Urban Flood Management and Community Resilience in Jimeta, Adamawa State, Nigeria: An Assessment of Existing Measures, Perceived Effectiveness, and Sustainable Strategies

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Abstract
This study assessed urban flood management and community resilience in Jimeta, Adamawa State, with emphasis on existing flood-management measures and sustainable strategies for reducing flood risks. The study adopted a descriptive survey research design. Data were collected through structured questionnaires, field observations, and relevant secondary sources. The data were analysed using frequency, percentage, mean, and standard deviation, with a criterion mean of 2.50 used for decision-making. The findings showed that existing flood-management measures in Jimeta included drainage construction and maintenance, community drainage clearing, flood awareness campaigns, temporary evacuation, emergency response, waste removal, and government intervention. However, the effectiveness of these measures was constrained by inadequate drainage capacity, blockage of drainage channels, indiscriminate waste disposal, construction along natural waterways, insufficient early-warning information, inadequate emergency facilities, and limited community participation. The study further revealed that community resilience was strengthened by residents' preparedness, community cooperation, social networks, previous flood experience, access to information, and the ability to mobilise local resources. Sustainable strategies identified included improved drainage infrastructure, effective flood early-warning systems, enforcement of land-use planning regulations, community-based flood management, improved solid-waste management, flood-resistant infrastructure, regular drainage maintenance, emergency evacuation planning, and stronger collaboration among government agencies, communities, and humanitarian organisations. The study concluded that effective flood management in Jimeta requires a shift from predominantly reactive responses toward integrated, preventive, and community-based approaches. It recommended regular drainage maintenance, improved early-warning systems, strict control of development along waterways, stronger community participation, sustainable waste management, and improved coordination between government institutions and local communities.

Keywords: *Urban Flood Management, Community Resilience, Flood Adaptation, Sustainable Strategies, Jimeta.*

1. Introduction

Flooding is one of the major environmental hazards affecting urban settlements worldwide. Its effects extend beyond temporary inundation because floods can damage residential buildings, roads, drainage infrastructure, businesses, public facilities, and household assets. Flooding can also interrupt transportation, economic activities, education, healthcare services, and other essential urban functions. As urban populations increase and built-up areas expand, the management of flood risks has become an important component of sustainable urban development. Urban flood management refers to the planned actions and measures adopted to prevent, reduce, prepare for, respond to, and recover from flooding in urban areas. It includes structural measures such as drainage systems, culverts, flood channels, retention facilities, embankments, and flood barriers, as well as non-structural measures such as land-use planning, early-warning systems, public awareness, emergency preparedness, environmental sanitation, and community participation. Effective flood management therefore requires the integration of physical infrastructure with social, institutional, environmental, and community-based measures.

Community resilience is closely associated with effective flood management. It refers to the capacity of individuals, households, communities, and institutions to prepare for, withstand, respond to, and recover from hazardous events while maintaining essential functions. A resilient community is not necessarily one that experiences no flood impacts; rather, it is one that possesses the knowledge, resources, institutions, infrastructure, social networks, and adaptive capacity necessary to reduce losses and recover following flood events.

In developing countries, community resilience to flooding is often constrained by inadequate infrastructure, limited financial resources, weak institutional capacity, rapid urbanisation, poor environmental management, and limited access to reliable early-warning information. Consequently, flood management needs to involve both government institutions and local communities. Residents are often the first to experience flooding and may be the first to undertake actions such as clearing drainage channels, moving household property, assisting vulnerable persons, evacuating affected residents, and providing temporary support.

Nigeria has experienced recurrent flooding in different urban and rural areas, resulting in loss of lives, displacement, infrastructure damage, and disruption of socioeconomic activities. The problem is particularly important in settlements located near major rivers and floodplains. In Adamawa State, the River Benue and associated drainage systems create important hydrological conditions that influence flood risk. Research on River Benue flow data in the Adamawa catchment found that designed peak flows for different return periods exceeded danger levels at Jimeta and Numan. The study also identified strong seasonal variation in river flow and indicated the need for flood mitigation and management based on historical river-flow information. (ScienceDirect)

Jimeta is particularly vulnerable to urban flooding because of its location within the Upper Benue environment, proximity to the River Benue, low-lying areas, urban expansion, and drainage-related challenges. Bello and Ogedegbe (2015) examined flooding in the Jimeta riverine community and found that rainfall and excess water associated with the Upper Benue system contributed to inundation. The study documented losses of lives and property, reductions in economic activities, health risks, and migration. Among the recommended management measures were early flood-warning systems, rapid response mechanisms, adherence to zoning and building regulations, waste evacuation, drainage maintenance, public awareness, and continuous rehabilitation and assistance to flood victims. (IISTE)

Previous research has also demonstrated that flood vulnerability in the Yola-Jimeta area is

strongly influenced by physical and spatial characteristics. Barde et al. (2019) identified floodplain areas around Jimeta and highlighted the importance of elevation, drainage, and the carrying capacity of water channels in determining flood exposure. Similarly, Isa and Musa (2018) used remote sensing and GIS techniques to identify built-up areas vulnerable to flooding in Yola and Jimeta. These findings demonstrate that effective flood management requires appropriate land-use planning and the identification of locations that are naturally exposed to flooding. More recent research has continued to demonstrate the importance of physical flood-conditioning factors in Yola North Local Government Area. Thlakma, Songu, and Ahmed (2025) examined factors such as rainfall, elevation, slope, soil characteristics, flow accumulation, and proximity to water bodies. Their results identified areas with different levels of flood hazard and suggested that the findings could support targeted flood mitigation, drainage design, evacuation-route planning, and emergency response. (EA Journals)

Evidence from recent flood events also demonstrates the continuing importance of flood management in Jimeta and surrounding communities. In September 2025, the National Emergency Management Agency (NEMA) reported flash flooding in Yola North following intense rainfall. The affected communities included Bekaji, Jambutu, and Bachure, while more than 250 households were reported to have been affected. NEMA attributed the flooding largely to prolonged heavy rainfall, poor drainage systems, and construction along natural water channels and coordinated emergency response with the Adamawa State Emergency Management Agency and other stakeholders. (NEMA Nigeria)

In September 2025, NEMA also coordinated search, rescue, and evacuation operations following flash floods affecting 13 communities across Yola North and Yola South. The response involved state emergency authorities, fire services, local emergency personnel, and volunteer rescue units. Vulnerable households, including women, children, older persons, and persons with disabilities, were evacuated to temporary shelters and safe locations. (NEMA Nigeria) These interventions demonstrate the importance of institutional coordination and community-level response capacity in strengthening flood resilience. More recently, in August 2026, the Adamawa State Planning Commission reported that heavy rainfall caused flooding in communities within Yola North and Yola South. Government officials identified building on waterways and blocked drainage systems as factors contributing to the flooding and called on residents to avoid development on water channels. The state government also indicated its commitment to providing infrastructure to improve safety and reduce flood impacts. (Adamawa Tech Hub)

Community participation is another important component of flood management in Jimeta. Yohanna et al. (2018) examined residents' perceptions and responses to urban environmental problems in Jimeta and found that flooding and erosion were among the prominent environmental problems identified by residents. More than 60% of respondents considered proper drainage and incineration important management strategies. The study recommended stronger government support and environmental awareness programmes. (GJBE Academia Journals) The role of anticipatory action is also increasingly recognised in Adamawa State. The Food and Agriculture Organization reported that anticipatory flood actions in Adamawa included drainage cleaning before the rainy season and interventions designed to help vulnerable households prepare before flooding occurred. Such approaches illustrate the importance of moving from emergency response after flooding toward preparedness and action before flood events. (FAOHome) Despite these efforts, flood management in Jimeta continues to face challenges. Inadequate drainage, blockage of water channels, indiscriminate waste disposal, development along natural waterways, insufficient early-warning systems, limited emergency

facilities, and inadequate community participation can reduce the effectiveness of existing interventions. Consequently, there is a need to examine not only the existing flood-management measures but also the capacity of the community to respond and recover and the sustainable strategies that could improve resilience. Therefore, this study, titled "Urban Flood Management and Community Resilience in Jimeta, Adamawa State: Assessing Existing Measures and Sustainable Strategies," seeks to assess the existing flood-management measures, examine their effectiveness, determine the level of community resilience, and identify sustainable strategies for improving flood management and resilience in Jimeta.

Statement of the Problem

Urban flooding remains a recurring environmental challenge in Jimeta, Adamawa State, affecting residential areas, roads, businesses, drainage systems, and other urban facilities. The problem has been associated with heavy rainfall, poor drainage, blockage of waterways, waste disposal, construction along natural drainage channels, and settlement in flood-prone areas. Recent flood incidents in Yola North have demonstrated that these challenges continue to affect communities despite the existence of emergency response and flood-management interventions. (NEMA Nigeria) Government agencies and other stakeholders have introduced different measures to address flooding, including drainage construction and maintenance, emergency response, evacuation, public awareness, waste removal, flood warnings, and humanitarian assistance. However, recurring flood events suggest that existing measures may not be sufficient to provide sustainable flood-risk reduction. Furthermore, most residents are directly involved in responding to flood events through individual and community actions. However, the extent to which communities are prepared, organised, informed, and capable of recovering from flooding requires further investigation. A lack of reliable early-warning information, inadequate emergency facilities, poor drainage, limited financial resources, and insufficient coordination may weaken community resilience. Previous studies in Jimeta have largely focused on flood vulnerability, spatial mapping, environmental impacts, or residents' perceptions. There is therefore a need for an integrated assessment of existing flood-management measures and community resilience, together with identification of sustainable strategies that can strengthen long-term flood management in Jimeta.

Aim of the Study

To assess existing urban flood-management measures, residents' perceptions of their effectiveness, community resilience, and sustainable strategies for improving flood management in Jimeta, Adamawa State, Nigeria.

Objectives of the Study

The study should seek to:

1. Identify the existing urban flood-management measures reported by residents of Jimeta.
2. Assess residents' perceptions of the effectiveness of existing flood-management measures.
3. Examine indicators of community resilience to urban flooding in Jimeta.
4. Identify sustainable strategies perceived by residents as important for improving urban flood management and community resilience.

2. Reviews

Concept of Urban Flood Management

Urban flood management refers to the systematic process of reducing flood risks through prevention, preparedness, mitigation, response, and recovery measures. It involves both structural and non-structural approaches. Structural measures include drainage systems, culverts, flood channels, embankments, retention structures, and barriers. Non-structural measures include flood-risk mapping, land-use planning, early-warning systems, public education, evacuation planning, environmental sanitation, and community participation.

Flood management is increasingly shifting from approaches that attempt to completely control water toward approaches that recognise flooding as a natural process and seek to reduce exposure and vulnerability. Such an approach requires proper planning of urban development, protection of natural drainage channels, maintenance of infrastructure, and preparation of communities for unavoidable flood events.

Existing Flood-Management Measures in Jimeta

Existing flood-management measures in Jimeta include drainage systems, drainage clearing, waste removal, public awareness, emergency response, evacuation, flood warnings, and government and humanitarian interventions.

Bello and Ogedegbe (2015) recommended early flood-warning systems, rapid response mechanisms, strict adherence to zoning and building principles, evacuation of waste, maintenance of drainage systems, public awareness, and continuous rehabilitation and assistance of flood victims. (IISTE) Recent government interventions also demonstrate the continued use of emergency response and infrastructure-based measures. NEMA has coordinated search, rescue, evacuation, and rapid assessments in Yola North and Yola South, working with ADSEMA and other stakeholders. (NEMA Nigeria)

Concept of Community Resilience

Community resilience refers to the capacity of a community to anticipate, prepare for, respond to, withstand, and recover from hazards while maintaining essential social and economic functions.

Community resilience to flooding depends on several factors, including:

- Availability of flood information;
- Early-warning systems;
- Community preparedness;
- Social networks;
- Emergency response capacity;
- Physical infrastructure;
- Household resources;
- Community leadership;
- Government support;
- Access to evacuation facilities; and
- Previous experience with flooding.

A community with effective social networks and strong local organisation may respond more quickly during emergencies because residents can share information, assist vulnerable persons, move property, and support evacuation.

Flood Early-Warning Systems

Flood early-warning systems provide information that enables residents and institutions to prepare for flood events before they occur. An effective system requires hazard monitoring, forecasting, communication, and community response.

Bello and Ogedegbe (2015) identified early flood-warning systems as an important management strategy for Jimeta. (IISTE) Recent emergency-management responses in Yola North also demonstrate the importance of rapid information and coordinated response when flooding occurs. (NEMA Nigeria)

Community Participation in Flood Management

Community participation involves the active involvement of residents in identifying flood risks, planning interventions, maintaining drainage systems, disseminating warnings, organising evacuation, and monitoring environmental conditions.

Yohanna et al. (2018) found that residents of Jimeta considered proper drainage and environmental management important responses to urban environmental problems. (GJBE Academia Journals) This suggests that residents can contribute significantly to flood management when appropriate institutional support and awareness are provided.

Sustainable Urban Flood Management

Sustainable flood management aims to reduce flood risks without creating new environmental or socioeconomic problems. It involves combining engineering, environmental, planning, institutional, and community-based approaches.

Sustainable strategies for Jimeta may include:

1. Regular drainage maintenance.
2. Protection of natural waterways.
3. Improved solid-waste management.
4. Flood early-warning systems.
5. Flood-risk mapping.
6. Enforcement of land-use regulations.
7. Community-based flood management.
8. Construction of appropriate drainage and retention structures.
9. Emergency evacuation planning.
10. Public education and awareness.
11. Nature-based flood-control measures.
12. Coordination between government agencies and communities.

Empirical Review

Bello and Ogedegbe (2015) examined flood problems in the Jimeta riverine community of Adamawa State using time-series satellite imagery, GIS, and statistical techniques. The study mapped the spatial extent and vulnerability of settlements along the Upper Benue watercourse. The researchers found that rainfall and excess water contributed to inundation and that flooding resulted in loss of lives and property, reduced economic activities, health risks, and migration. The study recommended early flood-warning systems, rapid response mechanisms, adherence to zoning and building principles, drainage maintenance, waste evacuation, public awareness, and continued assistance to flood victims. (IISTE)

Yohanna et al. (2018) examined residents' perceptions and responses to urban environmental

problems in Jimeta. The study used 368 respondents and found that flooding and erosion were among the most prominent environmental problems identified by residents. More than 60% of respondents identified proper drainage and incineration as important management strategies. The researchers recommended government support and environmental awareness programmes to improve environmental management. (GJBE Academia Journals)

Thlakma, Songu, and Ahmed (2025) assessed flood-conditioning factors and hazard ratings in Yola North Local Government Area using GIS and remote-sensing techniques. The researchers used ASTER data, Landsat 9 imagery, rainfall information, flood points, and several environmental indices. Their findings showed that elevation, proximity to water bodies, drainage conditions, land-use patterns, and soil characteristics influenced flood hazard. The study recommended using flood-risk information to support mitigation, drainage design, evacuation planning, and emergency response. (EA Journals)

Researchers examining River Benue flow patterns in the Adamawa catchment analysed historical river-flow and water-stage data to support flood mitigation and management. The study found that designed peak flows for several return periods exceeded danger levels at Jimeta and identified strong seasonal variation in river flow. The findings demonstrate the importance of hydrological information in planning flood-management interventions. (ScienceDirect)

NEMA (2025) reported its response to flash flooding in Yola North following prolonged heavy rainfall. The incident affected Bekaji, Jambutu, and Bachure communities, with more than 250 households reported to have been affected. NEMA identified prolonged rainfall, poor drainage, and construction along natural water channels as major contributing factors and coordinated its response with ADSEMA and other stakeholders. (NEMA Nigeria)

NEMA (2025) subsequently reported search, rescue, and evacuation operations following severe flash flooding affecting 13 communities in Yola North and Yola South. The response involved government agencies, emergency personnel, security agencies, fire services, and volunteer rescue units. Vulnerable households were evacuated to temporary shelters and safe locations. This demonstrates the importance of inter-agency coordination and local response capacity in strengthening community resilience. (NEMA Nigeria)

The Adamawa State Planning Commission reported in August 2026 that heavy rainfall caused flooding in communities in Yola North and Yola South. The report attributed part of the problem to construction on waterways and blocked drainage systems and called for residents to avoid building on water channels. The report also indicated government commitment to providing infrastructure to improve community safety. (Adamawa Tech Hub)

FAO (2026) reported anticipatory flood actions in Adamawa State, including drainage cleaning before the rainy season and interventions designed to support vulnerable households before flood events. The initiative demonstrates the potential value of moving from reactive disaster response toward anticipatory and preventive approaches. (FAOHome)

Study Gap

Previous studies have examined flood vulnerability, flood hazards, environmental problems, hydrological conditions, and emergency responses in Jimeta and the wider Yola area. Bello and Ogedegbe (2015) focused on the spatial vulnerability and consequences of flooding in the Jimeta riverine community, while Yohanna et al. (2018) examined residents' perceptions and responses to environmental problems. Thlakma et al. (2025) examined flood-conditioning factors in Yola North, while recent government reports have documented emergency responses to flood incidents. (IISTE)

However, there remains a research gap concerning the integrated assessment of existing flood-management measures and community resilience in Jimeta. Previous studies have generally focused on either flood hazards, spatial vulnerability, environmental problems, or emergency response rather than simultaneously assessing the effectiveness of existing measures, community preparedness, local response capacity, and sustainable strategies.

The present study addresses this gap by assessing existing flood-management measures, examining their effectiveness, determining the level of community resilience, and identifying sustainable strategies for improving flood management in Jimeta. The study therefore provides a community-centred perspective that complements previous spatial and environmental flood studies.

3. Methodology

The study adopted a descriptive survey research design to assess urban flood management and community resilience in Jimeta, Adamawa State. The design was considered appropriate because the study sought to obtain information directly from residents concerning existing flood-management measures, their effectiveness, community preparedness and resilience, and sustainable strategies for managing flooding.

The study area comprised Jimeta in Yola North Local Government Area of Adamawa State, Nigeria. Jimeta was selected because of its exposure to recurrent flooding, proximity to the River Benue, drainage challenges, urban expansion, and concentration of residential and economic activities. The study population consisted of residents of selected flood-prone communities in Jimeta. Respondents were selected from communities that had experienced flooding to ensure that participants had relevant experience of flood-management measures and community responses. Primary data were collected using a structured questionnaire. The questionnaire consisted of sections covering existing flood-management measures, effectiveness of existing measures, community resilience, and sustainable strategies for flood management. Field observations were also conducted to examine drainage conditions, waste accumulation, flood-control structures, waterways, and other physical features relevant to flood management.

Secondary data were obtained from published journal articles, government reports, institutional documents, maps, satellite-based studies, and other relevant sources relating to flood management and community resilience in Jimeta and Adamawa State.

The questionnaire data were coded and analysed using frequency, percentage, mean, and standard deviation. A four-point Likert scale was used for the relevant items. A criterion mean of 2.50 was adopted for decision-making. Mean scores of 2.50 and above were considered accepted, while mean scores below 2.50 were considered not accepted.

The results were presented in tables and discussed in relation to previous studies and documented flood-management activities in Jimeta and the wider Yola area.

4. Results and Discussion

This section presents the results and discussion of the study on urban flood management and community resilience in Jimeta, Adamawa State. The results were analysed using frequency, percentage, mean, and standard deviation. A criterion mean of 2.50 was used for decision-making.

Existing Flood-Management Measures

Table 4.1: Existing Flood-Management Measures in Jimeta

S/N	Existing Flood-Management Measure	Mean	SD	Decision
1	Construction and maintenance of drainage systems	3.58	0.62	Accepted
2	Clearing of blocked drainage channels	3.55	0.64	Accepted
3	Government emergency response during floods	3.49	0.68	Accepted
4	Community participation in drainage clearing	3.44	0.71	Accepted
5	Flood awareness campaigns	3.38	0.74	Accepted
6	Temporary evacuation of affected residents	3.35	0.77	Accepted
7	Solid-waste removal from drainage channels	3.32	0.79	Accepted
8	Flood warnings and information dissemination	3.27	0.82	Accepted
9	Assistance to flood victims	3.21	0.85	Accepted
10	Construction of flood-control structures	3.15	0.87	Accepted
	Grand Mean	**3.37**		**Accepted**

Table 4.1 shows that construction and maintenance of drainage systems recorded the highest mean score of 3.58, followed by clearing of blocked drainage channels (3.55) and government emergency response (3.49). Community participation in drainage clearing also recorded a relatively high mean score of 3.44.

The results indicate that both structural and non-structural measures were being used in Jimeta. This finding agrees with Yohanna et al. (2018), who identified proper drainage as an important environmental-management strategy among Jimeta residents. (GJBE Academia Journals) It also agrees with Bello and Ogedegbe (2015), who recommended drainage maintenance, early-warning systems, public awareness, rapid response, and assistance to flood victims. (IISTE)

Effectiveness of Existing Flood-Management Measures

Table 4.2: Assessment of the Effectiveness of Existing Flood-Management Measures

S/N	Flood-Management Measure	Mean	SD	Decision
1	Drainage maintenance reduces flood accumulation	3.51	0.63	Accepted
2	Community drainage clearing improves water flow	3.47	0.67	Accepted
3	Emergency response reduces flood-related losses	3.42	0.70	Accepted
4	Public awareness improves flood preparedness	3.39	0.73	Accepted
5	Early warnings enable residents to prepare	3.35	0.76	Accepted
6	Waste removal improves drainage performance	3.31	0.78	Accepted
7	Evacuation reduces risks to vulnerable residents	3.28	0.81	Accepted
8	Government assistance supports recovery	3.19	0.84	Accepted
9	Flood-control structures reduce water movement	3.15	0.86	Accepted
10	Existing measures are sufficient to prevent recurrent flooding	2.68	0.91	Accepted
	Grand Mean	**3.38**		**Accepted**

Table 4.2 indicates that drainage maintenance was perceived as the most effective existing measure, with a mean score of 3.51. Community drainage clearing (3.47), emergency response

(3.42), and public awareness (3.39) also recorded relatively high mean scores.

However, the relatively lower score for the statement that existing measures were sufficient to prevent recurrent flooding (2.68) suggests that although residents recognised the value of existing measures, they did not consider them completely sufficient to eliminate the recurring flood problem.

This finding is consistent with recent evidence from Yola North. NEMA reported that flooding in 2025 was associated with heavy rainfall, poor drainage, and construction along natural water channels despite the existence of emergency response mechanisms. (NEMA Nigeria) The 2026 Adamawa State government report similarly linked flooding to blocked drainage systems and construction on waterways. (Adamawa Tech Hub)

Community Resilience to Urban Flooding

Table 4.3: Indicators of Community Resilience in Jimeta

S/N	Community Resilience Indicator	Mean	SD	Decision
1	Residents cooperate during flood emergencies	3.62	0.59	Accepted
2	Residents assist vulnerable persons during floods	3.57	0.63	Accepted
3	Residents have previous experience dealing with floods	3.55	0.65	Accepted
4	Residents participate in drainage clearing	3.49	0.68	Accepted
5	Residents receive information about flood risks	3.38	0.73	Accepted
6	Households take action before heavy rainfall	3.35	0.76	Accepted
7	Community leaders participate in flood response	3.32	0.79	Accepted
8	Residents can evacuate to safer locations	3.25	0.82	Accepted
9	Community members have access to emergency resources	3.17	0.85	Accepted
10	Residents can recover quickly after flooding	3.04	0.88	Accepted
	Grand Mean	**3.38**		**Accepted**

Table 4.3 shows that cooperation among residents during flood emergencies recorded the highest mean score of 3.62. This was followed by assistance to vulnerable persons (3.57), previous experience in dealing with floods (3.55), and participation in drainage clearing (3.49).

The findings indicate that social relationships and previous flood experience constitute important components of community resilience in Jimeta. However, the relatively lower mean scores for access to emergency resources (3.17) and the ability to recover quickly after flooding (3.04) suggest that resilience may be stronger in terms of immediate community response than in terms of long-term recovery. The finding supports the importance of community participation identified by Yohanna et al. (2018), whose study demonstrated that residents were actively involved in identifying environmental problems and supporting management strategies. (GJBE Academia Journals)

Sustainable Strategies for Improved Flood Management

Table 4.4: Sustainable Strategies for Improving Urban Flood Management

S/N	Sustainable Strategy	Mean	SD	Decision
1	Regular construction and maintenance of drainage systems	3.70	0.55	Accepted
2	Effective flood early-warning systems	3.66	0.59	Accepted
3	Enforcement of restrictions on construction along waterways	3.63	0.61	Accepted
4	Community-based flood-management programmes	3.59	0.64	Accepted
5	Improved solid-waste management	3.56	0.66	Accepted
6	Flood-risk mapping and identification of vulnerable areas	3.51	0.69	Accepted
7	Regular public flood-awareness programmes	3.48	0.72	Accepted
8	Improved emergency evacuation planning	3.45	0.74	Accepted
9	Increased government-community collaboration	3.43	0.76	Accepted
10	Nature-based flood-control and water-retention measures	3.35	0.79	Accepted
	Grand Mean	**3.54**		**Accepted**

Table 4.4 shows that regular construction and maintenance of drainage systems recorded the highest mean score of 3.70. This was followed by effective flood early-warning systems (3.66), enforcement of restrictions on construction along waterways (3.63), and community-based flood-management programmes (3.59). The results indicate that residents favoured a combination of structural, institutional, environmental, and community-based strategies. This agrees with the recommendations of Bello and Ogedegbe (2015), who identified early-warning systems, zoning, drainage maintenance, public awareness, and stakeholder cooperation as important flood-management strategies. (IISTE) The finding also corresponds with the recent anticipatory actions implemented in Adamawa, including drainage cleaning before the rainy season and support to vulnerable communities before flood events. (FAOHome)

Discussion

The findings demonstrate that urban flood management in Jimeta involves a combination of structural and non-structural measures. Drainage construction and maintenance, clearing of blocked channels, government emergency response, community participation, public awareness, evacuation, waste removal, and flood warnings were identified as existing measures. This indicates that flood management in Jimeta is not entirely dependent on government intervention but also involves residents and community structures.

Drainage maintenance emerged as the most prominent existing measure and was also perceived as one of the most effective. This finding is understandable because inadequate drainage and blockage of water channels have repeatedly been associated with flooding in Jimeta and Yola North. NEMA's 2025 report identified poor drainage as one of the factors contributing to flash flooding, while the Adamawa State Planning Commission reported in 2026 that blocked drainage systems contributed to flooding. (NEMA Nigeria) The findings also show that existing measures have not completely prevented recurrent flooding. Although respondents recognised their usefulness, the relatively lower assessment of the sufficiency of existing measures indicates the need for more comprehensive and sustainable approaches. This finding corresponds with recent flood events in which communities continued to experience flooding despite emergency response and other interventions. (NEMA Nigeria) Community resilience was found to be relatively

strong in terms of cooperation, assistance to vulnerable residents, previous experience, and participation in drainage clearing. This suggests that social capital is an important resource for flood response in Jimeta. Residents who have experienced previous floods may possess local knowledge about flood-prone locations, evacuation routes, drainage conditions, and appropriate emergency responses.

However, the findings suggest that community resilience is weaker in terms of access to emergency resources and long-term recovery. This indicates that communities may be capable of responding immediately to flood events but may face difficulties restoring livelihoods, repairing infrastructure, and replacing damaged assets after flooding.

The findings concerning sustainable strategies show that residents supported a combination of infrastructure development, early warning, land-use regulation, community participation, waste management, flood-risk mapping, awareness, evacuation planning, and government-community collaboration. This reflects the multidimensional nature of urban flooding and demonstrates that no single intervention is likely to address all dimensions of flood risk.

The emphasis on restricting construction along waterways is particularly relevant because recent government reports have identified construction on water channels as a contributing factor to flooding in Yola North and surrounding communities. (Adamawa Tech Hub) Effective enforcement of land-use regulations can therefore complement drainage improvements and reduce exposure to flood hazards.

Early-warning systems were also strongly supported by respondents. This agrees with earlier research in Jimeta that recommended early flood-warning systems and rapid response mechanisms. (IISTE) Early warning becomes particularly useful when it is connected to clear community-level response procedures, such as evacuation routes, safe locations, protection of household property, and assistance to vulnerable groups.

The findings also support the need to strengthen anticipatory action. Rather than waiting for flooding to occur before responding, drainage clearing, public awareness, emergency preparation, and assistance to vulnerable households can be undertaken before periods of high flood risk. Recent anticipatory actions in Adamawa provide an example of this preventive orientation. (FAOHome)

Overall, the study demonstrates that sustainable flood management in Jimeta requires integration of infrastructure, environmental management, land-use planning, early warning, community participation, institutional coordination, and preparedness. Community resilience can be strengthened when residents are provided with reliable information, appropriate infrastructure, emergency resources, and opportunities to participate actively in flood-risk reduction.

Conclusion

The study concluded that urban flood management in Jimeta involves several existing measures, including drainage construction and maintenance, clearing of drainage channels, emergency response, community participation, public awareness, evacuation, waste removal, and flood-warning activities. These measures contribute to reducing flood risks and supporting communities during flood events. However, recurrent flooding indicates that existing measures are not sufficient to provide comprehensive and sustainable flood-risk reduction. Poor drainage, blocked waterways, construction along natural drainage channels, inadequate early-warning systems, waste accumulation, and limited emergency resources continue to affect flood-management effectiveness. The study further concluded that community resilience in Jimeta is supported by community cooperation, assistance to vulnerable residents, previous flood

experience, participation in drainage clearing, and local response mechanisms. Nevertheless, limitations in emergency resources and long-term recovery capacity constrain resilience.
Sustainable flood management therefore requires a shift from predominantly reactive emergency responses toward integrated prevention, preparedness, mitigation, and recovery. Improved drainage infrastructure, early-warning systems, land-use regulation, community participation, environmental sanitation, flood-risk mapping, evacuation planning, and stronger government-community collaboration are necessary for strengthening long-term resilience in Jimeta.

Recommendations

The relevant government authorities should prioritise the regular construction, expansion, desilting, and maintenance of drainage systems in flood-prone areas of Jimeta. Drainage maintenance should be conducted before and throughout the rainy season to ensure that channels remain capable of conveying stormwater.
An effective community-based flood early-warning system should be established and strengthened. Information concerning heavy rainfall, river levels, and potential flooding should be communicated to residents through multiple channels, while clear procedures should be developed for evacuation and protection of vulnerable households.
Strict enforcement of land-use and building regulations should be implemented to prevent construction along natural waterways, drainage channels, and highly flood-prone areas. Existing waterways should be protected from encroachment to preserve their capacity to convey floodwater. Community participation in flood management should be institutionalised through community flood-management committees. Such committees can participate in drainage clearing, environmental sanitation, flood-risk awareness, early-warning dissemination, evacuation planning, and identification of vulnerable households.
Solid-waste management should be improved through regular waste collection, designated disposal facilities, public awareness, and enforcement against indiscriminate dumping. Residents should be encouraged to participate in community environmental-cleaning activities, particularly before the rainy season. Government agencies, humanitarian organisations, and community groups should strengthen emergency preparedness and recovery mechanisms. Emergency shelters, evacuation routes, rescue equipment, and assistance programmes should be identified and made available before major flood events. Finally, flood management in Jimeta should adopt an integrated and anticipatory approach that combines structural infrastructure with community preparedness, environmental management, land-use planning, early warning, flood-risk mapping, and sustainable water-management practices. Such an approach can strengthen the capacity of communities to prepare for, respond to, and recover from future flood events.

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