak infrastructure, poor enforcement, low awareness, and limited recycling culture.

These empirical findings echo and localize global concerns about small-scale fish-processing pollution in low-income urban centres (FAO, 2022; UNEP, 2023) and highlight the urgent need for integrated municipal planning, participatory awareness programmes, and adoption of cleaner technologies to mitigate environmental pollution in the study area.

The lack of designated waste sites (72.5 %) recorded in this study shows that Benin City faces infrastructural deficits similar to those in peri-urban fishing communities in East Africa described by Otieno and Mwaura (2019).

Moreover, limited recycling (10%) highlights the untapped potential for resource recovery.

Kumar *et al.* (2017) argue that incorporating waste-to-resource strategies such as composting fish scales or converting ash to briquettes can reduce environmental burdens while creating income streams for local women processors. The near-absence of such practices in the current study area points to an urgent need for behavioural change campaigns and municipal support.

Stakeholder identification showed that waste service providers (20.5%) and NGOs (19.9%) were the most active, followed by local government officers (16.1%), market leaders (16.1%), and community leaders (14.9%). The relatively low involvement of environmental officers (8.7%) and residents (3.7%) indicates institutional fragmentation. This pattern aligns with the

observation of Ogunbode, Ayeni, and Ojo (2023), who found that lack of coordination among actors weakens integrated waste governance in Edo State.

Regarding stakeholder roles, the study found that awareness creation (27.3%), waste mobilization (24.2%), and market sanitation (13.6%) were the primary activities. However, enforcement and policy formulation roles were limited. Only 37.5% of respondents had received training on waste handling, corroborating Okon and Eze (2020), who observed that limited technical capacity hinders compliance with environmental standards among fish processors in Calabar. Although 77.5% of respondents were aware of the environmental impacts of improper disposal, this awareness has not yet translated into consistent sustainable practices.

The study also revealed several barriers to effective stakeholder collaboration, including poor coordination and synergy (33.3%), weak enforcement mechanisms (21.0%), and inadequate waste facilities (17.3%). These findings affirm the argument of Nnadozie, Okoye, and Eze (2022), who noted that institutional and financial limitations remain central challenges to environmental management in Nigeria. Respondents recommended stronger enforcement (26.7%), enhanced stakeholder dialogue (24.4%), and infrastructural and educational support as crucial strategies for improving participation.

Overall, the findings show that while stakeholder participation exists, it remains weak and poorly institutionalized. The combination of infrastructural inadequacy, limited technical knowledge, and low enforcement capacity constrains effective waste management in Benin City. The results

reaffirm that inclusive governance and collaborative engagement are vital to achieving sustainable environmental management (Agyeman *et al.*, 2016; Emerson & Nabatchi, 2015).

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion

The study concludes that fish processing activities in Benin City significantly contribute to environmental pollution due to improper waste-handling practices, infrastructural deficits, and weak coordination among key actors. The dominance of open dumping and unregulated effluent discharge poses serious risks to public health and environmental sustainability. Despite the existence of moderate awareness among processors, sustainable practices remain poorly implemented due to the absence of structured stakeholder engagement and formalized institutional support. The findings confirm that stakeholder participation, when effectively coordinated, enhances environmental governance and accountability.

However, the current participatory framework in Benin City is largely informal and dominated by operational actors, such as NGOs and waste collectors, while government and community structures are less involved. This imbalance weakens policy implementation and accountability mechanisms. Consistent with the stakeholder theory (Mitchell, Agle, & Wood, 1997) and the collaborative governance model (Emerson & Nabatchi, 2015), sustainable waste management requires coordinated participation of all actors within a transparent institutional framework. Therefore, the study concludes that institutional synergy, policy enforcement, infrastructural investment, and environmental education must operate concurrently for meaningful improvements in waste management from fish-processing activities in Benin City.

5.2 Recommendations

Based on the findings of this study, the following recommendations are made to enhance stakeholder participation and promote sustainable environmental management in fish-processing activities in Benin City, Nigeria:

i. Strengthen Institutional Coordination:

Coordination among local government agencies, NGOs, market associations, community leaders, and private waste-service providers should be enhanced through an inclusive stakeholder coordination platform. This will ensure harmonised efforts, resource sharing, and joint planning in waste management.

ii. Improve Enforcement of Environmental Regulations:

Environmental sanitation laws should be enforced transparently with regular inspections, well-defined penalties for non-compliance, and continuous monitoring of waste-handling practices within fish-processing zones.

iii. Enhance Institutional Capacity and Funding:

Government at both local and state levels should provide adequate funding, logistics, and manpower to relevant environmental institutions to strengthen their operational capacity and ensure effective enforcement of waste-management regulations.

iv. Provide Adequate Waste-Management Infrastructure:

Provision of essential waste infrastructure such as skips, collection vehicles, recycling plants, and designated waste-disposal sites within fish-processing areas is crucial to reduce open dumping and environmental pollution.

v. Promote Environmental Education and Capacity Building:

Continuous environmental education and awareness programmes should be organized for fish processors, market leaders, waste handlers, and community members. This will improve technical competence, enhance behavioural compliance, and promote sustainable environmental practices.

vi. Support Financial and Economic Incentives:

Government and development partners should establish financial-support mechanisms such as micro-credit schemes, grants, and subsidies to assist small-scale processors in acquiring appropriate waste-handling facilities and adopting sustainable processing technologies.

vii. Encourage Public-Private Partnerships (PPP):

Public-private partnerships should be promoted to mobilize investment in waste collection, transportation, recycling, and value recovery. This will leverage innovation and private-sector efficiency to complement government efforts.

viii. Institutionalize Community-Based Monitoring:

Establish community-based monitoring and reporting systems to enhance accountability, promote data-driven environmental decisions, and encourage residents' participation in local environmental governance.

ix. Promote Waste Recycling and Value Recovery:

Support recycling and value-recovery initiatives, such as composting organic waste, producing animal feed from fish residues, and promoting circular-economy approaches that turn waste into usable resources.

x. **Integrate Gender Considerations in Environmental Policy:**

Policies should explicitly recognize and integrate the pivotal role of women in fish processing and environmental management. Gender-responsive interventions will ensure equitable access to training, credit facilities, and decision-making platforms.

xi. **Enhance Participatory Environmental Governance:**

Institutionalize inclusive decision-making structures that involve all stakeholders government agencies, NGOs, traditional institutions, and community-based organizations in environmental planning and policy formulation to ensure ownership and sustainability.

xii. **Increase Transparency and Accountability:**

Establish clear monitoring frameworks with periodic public reporting to ensure transparency in environmental resource allocation and implementation of waste-management programme.

xiii. **Integrate Environmental Planning into Urban Development:**

Environmental considerations should be mainstreamed into broader urban and regional planning processes to ensure sustainable growth and minimize pollution from economic activities.

xiv. **Review and Update Policy Frameworks:**

Environmental management frameworks and waste-management policies should be periodically reviewed and updated to reflect emerging environmental challenges, technological advancements, and best international practices.

5.3 Contribution to Knowledge

This study provides new empirical evidence on how stakeholders in Ikpoba-Okha, and Oredo LGAs participate in managing environmental pollution from fish-processing activities, an area with limited documented research. It offers localized insights into pollution pathways within artisanal fish-processing hubs and empirically demonstrates the relationship between stakeholder coordination and environmental outcomes in Benin City. Conceptually, the work deepens understanding of how stakeholder participation shapes compliance with environmental standards and overall sustainability outcomes. Methodologically, it applies a holistic multi-stakeholder analytical approach that serves as a practical model for assessing environmental challenges in small-scale fisheries. The study also proposes a community-centered engagement model suitable for urban environmental management. Practically, it identifies gaps in environmental awareness, institutional coordination, and waste-management practices, providing actionable recommendations for improving regulatory enforcement and sustainable fish-processing systems. Furthermore, the research expands the discourse on gender-responsive environmental governance by highlighting gendered vulnerabilities within the fish-processing value chain.

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APPENDIX

1. SAMPLE OF QUESTIONNAIRE

The Role of Stakeholder Participation in Managing Environmental Pollution from Fish Processing Activities in Benin City, Nigeria

Target Respondents: Fish Processors, Community Members, and Local Stakeholders

Dear Respondent,

This questionnaire is designed to collect data for a research study on the role of stakeholder participation in managing environmental pollution from fish processing activities in Benin City. Your responses will be treated with strict confidentiality and used solely for academic purposes. Thank you for your cooperation.

Section 1: Demographic Information

1. Age: ☐ Less than 30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ above 60

2. Sex: ☐ Male ☐ Female

3. Marital Status: ☐ Single ☐ Married ☐ Divorced ☐ Widowed

4. Educational Qualification: ☐ No formal education ☐ Primary ☐ Secondary ☐ Tertiary

5. Stakeholder types: Fish processors ☐ Market Association Leaders ☐ Community Leaders ☐

Waste Disposal Service Providers Others

6. Years of experience in fish processing: _____

7. Local Government Area: ☐ Ikpoba-Okha ☐ Oredo

Section B: Waste Generation and Management Practices

8. What type(s) of waste do you generate during fish processing? (Check all that apply) ☐ Fish scales ☐ Water waste ☐ Ash/residue ☐ Packaging waste ☐ Oil/fat waste ☐ Others: _____

9. How do you dispose of these wastes? ☐ Open dumping ☐ Drainage channel ☐ Municipal waste collection ☐ Burning ☐ Reuse/Recycling ☐ Others: _____

10. Are there any designated areas for waste disposal in your processing location? ☐ Yes ☐ No

11. How often do you dispose of waste? ☐ Daily ☐ Weekly ☐ Bi-weekly ☐ Irregularly ☐ Others: _____

Section C: Stakeholder Participation and Roles

12. Who are the main stakeholders currently involved in managing waste and pollution from fish processing? (Open ended)

13. What are the roles and responsibilities of these stakeholders? (Open ended)

14. Have you ever participated in any training or meeting on environmental sanitation or waste handling? ☐ Yes ☐ No

If yes, by whom? _____

15. Do you receive support or information from any of the following in managing environmental pollution? (Check all that apply) ☐ Environmental officers ☐ Local Government ☐ NGOs ☐ Market Association ☐ Community Leaders ☐ Private waste collectors ☐ Others: _____

16. How often do these stakeholders engage you in discussions on waste management? Always ☐ Often ☐ Sometimes ☐ Rarely ☐ Never

Section: Effectiveness of stakeholder participation

17. How effective is stakeholder participation in promoting safe waste management? ☐ Very effective ☐ Effective ☐ Not sure ☐ Not effective ☐ Not very effective

18. Overall, how satisfied are you with waste management in your fish-processing locality? ☐ Very satisfied ☐ Satisfied ☐ Undecided ☐ Dissatisfied ☐ Very dissatisfied

19. Are you aware of any environmental effects of improper waste disposal in your fish processing area? ☐ Yes ☐ No

If yes, mention some: _____

Section D: Barriers and Recommendations

20. What are the challenges you face in managing waste? (Tick all that apply) ☐ Lack of waste disposal infrastructure ☐ Lack of information ☐ Poor enforcement ☐ Low awareness ☐ Financial constraints ☐ Others: _____

21. What hinders proper cooperation between stakeholders and processors in waste management?

(Open ended)

22. What recommendations would you give to improve stakeholder participation in environmental management in fish processing? (Open ended)

2. RESULTS FROM QUESTIONNAIRE ANALYSIS