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Flood Control and Socio-Economic Development of Uyo Capital City, Akwa Ibom State, Nigeria

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Abstract
Persistent seasonal flooding in Uyo Capital City disrupts socio-economic activities and threatens public health, necessitating an evaluation of existing flood control measures. This study assessed the effectiveness of selected flood management strategies and their implications for socio-economic development in the city. Specifically, it examined the effects of routine drainage desilting on residents' health and well-being and evaluated the influence of gutter construction on transportation efficiency. A survey research design was employed, with primary data collected from 400 respondents selected from an estimated population of approximately 1.5 million residents using structured questionnaires. The sample size was determined using the Taro Yamane sampling formula, while data were analysed using the Pearson Product–Moment Correlation technique. Results revealed statistically significant positive relationships between flood control interventions and socio-economic outcomes. Regular drainage desilting was associated with improved public health through reduced incidence of waterborne diseases and mosquito breeding, while gutter construction enhanced transportation efficiency by minimising road flooding. The study recommended institutionalising scheduled drainage maintenance and expanding gutter infrastructure to strengthen urban resilience and support sustainable development.

Keywords: Flood control, socio-economic development, drainage desilting and gutter construction.

Introduction

Flooding has become a significant environmental challenge across Africa, particularly in Nigeria, where it causes substantial damage to lives, property, infrastructure, and ecosystems. The frequency and severity of flooding have increased in recent years due to poor urban planning, environmental degradation, and the growing impacts of climate change. Musa & Adewale (2020) describe flooding as a natural hazard whose intensity is often amplified by human activities such as inadequate drainage development and unsustainable land use. Rapid urban expansion without sufficient drainage systems or green spaces increases surface runoff and accelerates water accumulation in residential and commercial areas. Similarly, deforestation associated with urban development disrupts natural water flow patterns and exposes previously low-risk areas to flooding (Udoikah & Ndaeyo, 2021).

In developing countries like Nigeria, the challenge is particularly evident in rapidly growing urban centres characterised by population pressure and limited infrastructure planning. Karanja & Mbiti (2021) observe that many African cities, including Uyo, Lagos, and Port

Harcourt, experience recurrent flooding due to inadequate flood control infrastructure, resulting in negative impacts on public health, transportation, agriculture, and economic productivity. States such as Lagos, Bayelsa, Delta, and Akwa Ibom frequently experience heavy rainfall that overwhelms existing drainage systems. In Uyo Capital City, blocked gutters and poorly maintained drainage channels restrict water flow during heavy rainfall, leading to road flooding and property damage (Adeyemi & Salako, 2021). Recurrent flooding in the Niger Delta has also been linked to displacement of residents, loss of farmland, and damage to infrastructure, thereby slowing socio-economic development (Osu & Nwankwo, 2022).

Flooding produces wide-ranging socio-economic consequences. Contaminated floodwaters increase the incidence of waterborne diseases, while stagnant water promotes mosquito breeding and malaria transmission (Olawale & Okechukwu, 2022). Transportation systems are disrupted when roads become impassable, reducing access to workplaces, schools, and markets (Ndebele & Juma, 2020). Agricultural productivity declines when farmlands are submerged, resulting in crop losses and financial hardship for farmers (Adesanya & Ibrahim, 2021). Commercial activities are also affected as flooding damages goods and interrupts business operations.

Although government interventions such as drainage construction and sanitation programs have been implemented, flooding persists due to inadequate maintenance and weak community participation (Nwosu & Mbok, 2020). Effective flood management therefore requires sustained infrastructure maintenance, proper urban planning, and coordinated community involvement. This study evaluates the effectiveness of selected flood control measures including drainage desilting, gutter and canal construction, dam development, and environmental sanitation and their influence on socio-economic development in Uyo Capital City.

Statement of the Problem

Flooding remains a persistent environmental and socio-economic challenge in Uyo Capital City, Akwa Ibom State, significantly disrupting public health, transportation, agriculture, and property stability. Communities such as Itam, Ewet Housing Estate Extension, Osongama, Shelter Afrique, and Nkemba Street are particularly vulnerable due to inadequate drainage infrastructure, poorly developed gutter networks, and uncoordinated canal systems. Despite repeated government interventions, flooding continues to occur, raising concerns about the effectiveness and sustainability of existing flood control measures.

Recent incidents highlight the severity of the problem. In June 2024, fatal flood-related accidents were reported in Ewet Housing Estate and along Nkemba Street. Beyond the loss of life, recurrent flooding damages residential buildings, displaces households, and increases economic vulnerability among affected populations. Blocked drainage channels resulting from irregular desilting and improper waste disposal remain major contributors to flooding. Bassey & Akpan (2021) report that stagnant water associated with blocked drains increases the prevalence of waterborne and vector-borne diseases in flood-prone communities.

Flooding also disrupts transportation networks, as major roads such as IBB Road, Atiku Abubakar Avenue, and Abak Road frequently become impassable during rainfall, leading to traffic congestion and productivity losses (Udoh & Effiong, 2022). Agricultural production is similarly affected when farmlands are submerged, resulting in crop losses and reduced food supply (Ekanem & Okon, 2021).

Although drainage construction and desilting programs have been implemented, their effectiveness is limited by poor maintenance, weak enforcement, and rapid urbanisation.

Consequently, empirical evaluation of existing flood control measures is necessary to determine their effectiveness in promoting sustainable socio-economic development in Uyo Capital City.

Objectives of the Study

1. To examine the effect of regular desilting of drainage systems on the health and well-being of residents in Uyo Capital City.
2. To assess the effect of gutter construction on transportation efficiency in Uyo Capital City.

Research Questions

1. What is the effect of regular desilting of drainage systems on the health and well-being of residents in Uyo Capital City?
2. What is the effect of the construction of gutters on transportation efficiency in Uyo Capital City?

Research Hypotheses

1. H_{01}: There is no significant effect of regular desilting of drainage systems on the health and well-being of residents in Uyo Capital City.
2. H_{02}: There is no significant effect of gutter construction on transportation efficiency in Uyo Capital City.

Review of Related Literature

Flood Control

Flooding is a natural hazard characterised by the overflow of water onto normally dry land and remains one of the most frequent and destructive disasters worldwide. Flood events may occur as river floods, flash floods, coastal floods, or urban floods, resulting from excessive rainfall, river overflow, storm surges, dam failures, or inadequate drainage infrastructure. These factors often interact through both natural processes and human activities, thereby increasing flood vulnerability in many regions (Smith & Ward, 2020).

Heavy rainfall is widely recognised as a major trigger of flooding, particularly when precipitation exceeds the soil's infiltration capacity and the carrying capacity of drainage systems. River flooding typically results from prolonged rainfall or sudden runoff, which may be intensified by deforestation and land use changes that reduce natural water retention (Ologunorisa, 2024). Coastal flooding is commonly associated with storm surges, while urban flooding occurs when rainfall overwhelms drainage systems, often due to poor urban planning, inadequate infrastructure, and the expansion of impermeable surfaces such as roads and buildings (Adelekan, 2020).

The impacts of flooding are extensive and multidimensional. Economically, flooding damages infrastructure, disrupts businesses, and reduces agricultural productivity through crop destruction. Public health risks are also significant, as contaminated floodwaters increase the spread of waterborne diseases such as cholera and dysentery, while stagnant water promotes mosquito breeding and the transmission of vector-borne diseases, including malaria (Nkwunonwo et al., 2022). Social consequences include population displacement, loss of livelihoods, and disruption of essential services. Environmentally, flooding contributes to soil erosion and ecosystem degradation, although it may also enhance groundwater recharge and soil fertility in certain contexts (Smith & Ward, 2020).

Effective flood control requires a combination of structural and non-structural measures. Structural measures include dams, levees, floodwalls, drainage systems, and canals designed to

regulate water flow and reduce flood intensity. However, the effectiveness of these systems depends largely on regular maintenance and proper design (Oyebande, 2021). Non-structural measures complement physical infrastructure by focusing on prevention and risk reduction. These include land-use planning, floodplain zoning, wetland conservation, early warning systems, and public awareness programs that encourage community participation in flood risk management (Ologunorisa, 2024; Adelekan, 2020).

In Uyo Capital City, flooding remains a recurring challenge driven by heavy rainfall, rapid urbanisation, poor waste management, and inadequate drainage maintenance. Although government initiatives such as drainage construction have been implemented, blocked channels and expanding impermeable surfaces continue to reduce stormwater capacity (Ekpo, 2020). Consequently, research increasingly emphasises integrated flood management approaches that combine infrastructure development, environmental planning, and community engagement. Scholars argue that structural measures alone are insufficient without addressing underlying drivers such as poor land use practices, deforestation, and ineffective waste management (Smith & Ward, 2020; Ologunorisa, 2024).

Measures of Flood Control

Drainage Desilting

Drainage desilting refers to the systematic removal of sediment, debris, and waste materials that accumulate in drainage channels and obstruct the free flow of stormwater. It represents a critical component of urban flood control, particularly in rapidly expanding cities such as Uyo, where poor waste management practices and increasing urbanisation contribute to frequent drainage blockages. When drainage systems are not regularly maintained, accumulated debris restricts water flow, thereby increasing the likelihood of flash flooding and surface water accumulation (Olawale & Ibrahim, 2021).

In flood-prone urban environments, routine desilting serves as an effective preventive measure by improving the hydraulic capacity of drainage infrastructure to convey stormwater during heavy rainfall events. This process reduces waterlogging, minimises property damage, and lowers the risk of disease outbreaks associated with stagnant water (Eze & Eni, 2023). Empirical evidence suggests that regular maintenance of drainage systems significantly decreases the occurrence of flooding and enhances public health conditions in densely populated communities (Abiodun & Udo, 2022).

Beyond environmental benefits, drainage desilting contributes to socio-economic stability by supporting transportation efficiency, protecting residential and commercial assets, and sustaining economic activities during rainy seasons. Nwankwo & Etim (2023) report that communities implementing consistent drainage maintenance experienced fewer disruptions to mobility and commerce. However, the effectiveness of desilting programs in many Nigerian cities remains constrained by inadequate funding, weak policy enforcement, and limited community participation (Akpan & Uche, 2020). Consequently, sustainable flood management requires institutionalised and well-coordinated drainage maintenance programs supported by adequate resources and public engagement.

Gutter Construction

Gutter construction refers to the engineering and installation of narrow channels along roads, residential areas, and public spaces to collect and convey stormwater away from built environments. In urban flood management, gutters serve as a first line of defence by channelling

surface runoff into drainage systems, thereby reducing water accumulation and localised flooding (Idoko & Musa, 2021). Their importance is heightened in rapidly expanding cities such as Uyo, where increased rainfall intensity linked to climate variability necessitates resilient infrastructure. Properly constructed gutters also extend the lifespan of roads and buildings by minimising erosion and structural damage (Anaba & Eyo, 2020). Conversely, inadequate or poorly maintained systems create stagnant water that promotes mosquito breeding and increases risks of malaria and dengue fever (Ogunleye & Adedayo, 2019).

Socio-economically, functional gutter systems support transportation and commercial activities by preventing road flooding, reducing vehicle damage, and sustaining business and emergency services access (Usoro & Nse, 2022). However, many Nigerian communities still experience substandard gutter infrastructure due to poor design, weak enforcement of engineering standards, and corruption in project execution (Okoro & Ibe, 2023). Sustainable solutions require strict compliance with standards, routine maintenance, and community participation to enhance urban resilience and sustainability.

Socio-Economic Development

Socio-economic development refers to the sustained improvement in the economic and social well-being of a population, typically measured through indicators such as income, education, health, infrastructure, and living standards (Udoms et al., 2017; Utok et al., 2025). It integrates economic growth with equitable distribution of benefits to ensure inclusive development. In flood-prone urban settings like Uyo Capital City, these impacts are reflected in health, transportation, agriculture, commerce, and real estate, all of which demonstrate the effects of environmental conditions and flood control measures (Udo & Ekanem, 2021; Ukpong & Etim, 2023).

Flooding undermines health by increasing exposure to waterborne diseases, while effective drainage reduces disease prevalence and improves productivity (Ukpong & Essien, 2022). Transportation is also disrupted through road damage and delays; however, functional drainage systems preserve infrastructure and sustain mobility and economic activities (Ekanem & Bassey, 2023; Umeh & Ojo, 2022). In agriculture, flood-control structures such as canals reduce crop losses, enhance soil conservation, and support consistent food production (Bassey & Ufot, 2020). Market activities benefit from reduced disruption, ensuring continuity of trade and livelihoods (Ekanem & Akpan, 2022; Udo & Okafor, 2021). Similarly, real estate development thrives in areas with effective drainage, as reduced flood risk increases property value and investment attractiveness (Edet & Johnson, 2023). Overall, flood management systems are essential drivers of urban socio-economic development and resilience.

Flood Control Measures and Socio-Economic Development in Uyo Capital City

Drainage desilting remains a key but inconsistently implemented flood control measure in Uyo Capital City. Studies show that communities such as Use Offot, Ikpa Road, and Urua Ekpa experience frequent flooding due to blocked drainage channels, leading to property loss and water overflow (Essien & Akpan, 2020). Before 2015, desilting was largely reactive, undertaken only after severe flood events (Udonwa & Bassey, 2021). Although institutional reforms in 2016 through AKSEPWMA and UCCDA introduced monthly sanitation exercises, outcomes remain uneven, largely depending on community participation (Bassey & Udofia, 2022).

Improved results are evident in areas like Aka Road and Akpan Andem Market, where collective sanitation efforts have reduced flooding, while Nsukara Offot, Itam, and parts of Nwaniba Road continue to experience persistent flood risks due to poor waste management and

irregular maintenance (Ekong & Ekpo, 2023). Etukudo & Johnson (2021) argue that these challenges are driven more by weak environmental management and poor continuity of interventions than by infrastructural inadequacy.

Field observations further confirm this disparity: residents in actively maintained areas report improved sanitation and reduced disease incidence, whereas poorly maintained communities continue to experience flooding and associated health risks. Overall, effective desilting depends on sustained institutional enforcement and strong community participation for long-term socio-economic benefits.

Figure 1: Children walk cautiously along a polluted drainage channel at Nsukara Offot, Uyo Capital City**,** where clogged gutters and uncollected waste reflect the persistent sanitation and flood control challenges still affecting parts of the community.

Source: Field Work (2025)

Figure 2: Sanitation workers desilting drainage in Nsukara Offot, Uyo Capital City

Source: Field Work (2025)

Gutter Construction and Transportation Efficiency in Uyo Capital City

Gutter construction across Uyo Capital City has significantly improved transportation efficiency, particularly in flood-prone areas. Major projects include the 2.3 km underground pipe-jacking drainage on Itam–Ikot Ekpene Road (completed in 2011), a 4.6 km storm-water drainage network

from the new stadium to Obot Idim (commissioned around 2015), a 3.7 km pipe-jacked drainage with an outfall in Itu LGA constructed between 2012 and 2013, and the 8.4 km IBB Avenue flood-control drainage inaugurated in 2022 under the World Bank's NEWMAP project. These projects combine underground and surface drains, strategically targeting low-lying routes such as IBB Avenue, Shelter Afrique, Atiku Abubakar Way, Esuene Street, Nkemba, Urua Ekpa, and Abak Road.

Table 1: Major gutter systems constructed in Uyo Capital City

Project / Location	Length Constructed	Year Completed
Itam–Ikot Ekpene (pipe-jacked)	2.3 km	2011
Stadium–Obot Idim stormwater drain	4.6 km	~2015
Itu LGA pipe-jacked drain	3.7 km	2012–2013
IBB Avenue and its environs (NEWMAP)	8.4 km	2022

Source: Akwa Ibom State Ministry of Works (2025)

Residents' experiences highlight the practical benefits of gutter construction on urban mobility and livelihoods in Uyo. Before drainage installation, public transport operators often avoided the area during rainfall, forcing commuters to move through stagnant water. Since the construction of gutters in 2021, vehicular access has become more dependable, and travel disruptions have significantly reduced. Along the Shelter Afrique–IBB corridor, it is observed that improved drainage eliminated the need for detours around flooded sections, resulting in shorter travel times and smoother journeys.

It is worthy to note that previously, waterlogged roads created safety hazards and limited his daily income; however, the installation of connected drainage channels restored safer movement and enhanced earnings. In the commercial sector, persistent flooding once discouraged customers, but the presence of functional gutters has stabilised customer turnout and sales during the rainy season.

Collectively, these accounts demonstrate that well-constructed and maintained drainage systems reduce transport interruptions, improve safety, and support local economic activities. Nevertheless, disparities in infrastructure provision persist, as some flood-prone areas continue to experience waterlogged roads and travel delays during heavy rainfall. Expanding drainage infrastructure and ensuring routine maintenance in underserved neighbourhoods, particularly Nkemba, Urua Ekpa, and Atiku Abubakar Way, remain essential for achieving equitable and citywide improvements in mobility and socio-economic stability.

Figure 3: Flooded, debris-choked open drain on IBB Avenue–Atiku Abubakar Way, illustrating pre-construction transport disruption.

Source: Field Work, (2025)

Figure 4: Functional concrete-lined gutter on Shelter Afrique/IBB corridor, exemplifying how modern drainage enables clear roads and smoother transportation

Source: Field Work, (2025)

Theoretical Framework

General Systems Theory by Ludwig von Bertalanffy (1940)

General Systems Theory (GST), developed by Ludwig von Bertalanffy in the 1940s, provides an interdisciplinary framework for understanding complex and interrelated phenomena. The theory posits that systems consist of interconnected components whose behaviour cannot be fully understood in isolation but must be examined as an integrated whole (Bertalanffy, 1968). Emerging as a response to reductionist approaches, GST emphasises that interactions among system elements generate outcomes that exceed the simple sum of individual parts. Subsequent scholars, including Kenneth Boulding, Ross Ashby, and Jay Forrester, expanded the theory through applications to organisational systems, cybernetics, and industrial management.

GST is grounded in several core principles. First, system components are interdependent, such that changes in one element influence the performance of others. Second, systems operate holistically, meaning overall behaviour reflects collective interactions rather than isolated actions. Third, systems seek stability through adjustment mechanisms that restore balance following disturbances. Fourth, systems are structured hierarchically, with smaller subsystems contributing to the functioning of larger systems. Finally, systems possess adaptive capacity, enabling them to respond to environmental changes and maintain functionality (Bertalanffy, 1972).

Despite its wide applicability, GST has attracted criticism for its abstract nature and challenges in empirical measurement. Critics argue that its emphasis on equilibrium may overlook the dynamic and evolving nature of many real-world systems. Others contend that the complexity of interdependence can make prediction difficult and may underrepresent the role of human decision-making in shaping system outcomes (Boulding, 1956; Ashby, 1956; Forrester, 1961).

GST provides a relevant analytical lens for examining the relationship between flood control measures and socio-economic development in Uyo Capital City. The theory highlights the interconnectedness of environmental management and urban development sectors, including health, transportation, agriculture, commerce, and real estate. Flood control interventions influence multiple systems simultaneously, for example, effective drainage reduces disease incidence, protects agricultural productivity, sustains transportation networks, and enhances property development.

Adopting a systems perspective is therefore essential for addressing urban flooding challenges. Rather than treating flood control as an isolated technical issue, GST supports a holistic approach that links environmental management to broader development outcomes. Its emphasis on adaptation and feedback mechanisms is particularly relevant in rapidly urbanising environments, where continuous adjustment of flood control strategies is necessary to sustain urban resilience and long-term socio-economic stability.

Empirical Review

Adedayo & Ogunlola (2021) conducted a study in Ogun State, Nigeria, examining the relationship between flood control measures and public health outcomes. Using interviews and statistical analysis, the researchers found that communities with inadequate flood management recorded higher incidences of waterborne diseases such as cholera and malaria. The study emphasised the importance of strengthening health-sector preparedness in flood-prone areas. However, it identified a gap in the limited longitudinal evidence linking flood control interventions to sustained health outcomes.

Bello & Ogundele (2022) investigated the effects of flood management strategies on socio-economic development in rural communities in Lagos State, Nigeria. Employing surveys and case studies, the study revealed that effective flood management enhanced agricultural productivity, improved food security, and reduced poverty levels. Nevertheless, disparities in the distribution of flood mitigation resources across communities were observed. The study highlighted the need for equitable investment in rural flood infrastructure, noting a research gap in resource allocation patterns and their developmental implications.

Ogunyemi & Afolabi (2023) examined flood risk management and urban development in Oyo State, Nigeria, using a mixed-methods design involving surveys and stakeholder interviews. Findings indicated that although government policies on flood management exist, implementation remains constrained by weak infrastructure, limited public awareness, and inadequate funding. The study recommended increased investment in flood defences and community education

programs. A key gap identified was the insufficient integration of local knowledge and community participation into formal flood management frameworks.

Aliyu & Umar (2023) assessed the influence of flood control measures on agricultural productivity in flood-prone areas of Sokoto State, Nigeria. Through surveys and interviews with farmers and local officials, the researchers found that drainage improvements and embankment construction significantly reduced crop losses and stabilised farm output during the rainy season. The study recommended expanded investment in flood-resilient agricultural technologies and improved policy coordination. However, it noted a limited examination of how farmers' adaptive strategies interact with formal flood control systems.

Okoye (2024) evaluated the role of flood control in improving socio-economic conditions in urban communities in Anambra State, Nigeria. Using a survey-based approach, the study found that drainage enhancement and river channelisation reduced flooding incidents and improved access to transportation, healthcare, and economic opportunities. The study recommended expanding flood control infrastructure and strengthening public awareness initiatives. A major gap identified was the lack of detailed analysis of community participation in sustaining flood risk management interventions.

Research Methodology

This study employed a survey research design to examine the impact of flood control measures on socio-economic development in Uyo Capital City, Akwa Ibom State. Survey design enables systematic collection of data from a defined population through structured instruments, allowing researchers to assess perceptions, experiences, and relationships among variables (Creswell, 2014). The design was considered appropriate because it facilitated direct data collection from residents and stakeholders regarding the effects of drainage desilting, gutter construction, and canal development on health, transportation, and agricultural productivity.

The study area was Uyo, the capital of Akwa Ibom State, Nigeria, located between longitudes 7°51′ E and 7°59′ E and latitudes 5°40′ N and 5°59′ N, covering approximately 188.024 km². Since its designation as a state capital in 1987, Uyo has experienced rapid urbanisation and population growth, with an estimated population of about 1.5 million residents (National Population Commission, 2023). The city is characterised by a humid tropical climate, low-lying terrain, and increasing land development, conditions that heighten vulnerability to seasonal flooding, particularly where natural drainage channels have been altered.

The target population comprised all residents of Uyo Capital City, estimated at 1.5 million people (National Population Commission, 2023). A sample size of 400 respondents was determined using the Taro Yamane sampling formula. Purposive sampling was adopted to select participants with relevant knowledge or experience related to flood management and its socio-economic effects.

Primary data were collected using structured questionnaires based on a four-point Likert scale to measure respondents' perceptions of flood control measures and their developmental impacts. The instrument underwent expert validation to ensure content relevance and clarity. Reliability testing through a pilot study produced a Cronbach's alpha coefficient of 0.82, indicating satisfactory internal consistency.

Data were analysed using the Pearson Product–Moment Correlation (PPMC) technique to determine the strength and direction of relationships between flood control measures and selected socio-economic indicators, including health outcomes, transportation efficiency, and agricultural productivity in Uyo Capital City.

Data Presentation, Analysis and Discussion of Findings

The analysis is based on the research questions and hypotheses that guided the study. Out of 400 copies of the questionnaire administered, 390 were properly completed and found suitable for analysis, representing a valid response rate of 97.5%, while 10 questionnaires (2.5%) were either not returned or incorrectly filled and were excluded from the study. This high response rate enhanced the reliability and generalizability of the study's findings.

Demography of Respondents

Table 2: Demographic Characteristics of Respondents

Variable	Category	Frequency	Percentage (%)
Gender	Male	188	48.2
	Female	202	51.8
Age Group	18–27 years	85	21.8
	28–37 years	110	28.2
	38–47 years	70	17.9
	48–57 years	55	14.1
	58 years and above	70	17.9
Marital Status	Single	195	50.0
	Married	165	42.3
	Divorced/Widowed	30	7.7
Educational Background	Uneducated	5	1.3
	Primary Education	12	3.1
	Secondary Education	102	26.2
	National Diploma (ND)	74	19.0
	Higher National Diploma (HND)	60	15.4
	Bachelor's Degree (BSc)	83	21.3
	Master's Degree (MSc)	44	11.3
	Ph.D.	10	2.6
Total		**390**	**100**

Source: Field Survey, 2025

The gender distribution of respondents was relatively balanced, comprising 188 males (48.2%) and 202 females (51.8%), indicating broad participation across genders and suggesting that flood-related challenges affect residents universally.

Age distribution showed representation across all groups, with the largest proportion aged 28–37 years (28.2%), followed by 18–27 years (21.8%). Respondents aged 38–47 years and those 58 years and above each accounted for 17.9%, while individuals aged 48–57 years constituted 14.1%. This range ensured the inclusion of both younger and older residents with varying experiences of flooding over time.

In terms of marital status, 50.0% of respondents were single, 42.3% were married, and 7.7% were divorced or widowed. The presence of diverse household structures provided insights into how flooding affects individuals and families differently, particularly regarding housing security and preparedness.

Educational attainment varied widely, reflecting the heterogeneous nature of the population. The largest group possessed secondary education (26.2%), followed by Bachelor's

degrees (21.3%), National Diplomas (19.0%), and Higher National Diplomas (15.4%). Smaller proportions held Master's degrees (11.3%) and Ph.Ds (2.6%), while few had only primary education (3.1%) or no formal education (1.3%). This diversity highlights the need for inclusive communication strategies to ensure effective public participation in flood control initiatives.

Analysis of Responses

Objective One: To examine the effect of regular desilting of drainage systems on the health and well-being of residents in Uyo Capital City.

Table 3: Responses on Regular Desilting of Drainage Systems

Statement	SA (f/%)	A (f/%)	D (f/%)	SD (f/%)
1. Drainage desilting activities are carried out in my area.	161 (41.3%)	134 (34.4%)	61 (15.6%)	34 (8.7%)
2. I have observed the frequency of drainage desilting in my area.	169 (43.3%)	132 (33.8%)	58 (14.9%)	31 (8.0%)
3. I am aware of any schedule or plan for drainage desilting in my community.	154 (39.5%)	138 (35.4%)	65 (16.7%)	34 (8.4%)
4. The drains around my area remain silt-free for most parts of the year.	146 (37.4%)	144 (36.9%)	64 (16.4%)	36 (9.2%)

Source: Field Survey (2025)

Table 2 summarises respondents' perceptions of drainage desilting in Uyo Capital City. Most respondents (75%) agreed that desilting occurs in their areas, while 24.3% disagreed, suggesting uneven service coverage. Similarly, 77.1% reported observing desilting activities, indicating reasonable visibility of flood control efforts. However, only 74% were aware of a defined desilting schedule, revealing gaps in communication between authorities and residents. A comparable proportion (74%) stated that drains remain largely free of silt for much of the year, reflecting generally effective maintenance in some locations. Overall, the findings point to moderate effectiveness but inconsistent implementation and public awareness, underscoring the need for more regular, coordinated, and clearly communicated drainage maintenance to enhance flood prevention and community well-being.

Table 4: Responses on the Health and Well-Being of Residents

Statement	SA (f/%)	A (f/%)	D (f/%)	SD (f/%)
1. Flooding in my area has affected my health through diseases such as malaria and typhoid.	69 (17.7%)	86 (22.1%)	125 (32.1%)	110 (28.2%)
2. Flooding has affected my household through frequent hospital visits during the rainy season.	58 (14.9%)	67 (17.2%)	140 (35.9%)	125 (32.1%)
3. Floodwater around my home has affected my access to clean water and toilet facilities.	62 (15.9%)	79 (20.3%)	132 (33.8%)	117 (30.0%)
4. Poor drainage conditions have affected the general hygiene of my environment.	78 (20.0%)	91 (23.3%)	121 (31.0%)	100 (25.6%)

Source: Field Survey (2025)

Table 4 summarises residents' perceptions of the health implications of flooding and poor drainage. Most respondents disagreed that flooding significantly affects their health, with 60.3% rejecting links to diseases such as malaria and typhoid. Similarly, 68% reported that they do not frequently visit hospitals during the rainy season due to flood-related illnesses. Regarding sanitation, 63.8% indicated that access to clean water and sanitation is not substantially disrupted by flooding, while 56.6% did not perceive current drainage conditions as negatively affecting environmental hygiene. Overall, these findings suggest that although flooding persists in certain locations, its direct health impacts appear to have been reduced, likely reflecting improvements in drainage maintenance and environmental sanitation practices.

4.2.2 Objective Two: To assess the effect of gutter construction on transportation efficiency in Uyo Capital City.

Table 5: Responses on the Effect of Gutter Construction

Statement	SA (f/%)	A (f/%)	D (f/%)	SD (f/%)
1. Gutters have been constructed along most major roads in my area.	92 (23.6%)	106 (27.2%)	108 (27.7%)	84 (21.5%)
2. I have noticed a difference in road usage since the construction of roadside gutters.	164 (42.1%)	122 (31.3%)	58 (14.9%)	45 (11.6%)
3. Vehicles move more freely in areas with properly constructed gutters.	138 (35.4%)	133 (34.2%)	57 (14.6%)	63 (15.8%)
4. Flooding affects transportation less in areas where gutters are well-maintained.	125 (32.1%)	127 (32.6%)	64 (16.4%)	74 (19.0%)

Source: Field Survey (2025)

Table 5 highlights residents' responses on the impact of gutter construction on transportation in Uyo Capital City. About 50.8% of respondents agreed that gutters have been constructed along major roads in their areas, though 49.2% expressed doubt or disagreement, indicating varying levels of infrastructure development across neighbourhoods. Additionally, 73.4% noticed improved road usage after gutter construction, pointing to perceived benefits in traffic flow and road conditions. Regarding mobility, 79.6% of respondents agreed that vehicles move more freely where gutters are properly built, suggesting that drainage helps preserve road quality. Furthermore, 64.7% agreed that flooding interferes less with transportation in areas with well-maintained gutters. The responses suggest that gutter construction contributes to easing transportation challenges, especially during rainfall. However, the fairly even spread of disagreement shows that not all areas enjoy the same level of intervention, underscoring the need for broader implementation and maintenance.

Table 6: Responses on Transportation Efficiency

Statement	SA (f/%)	A (f/%)	D (f/%)	SD (f/%)
1. Vehicle movement has improved in areas where gutters have been constructed.	117 (30.0%)	135 (34.6%)	78 (20.0%)	60 (15.4%)
2. Traffic congestion persists in parts of Uyo where gutters are absent or ineffective.	126 (32.3%)	138 (35.4%)	72 (18.5%)	54 (13.8%)
3. Public transportation flows better in locations where flood control gutters are functional.	121 (31.0%)	129 (33.1%)	82 (21.0%)	58 (14.9%)
4. Gutter construction has not been effective in solving transport delays in all parts of the city.	101 (25.9%)	114 (29.2%)	97 (24.9%)	78 (20.0%)

Source: Field Survey (2025)

Table 6 highlights residents' views on how gutter construction affects transportation efficiency in Uyo Capital City. Many of the respondents (64.6%) agreed that vehicle movement has improved in areas with constructed gutters, showing that proper drainage helps reduce waterlogging and traffic disruptions. Similarly, 67.7% acknowledged that traffic congestion persists in areas where gutters are absent or ineffective, reflecting the uneven distribution of drainage infrastructure across the city. About 64.1% agreed that public transport flows better in areas with functional gutters, further affirming the role of drainage in supporting urban mobility. However, 55.1% believed that gutter construction has not resolved transport delays citywide. These findings suggest that while some neighbourhoods enjoy better traffic conditions due to improved drainage, others remain affected, emphasising the need for expanded gutter coverage and regular maintenance in flood-prone areas.

Testing of Hypotheses

Testing Hypothesis One

H_{01}: There is no significant effect of regular desilting of drainage systems on the health and well-being of residents in Uyo Capital City.

H_{i1}: There is a significant effect of regular desilting of drainage systems on the health and well-being of residents in Uyo Capital City.

Table 7: Correlation Result

Correlations

		HEALTH AND WELL-BEING	REGULAR DESILTING
HEALTH AND WELL-BEING	Pearson Correlation	1	.815**
	Sig. (2-tailed)		.000
	N	390	390
REGULAR DESILTING	Pearson Correlation	.815**	1
	Sig. (2-tailed)	.000	
	N	390	390

*. Correlation is significant at the 0.01 level (2-tailed).

Source: Computed using SPSS 24

The correlation result presented in Table 7 shows a Pearson correlation coefficient of 0.815 between regular desilting of drainage systems and the health and well-being of residents in Uyo Capital City. This correlation is marked with "**", indicating that it is statistically significant at the 0.01 level (2-tailed). The corresponding p-value is 0.000, which is less than the threshold of 0.01. This implies a strong positive and statistically significant relationship between regular desilting and residents' health and well-being. In other words, as regular desilting of drainage systems increases, there is a corresponding improvement in the health and well-being of residents. Since the p-value (0.000) is less than 0.01, we reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1).

4.3.2 Testing Hypothesis Two

H_{02}: There is no significant effect of gutter construction on transportation efficiency in Uyo Capital City.

H_{i2} : There is a significant effect of gutter construction on transportation efficiency in Uyo Capital City.

Table 8: Correlation Result

Correlations

		TRANSPORTATION EFFICIENCY	GUTTER CONSTRUCTION
TRANSPORTATION EFFICIENCY	Pearson Correlation	1	.548**
	Sig. (2-tailed)		.000
	N	390	390
GUTTER CONSTRUCTION	Pearson Correlation	548**	1
	Sig. (2-tailed)	.000	
	N	390	390

Source: Computed using SPSS 24.

The correlation result in Table 8 shows a Pearson correlation coefficient of 0.548 between gutter construction and transportation efficiency in Uyo Capital City. The result is statistically significant at the 0.01 level (2-tailed), as indicated by the "**" symbol and the p-value of 0.000, which is well below the 0.01 significance threshold. A coefficient of 0.548 suggests a moderate positive correlation, meaning that improvements in gutter construction are moderately associated with better transportation efficiency. The significance level confirms that this observed relationship is not due to chance. Since the p-value (0.000) is less than 0.01, we reject the null hypothesis (H_{02}) and accept the alternative hypothesis (H_{12}).

Discussion of Findings

The study established a strong and statistically significant positive relationship between regular drainage desilting and residents' health and well-being ($r = 0.815$, $p < 0.01$). This indicates that consistent removal of debris from drainage channels enhances sanitation and reduces the risk of waterborne diseases such as malaria, typhoid, and cholera. The finding corroborates Akpan et al.'s (2021) report that improved drainage maintenance in Calabar South reduced sanitation-related hospital visits. Similarly, Nwankwo & Obi (2020) observed lower incidences of environmental health hazards in communities in Anambra State with routine desilting practices. In contrast,

Okonkwo (2019) found no significant association between desilting and health outcomes in parts of Owerri, attributing this to poor hygiene practices among residents. Nevertheless, the strong relationship identified in this study reinforces the view that effective environmental management directly influences public health. Proper drainage maintenance minimises water stagnation and vector breeding, thereby improving living conditions. These findings highlight the need to institutionalise regular desilting as a core component of urban health and environmental management strategies in Uyo Capital City.

The findings also revealed a moderate but statistically significant positive relationship between gutter construction and transportation efficiency ($r = 0.548$, $p < 0.01$). This suggests that functional roadside gutters enhance road durability and reduce traffic disruptions associated with flooding. The result aligns with Ibrahim & Musa's (2022) finding that effective drainage systems in Kano reduced road erosion and improved vehicular movement during rainy seasons. Likewise, Udoh & Etim (2023) found that properly constructed gutters in Akwa Ibom minimised waterlogging and improved traffic flow in high-activity areas such as markets and schools. However, Chukwu (2020) noted that inadequate maintenance of drainage infrastructure in Abia State limited transportation benefits due to persistent blockages. These findings, therefore, confirm that well-designed and maintained gutter systems are essential for sustaining urban mobility. Continued investment in drainage infrastructure and routine maintenance is critical for enhancing transportation efficiency and supporting economic productivity in Uyo Capital City.

Conclusion

The study examined the effectiveness of flood control measures and their impact on socio-economic development in Uyo Capital City. Findings show that regular drainage desilting improves residents' health and environmental conditions, while gutter construction enhances transportation efficiency by reducing flood-related disruptions.

Overall, the results indicate that flood control measures not only reduce flooding risks but also strengthen urban resilience and support socio-economic development. The study highlights the need for sustained investment in drainage infrastructure and consistent community participation in sanitation. Urban planners and policy-makers should prioritise these interventions to improve living conditions, protect infrastructure, and ensure long-term stability in Uyo Capital City.

5.3 Recommendations

Based on the findings of this study, the following recommendations are made:

1. The Akwa Ibom State government should institutionalise a scheduled and well-funded drainage desilting programme across all residential and commercial areas of Uyo Capital City. This will help prevent blockages, improve public health conditions, and reduce incidences of waterborne diseases during the rainy season.
2. The Akwa Ibom State government should also expand and rehabilitate gutter networks, particularly in flood-prone and high-traffic areas. Properly constructed gutters will facilitate faster water evacuation, reduce road flooding, and significantly enhance transportation efficiency within Uyo Capital Capital City.

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