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ASSESSMENT OF ENVIRONMENTAL COMPLIANCE LEVEL ON FLOODING CONTROL IN ANIOCHA SOUTH LOCAL GOVERNMENT AREA OF DELTA STATE, NIGERIA

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Keywords: *Compliance, Control, Environmental, Flooding, Level*

Abstract: *This work Assessed the Environmental Compliance Level on Flooding Control In Aniocha South Local Government Area of Delta State, Nigeria. The specific objectives were to; Identify the environmental monitoring/compliance strategies/methods used on flood control; ascertain that the environmental strategies /enforcement methods used in Aniocha South LGA of Delta State are in conformity with world best practices and is effective in flood control; access the impact of ineffective environmental compliance on flood control in Aniocha South LGA of Delta State. The study population was 194,702, sourced from the National Population Commission Report 2023. The study used the descriptive survey design approach. The primary data source was the administration of a structured questionnaire with the help of 5 research assistants. A sample size of 399 was obtained using Taro Yamane scientific formula. 350 respondents returned the questionnaire accurately filled. Data from the questionnaire was administered and analysed using simple percentages and mean, and the research hypotheses were tested using a t-test. The findings showed that Environmental monitoring/compliance strategies/methods significantly impact flood control in Aniocha South LGA in Delta State, Nigeria. (t=85.045, pv=.000<0.05). The environmental strategies/enforcement methods employed in Aniocha South Local Government Area (LGA) of Delta State are not in line with world best practices. (t=-83.015, pv=.000<0.05). Ineffective environmental compliance had a significant impact on flood control in Delta State, Nigeria (t=80.005, pv=.000<0.05). The study concluded that Environmental monitoring/compliance strategies/methods had a significant impact on flood control. To this end, the study recommends raising awareness about the importance of environmental monitoring/compliance in flood control by engaging the local communities, stakeholders, and business initiatives to promote sustainable land use practices, emulating best practices in terms of strategies and enforcement methods to produce desired results. Finally, strengthening enforcement mechanisms to ensure compliance with existing environmental regulations is necessary.*

1.1 Introduction

Flooding is a disaster that could cause serious disruption of the normal functioning of society, causing widespread human, material or environmental losses, which exceed the ability of the affected society to cope with its own resources (Cutter, 2018). A disaster occurs when a significant number of vulnerable people experience a hazard and suffer severe damage and/or disruption of their livelihood system in such a way that recovery is unlikely without external aid (Ndah & Odihi, 2021). Heavy

precipitation, which in many contexts is produced by convective storm, is considered as the main cause of flooding because it provides the amount of water necessary for flood occurrence (Schumacher, 2020).

Floods are the most common natural disaster in the world. In the United States, the most costly on average, and the most dangerous. Between 1955 and 1999 floods caused an annual average of about $2 billion in direct damage to property, crops, and infrastructure, and 100 deaths (Rojas *et al.,* 2022). Because flooding is fairly predictable, however, a large proportion of these losses and deaths could have been avoided. The National Flood Insurance Act of 1968 (Public Law 90-448) was enacted by Congress as a comprehensive effort to minimize both flood damage and the financial impacts of floods on individuals and federal, state, and local governments (Rojas *et al.,* 2022).

The incidence of flooding in Nigeria could be described as old as the country itself. The attendant disaster is, however, not peculiar to Nigeria as it happens in many other big cities throughout the world, be it developed or underdeveloped. This is because the factors behind its occurrence, which is common to all areas that are prone to flooding, is torrential downpour at least. The mitigation and response to the disaster are however different across nations. Many developed nations have developed mechanisms and institutions that are already established to checkmate the incidence and the negative impacts of flooding on man and other components of the environment (Mehryar & Surminski, 2020). Several cases of flood disaster have occurred in Nigeria. The generalized cause is heavy rainfall in view of the location of the country in the tropical climate environment.

Most of the States/cities in Nigeria had one time or the other experienced flooding. For instance, the history of flood disaster in Ibadan, Oyo State, Nigeria could be traced to July 9th and 10th, 1933 which was recorded as the first flood disaster in the town. Apart from that of 1933, the city had been hit by flood disaster like in June 1955, July 1960, August, 1963 and August 1980 among others (Saediman *et al.,* 2021). Kano State in Northern part of the country also experienced flood disaster on August 7, 1988), the event that led to the collapse of Bagauda Dam and resulted in the loss of lives and destruction of properties worth millions of dollars. Ilorin, the Kwara State capital also had the tastes of excessive surface flow of water in 1976, the event that led to the destruction of vegetable and sugarcane farmlands and the flooding of urban roads with about 40 houses submerged. The flood events of September, 1989 in Cross River State resulted in submergence of over 130,000 hectares of farmlands while, in the same year, over 150,000 farming families became homeless and destruction of economic trees in Akwa Ibom State (Saediman *et al.,* 2021).

1.2 Statement of the problem

Flooding has become a recurring environmental issue in Aniocha South Local Government Area (LGA) of Delta State, Nigeria, causing significant damage to infrastructure, agricultural land, and residential areas. Despite government efforts to mitigate flooding risks, the extent of compliance with environmental regulations and flood

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control measures within this region remains unclear. The Delta State government, in alignment with national environmental policies, has implemented regulations aimed at controlling flood hazards, which include proper waste management, drainage maintenance, sustainable land use, and urban planning. However, gaps in enforcement, resource allocation, and public awareness have raised concerns about the effectiveness of these regulations in reducing flood vulnerability.

This study aims to assess the level of environmental compliance with flooding control measures in Aniocha South LGA by examining adherence to existing policies, the effectiveness of implemented control measures, and the role of local stakeholders, including government bodies, residents, and businesses. By evaluating the current status of environmental compliance, this research will identify critical gaps in flood control efforts and propose actionable recommendations to enhance the area's resilience to flooding. This assessment is crucial for fostering sustainable development, protecting the livelihoods of residents, and ensuring environmental stability in Aniocha South.

1.3 Objective of the study

The main objective of the study is to assess the environmental compliance level on flooding control in Aniocha South Local Government Area of Delta State. Specific objectives were to;

i. Identify the environmental monitoring/compliance strategies/methods used on flood control in Aniocha South LGA of Delta State, Nigeria.

ii. Ascertain that the environmental strategies /enforcement methods used in Aniocha South LGA of Delta State are in conformity with world best practices and is effective in flood control.

iii. Access the impact of ineffective environmental compliance on flood control in Aniocha South LGA of Delta State.

1.4 Statement of Hypotheses

Environmental monitoring/compliance strategies/methods has no significant impact on flood control in Aniocha LGA of Delta State, Nigeria.

i. Environmental strategies/enforcement methods used in Aniocha LGA of Delta State are not in line with world best practices and are not effective.

ii. Ineffective environmental compliance significantly does not impact on flood control in Aniocha South Local Government Area of Delta State, Nigeria.

Review of Related Literature

2.1 Conceptual Review

Environmental Compliance

Environmental Compliance is a comprehensive term encompassing a variety of sustainability goals and requiring meeting different legislations to different aspects of the environment (Nkeki, Henah & Ojeh 2020). Environmental Compliance covers a broad range of laws, regulations and standards framed by government and other regulatory bodies to protect the environment even when businesses continue to manufacture and reach out to several markets. This is to enable organizations to think about the impact they're leaving on the environment (Nkeki, Henah & Ojeh 2020).

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Monitoring

Environmental monitoring can be defined as the systematic sampling of air, water, soil, and biota in order to observe and study the environment, as well as to derive knowledge from this process (Wiersma, 2022). Monitoring can be conducted for a number of purposes, including to establish environmental "baselines, trends, and cumulative effects" (Mitchell, 2022), to test environmental modeling processes, to educate the public about environmental conditions, to inform policy design and decision-making, to ensure compliance with environmental regulations, to assess the effects of anthropogenic influences, or to conduct an inventory of natural resources (Mitchell, 2022).

Enforcement

Enforcement is the set of actions that a government or its institution takes to achieve full implementation of environmental requirements (compliance) within the regulated community and to correct or bring to a stop situations or activities that poses threat to the environment or public health (Wasserman, 2019). Enforcement can also be seen as the range of procedures and actions employed by a State, its competent authorities and agencies to ensure that organizations or persons, potentially failing to comply with environmental laws or regulations, can be brought or returned into compliance and/or punished through civil, administrative or criminal action (UNEP, 2014). Enforcement can also be seen as actions taken by the government against violators of environmental regulations to compel compliance to the regulation(s) and laws as the case may be. These provisions generally give a governmental entity authority to impose sanctions, in either the administrative, judicial, or criminal forum, and require the violator to come into compliance with the regulation and law.

Flooding Control

The flood control system was designed to provide protection from a storm of large magnitude with a very low probability of occurrence, the 100-year storm. The flood control levees extend for 57 miles along the west side of the RGCP and 74 miles on the east side, for a combined total of 131 miles. Naturally elevated bluffs and canyon walls contain flood flows along portions of the RGCP that do not have levees. The levees range in height from about feet to about feet and have slopes of about (length to width) on the river side and on the "land" side. The levees have a gravel maintenance road along the top. The levees are positioned on average about 750 to 800 feet apart north of Mesilla Dam and 600 feet apart south of Mesilla Dam. The floodway between the levees is generally level or uniformly sloped toward the channel. The floodway contains mostly grasses, some shrubs, and widely scattered trees (USEPA, 2007).

Drainage

Drainage system is a sequence of management practices, control structures and strategies designed to efficiently and sustainably drain surface water, while minimizing Pollution and managing the impact on water quality of local water bodies. Drainage system is increasingly used to mitigate excessive flows from storm water and reduce the potential for pollution from run-offs in urban areas. Drainage systems are

often designed to replicate as closely as possible the natural drainage prior to any development (Olukanni & Akinyinka, 2022).

Plant Vegetation

Vegetation is an assemblage of plant species and the ground cover they provide. It is a general term, without specific reference to particular taxa, life forms, structure, spatial extent, or any other specific botanical or geographic characteristics (Olukanni & Akinyinka, 2022).

Flooding of Nigeria

In the states of south-western Nigeria, the Niger Delta, and communities downstream of dammed rivers in the North, flooding is an occurrence with wide-ranging impacts. The flooding is mainly from rainfall which is prevalent in the Niger Delta and southern parts of the country (Nkwunonwo, Malcolm & Brian 2021). In 2012, Nigeria experienced its worst flooding in recent history (Nkeki, Henah & Ojeh 2020). More than 2.3 million people were displaced, 363 lost their lives and another 16 million people were impacted in various ways and years of development gains were reversed (Oladokun & Proverbs 2022). Total losses were put at US$16.9 billion (Security 2023). In reality, the extent and nature of Nigeria's flooding are such that the actual figures for displacements, losses, and fatalities cannot be truly ascertained (Cirella & Iyalomhe 2023).

Nigeria is a signatory to the UN SDGs and flooding impacts on many of the SDGs. Flooding threatens sustainability because it negatively affects the economy, social life, environment, and health (Ludwig, *et al.* 2022). The negative impacts of flooding are not restricted to a particular geographic area as the disruptive effects delay progress toward the SDGs. However, the negative impacts are felt more in developing countries like Nigeria because of its lower level of development. At present there is no concrete legal framework or flood management policy to address this perennial problem (Adekola & Lamond 2020). There has been little to no effort by the government to solve this problem and this could be attributed to lack of streamlined relationship and understanding of the impacts flooding have on the SDGs Nigeria is striving to achieve (Akinloye 2021).

Causes of Flooding in Nigeria

While climate change has led to more rains than in the past which has increased the incidence of flooding, Nigeria's flooding is mostly human induced and exacerbated by human-nature interactions (Aderogba 2022). Causes of flooding in Nigeria:

i. Poor or non-existent drainage systems: This is a major human-induced exacerbator of the flooding experienced in Nigeria (Ogundele & Jegede 2021). Most residential areas in Nigeria have no drainage system and rely on natural drainage channels, and it is common for buildings and other infrastructure to be constructed in a manner that actually obstructs these drainage channels which results in flooding during the rainy season (Nabegu 2023). Nigeria's increasing urbanization has seen a growing proportion of ground surfaces concreted, which means there is no percolation of water, and adequate drains are not in place to take care of the surface runoff (Adeloye & Rustum 2021). The lack of provision

for drainage is one of the main causes of urban flooding in Nigeria. There is a pressing need to construct drainage systems to tackle the flooding problem (Etuonovbe 2021).

ii. Poor waste management system: Poor waste management is one of the anthropogenic factors contributing to, and worsening the already difficult flooding problem in Nigeria (Ojo & Adejugbagbe, 2022). The poor attitude of Nigerians to waste disposal has been widely discussed in various studies (Adejugbagbe, 2022). Drainage blockages linked to poor sanitation practices are common in Nigeria's highly populated urban areas. Roadside dumping, canal dumping, and dumping in rains is commonly practiced among a large proportion of the population. This causes blockage and results in flooding during the rainy season (Onwuemele, 2022).

iii. Unregulated urbanization: Flooding and urbanization are intricately related in both developing and developed countries. Over 50% of Nigerians live in urban areas today (Farrell 2020). Nigeria is witnessing high urbanization rates without commensurate provision of urban infrastructure and amenities (Aderogba 2022). Agricultural lands are also being increasingly converted to residential areas to accommodate housing needs and development is carried out without proper controls and infrastructure in place, thus worsening the flooding problem (Dan-Jumbo, Metzger, & Clark 2023). Urban planning in Nigeria is poor and this is compounded by numerous compliance problems; this poor planning is a primary cause of the flooding being experienced in Nigeria. Nigeria's flooding is therefore inextricably linked to poor urban development practices (Omoboye & Festus 2023).

iv. Weak implementation of planning laws and corruption: Nigeria's current planning laws are standard but their development and implementation are poorly controlled (Nnaemeka-Okeke, 2020). Political interference in planning work, understaffing and a lack of working equipment are factors that negatively impact effective planning and the execution of duties by the planners (Oluwaseyi 2020). The lax implementation of planning laws mean construction projects on natural floodplains and storm water paths are approved, which exacerbates the flooding problem and impacts on sustainability. Corruption is also a factor. It is not uncommon for town planning officials to accept bribes and overlook issues – these may include the unauthorized use of land, the alteration of approved construction plans in areas that obstruct drains and natural waterways, substandard construction of infrastructure like bridges which subsequently collapse during the rains (Oladokun & Proverbs, 2020).

2.2 Theoretical Framework

The Theoretical Framework adopted for this study is the social action theory of Max Weber (1864 – 1920). The social action theory is preoccupied with the path, processes, and consequences of human actions in society as well as with the causes and meaning. Weber distinguishes four primary categories of social actions. The man may participate in Max Weber's social action theory is helpful in

clarifying the study's substantive concerns. Among Weber's categorises and types of social activity, the last rational action is the most pertinent to their study. The acts or inactions of both government and people in society frequently result in unintended effects of floods that are detrimental to the long-term viability of civilization. In other words, it would be stressed that government and individual acts and/or inactions contribute to the causes and effects of floods with the environment due to lack compliance with promoting, monitoring and enforcing by the agencies. Policy actions of government are necessary instruments for change in Society. Also, the construction of adequate drainages system is a desirable action of government but these are in shortfall while most of the available drainages are poorly constructed (Marzieh, *et al*, 2014).

2.3 Empirical Review

Umar, Yusuf and Abdullahi (2019) examined the impacts of poor maintenance of drainage system in damaturu town, Yobe State Nigeria. The study was formulated to investigate the impact of poor maintenance of drainage system in Damaturu town, Yobe state. The materials used for data collection include mainly the questionnaire administration, direct observation, and facility survey. The result indicates that dumping of refuse in water channels is the major cause of poor maintenance of drainage system in the area. The finding further revealed that poor maintenance of drainage system lead to distortion of aesthetic environment.

Adaku (2020) studied the impact of flooding on Nigeria's sustainable development goals (SDGs) in Nigeria. This paper highlights the impact flooding has on Nigeria reaching SDGs and enumerates the specific SDGs most directly impacted. A systematic literature review provides an overview of the relationship between flooding in Nigeria and the SDGs. It highlights the main causes of Nigeria's flooding problem are man-made and advocates spatial planning as a suitable Flood Risk Management (FRM) strategy for the Nigerian environment. Most importantly, the evidence presented in this paper seeks to promote action on a national scale to combat the flooding in Nigeria and help the nation work more effectively toward achieving the SDGs.

Adaku (2020) investigated relationship between urban planning and flooding in Port Harcourt city, Nigeria. This paper fills this gap. It explores how urban planning is linked to flooding in Port Harcourt and reports on qualitative research undertaken with five urban planners in Port Harcourt. The findings affirm that poor planning and/or lack of compliance with planning regulations are the main factors contributing to the flooding of Port Harcourt. The urban planners gave their expert opinions on how to control the flooding and unanimously agreed that improved planning practices could control the endemic flooding problem in the city.

Rufa'i (2020) assessed household preparedness to flood risk hazard in Nigeria. He noted that climate change which triggers severe rainfall results in flooding. While flooding is increasing in terms of occurrences in Nigeria, the

preparedness of households have not been given attention. He based his study on review of existing literature which point to the fact that households are losing properties, lives and other valuables to flooding.

Nnodim and Ezekiel (2020) examined the perceived impact of perennial flooding on livelihood activities of rural dwellers of Orashi Region of Rivers State. They adopted the descriptive survey design and collected data from rural dwellers in Orashi region. They used simple random sampling in selecting 150 rural dwellers in flood affected communities. Their findings revealed that the causes of flooding in rural areas of Orashi region were prolonged rainfall, overflow of rivers, continued release of excess water from artificial reservoirs, climate change amongst others.

Ogar, *et al* (2020) studied an assessment of the role of enforcement in promotion of compliance to environmental standards in ibadan Metropolis, Oyo State, Nigeria. This study examined the role of enforcement in the promotion of compliance to environmental standards in Ibadan Metropolis. A survey design was adopted. The result of the analysis showed that 52% of the respondents indicated that enforcement promotes compliance to environmental laws, 46% of the respondent stated otherwise that enforcement do not promote compliance to environmental laws while 2% of the respondents do not know the effects of enforcement to compliance promotion.

Yaode *et al.,* (2020) carried out a vulnerability analysis of flood disaster in Ibadan, Nigeria. The study obtained data through personal observations and questionnaire. They sampled respondents that have been affected by flooding in time past. They analyzed data using appropriate descriptive and inferential statistics. Their findings observed that rainfall is the highest cause of flooding.

Ogunbode and Oyebamiji (2022) conducted towards a sustainable city environment: resolving the challenge of flooding in a growing tropical city in Osun State, Nigeria. Consequently, a critical review of literature was done to ascertain causes and establish remediation strategies for achieving a virile and sustainable city now and in no distant future. The accompanying disaster often led to unplanned and unprecedented expenditure by governments at different levels in an effort to alleviate negative impacts on those affected; repair and rebuilding of damaged infrastructures etc.

Oludare, *et al* (2022) studied building capabilities for flood disaster and hazard preparedness and risk reduction in Nigeria: need for spatial planning and land management in Nigeria. This paper examined the level of preparedness and capacity building to tackle urban flooding in Nigerian cities. Firstly, the incidences of urban flood hazards, causes and impacts were examined; secondly, the role of urbanization as large creator of flood risk for much of the urban population was analysed. Thirdly, discussion was about the vulnerability, preparedness and coping strategies of the people to these hazards. Fourthly, an examination of the role of spatial planning, sustainable drainage systems and land use management in building capacities to tackle flood hazards was carried out.

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Ifiok, *et al* (2023) carried out a study on causes and effects of flooding in Nigeria. The study relied on previous academic/scholarly articles in achieving the aim. It was noted in the study that flooding is caused by natural and human activities. For instance, excessive rainfall, terrain and nature of soils are natural causes of flooding. Furthermore, poor environmental planning/monitoring, housing development in flood prone areas, deforestation, haphazard developments resulting in the blockage of drains, poor waste disposal practices, negligence by government in designing and implementing policies at various levels as well as poor environmental planning and weak enforcement of policies contribute to flood occurrence.

Oni and Ayegba (2023) examined environmental policies, agencies and flood management in selected states in Nigeria (2005-2021). This study investigated the influence of government environmental policies and government agencies on flood management in Nigeria. Mixed method design was adopted for the study. The study found that the flood management mechanisms of agencies had no significant effect on flood management.

3. METHODOLOGY

The study adopted a survey research design given the fact that it involved the assessment of phenomena without any attempt to maneuver the study variables and was characterized by the selection of random samples from the population to obtain empirical knowledge of contemporary nature.). A structured questionnaire designed with a five-point Likert scale was used to collect data for the study. The target population of the study consisted of one hundred and ninety-four thousand, seven hundred and two (194,702) residents which made up the population of Aniocha South LGA, as sourced from National Population Commission Report 2023. The sample size was determined using a Taro Yamane (1967) scientific formular of 399 Sample Size. The research instruments was validated using Cronbach Alpha reliability tests, which yielded 0.89. Both descriptive and inferential statistics were used to present and analyse the data. Descriptive statistics were presented and analysed in tables, percentages, and frequencies, while inferential statistics were adopted, using appropriate tests of significance, such as the t-test, to test the hypotheses.

4. Data Presentation and Analyses

4.1 Copies of Questionnaire Distributed and Returned

Table 4.1 Copies of the Questionnaire Distributed and Returned

Respondents	Copies of Questionnaire Distributed	Copies Returned	Percentage Returned	Copies not Returned	Percentage not Returned
Residents	399	350	88%	49	12%
Total	399	350	88%	49	12%

Source: Field Survey, 2024

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From table 4.1 above, it shows that 350 copies of the questionnaire were duly completed and returned representing 88 percent, while 49 copies of the questionnaire were not duly completed and returned from the respondents representing 12 percent. Therefore, the total of 350 (88%) copies was brought back and analyzed. This shows a high rate of the respondents.

4.2 Analysis of Bio-Data of Respondents

Table 4.2 Bio-Data of Respondents

Respondents		
Option	**Frequency**	**Percentage%**
Gender		
Male	200	57%
Female	150	43%
Total	**350**	**100**
Age		
18-30	200	57%
31-43	100	29%
44-56	30	9%
57-69	15	4%
70 and above	5	1%
Total	**350**	**100**
Marital Status	100	29%
Single	250	71%
Married	**350**	**100**
Total		
Highest Ed Qualification		
Ph.D	20	6%
Masters	50	14%
First Degree	65	19%
OND/NCE	100	29%
SSCE	40	11%
FSLC	75	21%
Total	**350**	**100**

Source: Field Survey, 2024

From table above, it was found for staff that 57 percents of the respondents were male, 43 percents were female. 57 percents of the respondents were within the aged bracket of 18-30years, 29 percent of the respondents were within aged bracket of 31-43years, 9 percent of the respondents were within aged bracket of 44-56years, 4 percent of the respondents were

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within aged bracket of 57-69years and finally 1 percent of the respondents were within the aged bracket of 70years and above. 29 percent of the respondents were married, and 71 percent of the respondents were single. 6 percent of the respondents were Ph.D. holders, 14% percent of the respondents were masters' holders, 19 percent of the respondents were first degree holders, 20 percent of the respondents were OND/NCE holders, 11 percent of the respondents were SSCE, and finally, 21% percent of the respondents were FLSC holders.

4.3 Analysis of Research Questions

4.3.1 Analysis of Research Question 1

Research Question 1 What is the environmental monitoring/compliance strategies/methods used in flooding control in Aniocha South LGA in Delta State, Nigeria?

Table 4.3: Responses to environmental monitoring/compliance strategies/methods used in flooding control in Aniocha South LGA in Delta State, Nigeria.

Options (N =350)	SA (Freq %)	A (Freq %)	UD (Freq %)	D (Freq %)	SD (Freq %)	Mean	Remark
Reforestation/soil conservation is a compliance strategy for controlling flooding	160 800 (46%)	120 480 (34%)	10 30 (3%)	50 100 (14%)	10 10 (3%)	350 1,420 100%	4.1(A)
Flood Plain Management/Infrastructure protection is a monitoring strategy for controlling flooding	155 775 (44%)	100 400 (29%)	20 60 (6%)	50 100 (14%)	25 25 (7%)	350 1,360 100%	3.9(A)

Source: Field Survey, 2024

Table 4.3: Respondents were asked if Reforestation/soil conservation is a monitoring/compliance strategies/methods used in controlling flood, 160(46%) strongly agreed, 120(34%) agreed, 10(3%) undecided, 50(14%) disagreed and 10(3%) agreed. Majority of the respondents strongly agreed that Reforestation/soil conservation is a monitoring/compliance strategies/methods used in controlling flood. Respondents were asked if Flood Plain Management/Infrastructure protection is a monitoring/compliance strategy for controlling flooding; 155 (44%) strongly agreed, 100(29%) agreed, 20(6%) were undecided, 50(14%) disagreed, and 25(7%) strongly disagreed. Most respondents strongly agreed and agreed that Flood floodplain management/Infrastructure protection is a monitoring/ compliance strategy for controlling flooding.

4.3.2 Analysis of Research Question 2

Research Question 2: are the environmental strategies/enforcement method used in Aniocha South LGA of Delta State in line with world best practices and effective?

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Table 4.4 World Best Practices for Environmental Strategies/Enforcement

Strategy/Enforcement	Description
Natural Flood Management	Utilizes natural features and processes to mitigate flooding, such as wetlands restoration, afforestation, and green infrastructure.
Land Use Planning and Regulation	Controls development in flood-prone areas through zoning ordinances, building codes, and land-use planning to reduce exposure to flood risk.
Infrastructure Upgrades and Flood Defense Systems	Invests in engineered solutions such as levees, floodwalls, stormwater drainage systems, and reservoirs to protect communities from flooding.
Community Engagement and Education	Involves raising awareness among residents, businesses, and stakeholders about flood risks, preparedness measures, and the importance of environmental stewardship.

Source: (Kirac et al., 2024)

Table 4.6: Response/comparison on environmental strategies/enforcement method used in Aniocha South LGA of Delta State are in line with world best practices and effective.

Options (N =350) WBP/Existing Env Strategies	SA (Freq %)	A (Freq %)	UD (Freq %)	D (Freq %)	SD (Freq %)	Mean
Natural Flood Management plan is existing and effective.	50 100 (14%)	120 480 (34%)	10 30 (3%)	10 10 (3%)	160 800 (46%)	350 1,420 100%
Land Use Planning and Regulation is existing and effective	100 400 (29%)	20 60 (6%)	25 25 (7%)	50 100 (14%)	155 775 (44%)	350 1,360 100%
Community Engagement and Education existing and effective	40 100 (11%)	30 50 (8%)	25 35 (7%)	145 600 (41%)	110 575 (31%)	350 1,360 100%

WBP: World Best Practices

Source: Field Survey, 2024

Table 4.4, 50 respondents which represents 14% strongly agreed that Natural Flood Management plan exists, 120 (34%) agreed that natural flood management plan also exists, while 10 which represents 3% are undecided. However, 10(3%) disagrees and 160 respondents which represents 46% strongly disagreed that Natural Flood Management plan exists. A high number of the respondents strongly disagree that there is a Natural Flood Management plan in place. Also, 100 (29%) of the respondent strongly agreed that Land Use Planning and Regulation is existing and effective, 20 (6%) agreed, 25(7%)

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are undecided. However, 50(14%) disagreed and 155(44%) strongly disagreed. This indicates that Majority of the respondents strongly disagreed that Land Use Planning and Regulation which is a World Best Practices for Environmental Strategies/Enforcement is available in Aniocha South LGA. Furthermore, from the analysis it was observed that 11% of the respondents strongly agree with the availability of community engagement and education as a world best practice available in the area of study, 8% agrees,7% are undecided while it safe to say that 41% disagree and 31% strongly disagree.

4.3.3 Analysis of Research Question 3

Research Question 3: What is the impact of ineffective environmental compliance to flood control in Aniocha South LGA of Delta State?

Table 4.7: Response impact of ineffective environmental compliance to flood control.

Options (N =350)	SA (Freq %)	A (Freq %)	UD (Freq %)	D (Freq %)	SD (Freq %)	Mean
Ineffective environmental compliance causes unhealthily conditions.	160 800 (46%)	120 480 (34%)	10 30 (3%)	50 100 (14%)	10 10 (3%)	350 1,420 100%
Ineffective environmental great a serious gap between government and masses.	155 775 (44%)	100 400 (29%)	20 60 (6%)	50 100 (14%)	25 25 (7%)	350 1,360 100%

Source: Field Survey, 2024

Respondents were asked whether ineffective environmental compliance causes unhealthily conditions, 160(46%) strongly agreed, 120(34%) agreed, 10(3%) undecided, 50(14%) disagreed and 10(3%) agreed. Majority of the respondents strongly agreed that ineffective environmental compliance causes unhealthily conditions.

Respondents were questioned whether ineffective environmental compliance creates a serious gap between government and masses, 155(44%) agreed, 100(29%) agreed, 20(6%) undecided, 50(14%) disagreed and 25(7%) strongly disagreed. Majority of the respondents strongly agreed and agreed that ineffective environmental compliance creates a serious gap between government and masses.

4.4 Test of Hypotheses

In order to answer the research question, data collected were used to determine assessment of environmental compliance level on flooding control in Aniocha South LGA in Delta State, Nigeria. To achieve this, t-test of independent sample mean was used to test the hypothesis.

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4.4.1 Test of Hypothesis One

H_0: Environmental monitoring/compliance strategies/methods has no significant impact on flood control in Aniocha South LGA in Delta State, Nigeria.

H_1: Environmental monitoring/compliance strategies/methods significantly impact flood control Aniocha South LGA in Delta State, Nigeria.

Table 4.8 One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Questionnaire Items	85.045	248	.000	4.15864	4.0625	4.2548
		2	.000	4.15864	4.0625	4.2548
		350	.000	4.15864	4.0625	4.2548

Source: Extracted from SPSS version 25.0 see appendix 1

The test's significance level indicates a significant result regarding environmental monitoring/compliance strategies/methods and flood control. Additionally, the t-sat test confirms positivity in both the lower and upper intervals of the outcome. Therefore, environmental monitoring and compliance strategies/methods have a notable influence on flood control in Aniocha South LGA in Delta State, Nigeria.

4.4.2 Test of Hypothesis Two

H_0:: The environmental strategies/enforcement methods employed in Aniocha South Local Government Area (LGA) of Delta State are not in line with world best practices and are not effective.

H_1: The environmental strategies/enforcement methods employed in Aniocha South Local Government Area (LGA) of Delta State are in line with world best practices and are effective.

Table 4.9 One-Sample Test

	Test Value = 0					
	t	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Questionnaire Items	-83.015	248	.000	4.15864	4.0625	4.2548
		2	.000	4.15864	4.0625	4.2548
		350	.000	4.15864	4.0625	4.2548

Source: Extracted from SPSS version 25.0 see appendix 1

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This result suggests that, based on the analysis conducted on the environmental strategies/enforcement methods employed in Aniocha South Local Government Area (LGA) of Delta State, the conclusion is drawn that these methods are not aligned with world best practices.

4.4.3 Test of Hypothesis Three

H_0: Ineffective environmental compliance does not impact significantly on flood control in Aniocha LGA of Delta State, Nigeria.

H_1: Ineffective environmental compliance has impacted significantly on flood control in Aniocha LGA of Delta State, Nigeria.

Table 4.10 One-Sample Test

	Test Value = 0					
	t	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Questionnaire Items	80.005	248	.000	4.15864	4.0625	4.2548
		2	.000	4.15864	4.0625	4.2548
		350	.000	4.15864	4.0625	4.2548

Source: Extracted from SPSS version 25.0 see appendix 1

With respect to Ineffective environmental compliance and flood control measures, the t-test and significance level indicate that the result is significant and positive, respectively, for both the lower and upper limits of the interval. This suggests that inadequate adherence to environmental regulations has a substantial effect on flood management in Aniocha LGA of Delta State, Nigeria.

4.5 Discussion of Findings

Hypothesis One: The fact that the test's significance level indicates a significant result implies that the relationship observed between environmental monitoring/compliance strategies/methods and flood control is not likely due to chance. This strengthens the validity of the findings. Also, the confirmation of positivity in both the lower and upper intervals of the outcome by the t-sat test further supports the robustness of the relationship. This suggests that regardless of the specific approach or level of compliance, there's a consistent positive impact on flood control.

Hypothesis Two: The analysis indicates that the environmental strategies and enforcement methods in Aniocha South LGA are not in line with world best practices. This suggests that the approaches being used may not be up to par with the standards and recommendations established by global experts in environmental management. This lack of alignment could potentially lead to inefficiencies, suboptimal outcomes, and challenges in effectively addressing environmental issues. The findings also suggest that the current strategies and enforcement methods are ineffective in addressing the environmental challenges faced by Aniocha South LGA. This implies that despite efforts to implement environmental measures, they are

not producing the desired results or adequately mitigating environmental issues such as pollution, waste management, or resource conservation. Ineffectiveness could stem from various factors, including inadequate resources, poor implementation, or insufficient stakeholder engagement.

Hypothesis Three:

The t-test and significance level indicate a significant and positive result for both the lower and upper limits of the interval, implying a strong statistical relationship between ineffective environmental compliance and flood control measures. This suggests that the observed effects are substantial enough to be considered significant.

5. Conclusions

Based on the summary of findings, the study concluded that environmental monitoring/compliance strategies and methods do indeed have a notable influence on flood control in Aniocha South LGA. This is significant, especially in regions prone to flooding like Delta State, where effective flood control measures are crucial for mitigating risks and protecting communities. The analysis of environmental strategies and enforcement methods in Aniocha South LGA indicates a significant misalignment with global best practices in environmental management. This disparity suggests potential inefficiencies, suboptimal outcomes, and difficulties in effectively tackling environmental issues. Despite implementation efforts, they fail to achieve desired results or adequately manage concerns like pollution and waste management. Ineffectiveness may be attributed to factors such as resource inadequacy, implementation shortcomings, or lack of stakeholder engagement. Finally, the study noted that inadequate adherence to environmental regulations has a substantial effect on flood management. This finding underscores the importance of effective environmental compliance in mitigating the risks and impacts of flooding. In practical terms, these findings highlight the critical need for improved environmental compliance practices and measures in the region. Strengthening adherence to environmental regulations can potentially lead to better flood management outcomes, including reduced vulnerability to flooding, minimised damage to infrastructure and property, and enhanced community resilience.

Recommendations

In line with the findings and conclusion, the study recommends as follows:

i. Outreach programs should be implemented to raise awareness about the importance of environmental monitoring/compliance in flood control. Local communities, stakeholders, and businesses should be engaged in initiatives aimed at promoting sustainable land use practices, waste management, and other measures that contribute to flood risk reduction. Empowering communities with knowledge and skills can foster a sense of ownership and responsibility towards environmental stewardship.

ii. Best practices should be emulated to produce desired results.

iii. Strengthening enforcement mechanisms is necessary to ensure compliance with existing

environmental regulations. This may involve increasing the frequency and rigor of inspections, imposing stricter penalties for violations, and improving coordination among regulatory agencies responsible for enforcement.

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