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THE MISSING LINK BETWEEN FLOOD EARLY WARNINGS AND RESIDENTS' RESPONSE IN REDUCING VULNERABILITY TO DISASTER: THE AKURE EXPERIENCE

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Abstract

This study examined the missing link between Flood Early Warnings (FEWs) and residents' response at reducing their vulnerability to flood disasters the flood prone areas of Akure, Ondo State Nigeria. It identified sources and frequency of receiving FEWs by the residents during rainy and dry seasons; means and frequency of communicating FEWs during both dry and rainy seasons by the agencies; languages of communicating FEWs by the agencies; residents' satisfaction with the sources and means of flood early warnings; and resident's response before and after FEWs. The study utilised survey approach through structured questionnaire administered on the residents. There were 30 areas identified as flood prone areas due to frequent flood occurrence, out of 7 were selected through purposive sampling due to frequency and intensity of flood experience. A total of 156 (20%) buildings were sampled where a respondent was surveyed out of 779 building identified in the 7 selected flood prone areas. Findings revealed that Ondo State Emergency Management Agency (ODSEMA) and Nigeria Meteorological Agency (NiMET) were major sources of receiving FEWs at both seasons. Local radio stations and television were common as means of receiving FEWs by the residents at both seasons, and mostly received once in a year. Conversely, official websites and social media platforms were mostly utilised means of issuing FEWs by the agencies, thus revealing a gap in communicating between the residents and statutory agencies responsible for issuing FEWs. It was further observed that majority of the residents were not satisfied with the means and frequency of receiving FEWs, which reflected in their preparedness activities whereby there was no significant improvement both before and after receiving the warnings. The study concluded that inherent benefits in FEWs towards reduction in vulnerability to flood disaster risk could not be harnessed due to observed gap in communicating warnings between the agencies and residents.

Keywords: Flood, Disaster, Warnings, Vulnerability and Reponses.

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INTRODUCTION

Global indices on the increasing occurrence of disasters have continued to attract attention towards concerted effort at minimising their multidimensional impacts (Academy of Disaster Reduction and Emergency Management, 2024). These disasters, which include hurricanes, volcanic eruptions, droughts, wildfires and extreme temperatures, transport and industrial accidents, flooding and land slide are driven by both natural and anthropogenic events. They results in disruptions to communities' stability, leading to losses of human life, livelihood, economic opportunities, critical infrastructure and environmental biodiversity (United Nations International Strategy for Disaster Reduction [UNISDR], 2009; Brecht, et al, 2013).

In the year 2021 alone, report indicated that there were 367 recorded major natural disasters (exclusive of epidemics), which is 13% higher compared with average incidences over a period of three decades (1991-2020) leading to 82% disruption in economic activities and consequential losses (Academy of Disaster Reduction and Emergency Management, 2024). The report further revealed that there were increase in the frequency of flood disasters in 2021 with 48% higher than historic levels. The disaster account for the death of 4,393 people, which is 41.87% of all deaths recorded from disasters for the year. Apparently, flood disaster is the most recurrent natural calamity that impacts a greater number of individuals worldwide than any other type of natural disaster.

The magnitude of multidimensional impacts of flooding have necessitated evolving approaches at reducing the vulnerability of the residents and mitigating against the accompanying losses, which are broadly categorised as structural and non-structural measures (Wisner et al*.,* 2004; Di Baldassarre et al*.* 2009; Molinari & Handmer, 2011; UNDRR, 2021). Structural measure involves construction of physical structure such as embankments, dams, canals, and evacuation centres, expansion of drainage facilities among others.

Non-structural measure non-physical in nature, which comprise initiatives towards the reduction of the impacts flood damage in the form of planning and policy towards strengthening governance and support long-term resilience, training and education initiative, Sendai Framework, forecasting, Risk Communication and Flood Early Warning Systems (FEWS), Among these, World Meteorological Organization [WMO] (2011) noted that FEWS and forecasting are the crucial connections among fundamental structures, particularly that it is a multi-stakeholder approach.

FEWS encompasses the provision of precise forecasts regarding the magnitude and timing of rainfall, the establishment of a network of hydrometric stations, the operation of real-time flood forecasting model software, and the issuance of early flood warnings. It is an amalgamated system of hazard monitoring, forecasting and prediction, disaster risk assessment, communication, and preparedness activities systems and processes (United Nations Disaster Risk Reduction [NDRR], 2020).

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This system empower individuals, communities, governments, businesses, and other stakeholders to undertake prompt actions to mitigate disaster risks in anticipation of hazardous events. It is a platform for effective risk communication and engagement of individuals in ensuring adequate preparation for the eventualities of flood disaster (Potter *et al.*, 2018; Daramola, *et al*, 2017; Odunsi, *et al.* 2024).. In essence, it involves the process of communicating the magnitude of flood risk disasters and the required actions by the concerned individuals or authority. Lino *et al.* (2021) and Pham *et al* (2024) noted that the channels of communicating FEWs include SMS, WhatsApp media channels such as radio, television and word of mouth from friends, neighbours, workplace among others, with the overall aim of reducing the vulnerability of resident to flood risk disasters.

Fielding *et al.* (2008) opined that neglect or lack of response to FEWs by the population at risk are mostly precipitated by illiteracy and failure to understand the measures to adopt in order to respond to the warnings. In the same vein, Awopetu *et al.* (2013) noted that strong cultural ties of residents' ancestral land as well as the fear of losing their assets and livelihood sometimes hinder appropriate response to FEWs. Moreover, Ashfaq *et al*. (2023) noted that societal constraints relating to response capacity shows that residents' scarce resources which include credible modes of transportation, logistic assistance consisting rope, stretchers, life vests, boats, headgear, information on plausible evacuation pathway alternatives, and protected shelters limited the capacity to respond to FEWs. Despite these research efforts and findings, there seems to be dearth of research on other issues such as investigating the sources, means and language of communicating of FEWs to residents by the concerned agencies.

In addition, the frequency of communicating FEWs at both rainy and dry seasons of the year deserves attention. Moreover, probing into the effectiveness of the warnings based on residents' response through the activities engaged before and after receiving FEWs and level of satisfaction with the sources and means are also critical. Operationalizing FEWs is mostly integrated within the responsibility of specific government agencies and this vary across different geographic boundaries. In Ontario, Canada, the responsibility of delivering FEWs lies with the conservation authorities at the municipal level. Conversely, in provinces such as New-Brunswick, Quebec, and Manitoba, the onus of FEWs falls within the hydrological centre of each respective province. This is due to the fact that FEWs is considered a provincial responsibility (Zahmatkesh, 2019).

In Nigeria, specific government entities that are involved in FEWs include the Nigerian Meteorological Agency (NiMET), Nigeria Hydrological Services Agency (NHSA) and National Emergency Management Agency (NEMA), which have offices and replica at state levels as State Emergency Management Agency (SEMA). For instance, in Ondo State, Ondo State Emergency Management Agency (OSEMA) is responsible for emergency management at the state level. There are reports that these agencies have implemented various measures to address the issue of flooding, including public sensitization campaigns aimed at increasing awareness and mitigating the impact of floods in the country (Olajuyigbe *et al*., 2012; Agbonkhese, *et al.* 2014; Yoade, *et al*, 2019).

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Nigeria has witnessed series of flood over the years with varying impacts, particularly since the turn of the millennium. For instance, there were flood occurrences in 2018 attributed to heavy rainfall, poor drainage systems, and the release of water from dams affected many states including Lagos, Niger, Kogi, Anambra, and Delta resulting in the displacement of thousands of people and caused damage to infrastructure, crops, and livestock.

Another record of flood occurrence was in 2022 where 30 out of Nigeria's 36 States were affected and considered the worst in the recent times as a result of heavy rainfall and climate change as well as the release of water from the Lagdo Dam in neighbouring Cameroon (Khalid & Maishman, 2022; NHSA, 2022). According to National Emergency Management Agency [NEMA] (2023), the flooding recorded a total of 612 causalities, 1,427,370 persons were displaced and 2,776 others suffered various degrees of injuries. In addition, 181,600 houses were partially damaged, 123,807 houses were totally damaged, 176,852 hectares of farmland were partially destroyed and 392,300 hectares of farmland got totally destroyed.

In Nigeria, flooding along River Ala in Akure has been noted to be a recurrent experience over the years (Ogunbodede & Sunmola, 2014; Olatona *et al*., 2017; Yoade *et al*, 2019; Fagunloye, 2024). The vulnerable condition of lives and properties along the river has over the years become an issue of serious concern to both individuals and government at all levels. Properties worth billions of naira are damaged annually; thus rainy season raises apprehension for residents nearby River Ala in Akure as buildings are submerged making life unbearable for the residents as well as patrons of business located in these areas. Based on the foregoing, this study aims to investigate the communication of and response to FEWs among residents in the flood prone areas of Akure, Ondo State, Nigeria.

MATERIALS AND METHODS

The study Area

Akure is the capital city of Ondo State in the south-western part of Nigeria (Figure 1) and the headquarters of Akure South Local Government Area (LGA) among the eighteen (18) LGAs in Ondo State. It is located between latitude 7º 21'N and 7º 50'N of the Equator and Longitude 5º 50'E and 7º 25'E of the Greenwich Meridian (Figure 2). It is about 250 metres above the sea level with a landmass covering an area of 331 square kilometres (Olugbamila, 2018).

Since the establishment of Ondo State in February 1976, population of the residents has continued to grow. For instance the population of 144,544 residents in 1987 to become 157,947 by 1990 according to Ondo State Government (2010). Furthermore, the population figure of the city in 1991 was put at 239,124 and rose to 360,268 in 2006 (Federal Republic of Nigeria, 2009). This upsurge can be attributed to typical clustering of governmental and corporate establishments with attendant job and economic opportunities serving as attractive force to people from various places to the city.

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Akure has a tropical climatic condition with precipitation patterns of contrast majorly that of the summer (often refer to as dry season) and the winter (with substantial duration rain fall - rainy season). The annual mean temperature is put at 27.3°C while that of rainfall is estimated to be 1805.9 mm (Ogunrayi et al, 2016). The main river that drain the city of Akure is the River Ala and its tributaries with annual floods caused by the rivers are highly noticeable in the city's wetland areas. Series of flooding in Akure have been attributed to River Ala considering its location and other human activities around the river. River Ala takes its source from the north-western part of Akure and flows towards the south-eastern part of the city through Oba-Ile to Edo State (Ayeni *et al.* 2011). The river is one of the tributaries of River Ogbese and it traversed an average total length of about 57km. However, it has a total length of about 14.8km within Akure. During rainy season, the river's frequent flash floods lead to untold hardship on the residents of Akure. Roads are sometimes rendered inaccessible for residents, while in other times, it prolongs travel time. For instance, the torrential rainfall, which began on a Friday night of 23rd June, 2023 lasted several hours into Saturday, 24th of June, 2023, leading to flood that affected several areas in the state capital. The affected areas include Aiyedun Quarters, Akure High School Area, Araromi Road, Irese-Ijare Bridge, Aye community in Irese among others. Specifically, major areas that are prone to flood in Akure included Ayedun Quarters, Odo Isolo, Odo Ikoyi/Araromi, Danjuma Junction, Total Garden, Isolo/Oja-Oba Junction, first Bank/Sectariat Junction, Aule/Ondo Road, St. Louis Nursery & Primary School, Iyioma Plaza and Champion Junction.

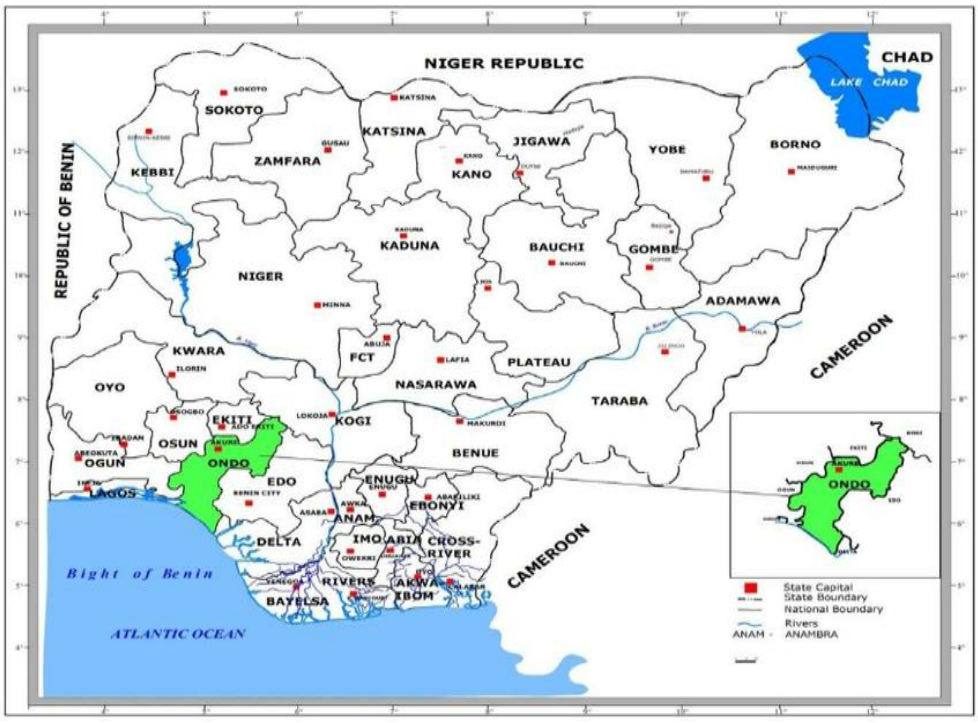

Figure 1: Ondo State in the context of Nigeria

Source: Ondo State Ministry of Lands and Housing, Akure (2010)

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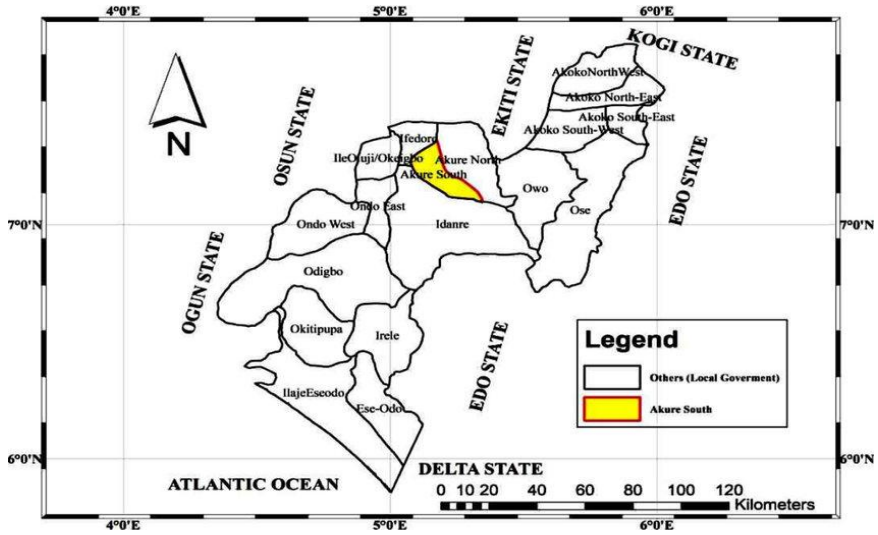

Figure 2: Akure South Local Government Area within the context of Ondo State

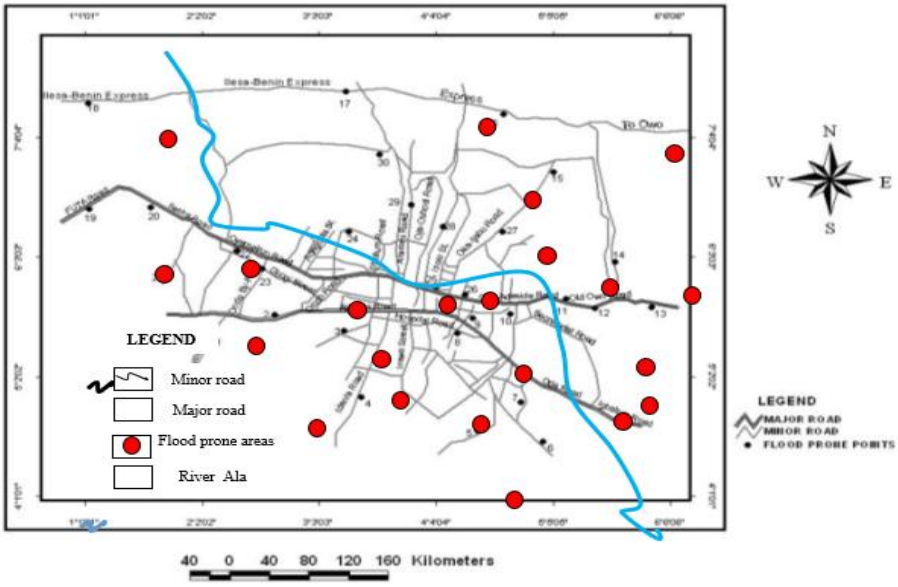

Figure 3: Flood prone areas within the context of Akure South LGA

Source: Google earth Imagery, Digitized by Author (2024)

METHODOLOGY

Data for the study were obtained data from both primary and secondary sources. Primary source included reconnaissance survey/personal observation, interviews, and the administration of two sets of questionnaires. The first set of questionnaire were administered on the residents of Akure in the flood prone areas, while the second was on the government agencies responsible for communicating FEWs. Studies have identified 30 areas that are flood prone in Akure due to incessant experience of flooding

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(Ogunbodede & Sunmola, 2014; Olatona *et al*., 2017; Yoade *et al*, 2019; Fagunloye, 2024), out of which 7 were purposively selected due to frequency and intensity of flood experience. The selected flood prone areas are Odo-Ikoyi, Ala, Isikan, Ayedun, Danjuma, Isolo and Oshinle. Reconnaissance survey revealed that there were 117 buildings in Odo-Ikoyi, 162 in Ala, 107 in Isikan, 96, 105, 110 and 82 in Ayedun, Danjuma, Isolo and Oshinle respectively (see Table 1). Using random sampling without replacement, one out of every five buildings (20%) was selected within each of the selected flood prone areas, which led to selection of 156 buildings where respondents were surveyed. Thus, a total of 156 residents were surveyed for the study.

For the agencies of government responsible for communicating FEWs, purposive sampling method was employed to select 3 officials from each of NiMET, NEMA and NHSA that were administered making a total of 9. Information obtained were on the means and frequency of communicating FEWs during both dry and rainy seasons, languages of communicating FEWs to the residents. Other information was obtained through personal observation and photograph of some areas showing evidence of preparedness and mitigation practices in the study area. Secondary sources Google earth Software Package was used to supplement the primary source. These include: the number of buildings in the selected households from; impacts and effects of flood disasters from the records from NEMA.

Table 1: Number of houses to be sampled

S/N	Selected Flood Prone Areas	Number of housing units identified	Houses sampled (20%)
1	Odo-Ikoyi.	117	23
2	Ala	162	32
3	Isikan	107	22
4	Ayedun	96	19
5	Danjuma	105	21
6	Isolo	110	22
7	Oshinle	82	17
	Total	**779**	**156**

RESULTS AND DISCUSSION

Socioeconomic Attributes of Residents in Flood Prone Area of Akure

Findings revealed that there were more female respondents (52.6%) compared with male (47.4%). Reports have shown that females are more vulnerable to the impact of flood than males particularly in developing countries (Neumayer & Plumper, 2007; Fan & Huang, 2023). In addition, Erman *et al* (2021) asserts that gender dynamics influence the way residents are affected by the impacts of flood as well as capacity to withstand and respond to flood occurrences. Age is generally acknowledged as one of the indices to measure maturity, which consequently influences level of responsiveness to flood early warnings and choice of preparedness and mitigation strategies. Findings revealed that the youngest among the respondents was 34 years old; the oldest was 77 years old, while the average age was 55 years. Furthermore, for ease of presentation, the age of the

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respondents were grouped into three as presented in Table 2. These were respondents who were 20- 39 years and regarded as Young Adult, those within 40-59 years old referred to as Elderly, while respondents that were 60 years and above were regarded as Old People. The dominant group were those within the age range of elderly adults (64.1 %), followed by the old people (31.4%), while the youth adult (4.5%) had the least share. By implication, it presupposes that the flood prone areas are dominated by elderly adults who are matured and physically fit enough to respond to flood early warnings provided other social and economic variables are not setbacks. In contrast, the old people age group who may be considered more socially vulnerable constitute about a third of the population. This raises concern on their ability to respond effectively to early warnings and particularly in emergency cases that require physical agility and strength, which may further pose mobility challenges to get out of risk zones in times of emergency affect.

Marital status of the respondents were cauterised into four (4) namely married, windowed, single parents and those who are unmarried refers to as single. Findings showed that as much as 61.5% of the respondents were married; the proportion of single parents were 15.3%, those that were widowed and single accounted for 13.5% and 5.1% respectively. In essence, the area is mostly dominated by married people with possibility of younger children as noted in the age distribution whereby majrity are within the productive age. Education plays a significant role in determining the capability of residents to comprehend and respond to flood early warnings (Sufri *et al*., 2020). Residents with higher education qualification may be less vulnerable unlike those with little or no education. Findings revealed that respondents with no formal education cconstituted 27.6 %, those with primary school education were 32.7%; 16.0% accounted for those that had Senior School Certificate Examination (SSCE), while those who had tertiary education were 13.7 %.

This implies that substantial proportion are literate, which could influence their perception and ability to read information regarding early warnings. Furthermore, findings presented in Figure 4 showed that majority of the residents were traders with the share of 55.1%, followed by 20.5% that were artisan, while 16.0% were civil servants. It was also observed that 3.2% were into commercial driving unlike those that were cleric and dry cleaner with a share of 1.9% each. It could be assumed that the inability of substantial proportion of the residents to engage in tertiary activities with high income, which could improve their standards of living and consequent capacity against vulnerability to the impacts of flood.

Income is another socioeconomic variables that could also influence access and response to flood early warnings among residents in flood prone areas. It has also been noted that high income is usually attributed with high standard of living, which influences locational characteristics and housing choice (Olayiwola & Ajala, 2022). In the same vein, Hallegatte (2017), noted that poverty is closely connected to flood prone areas in cities of developing countries, whereby low-income earners may resort to flood prone areas, which is often associated with cheaper cost of land and house rent. Income of the respondents was categorized into four groups. These were those earning less than minimum wage of ₦30,000.00 (as at the time of survey), those within the range of ₦30,000.00 – ₦59,999.00; ₦60,000.00 – ₦89,999.00; and those whose average monthly

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income is more than ₦90,000.00. Findings showed that majority earned monthly income in the range of ₦30,000.00 – ₦59,999.00 wage with the share of 40.4 %, followed by 32.7 % that earned less than minimum wage of ₦30,000.00, while 20.5% accounted for the respondents with monthly income of ₦60,000.00 – ₦89,999.00. The remaing 6.4% earned ₦90,000.00 and above. In other words, substantial proportion (73.1%) do not earn more than more than ₦60,000.00 in a month. By implication, they may lack the wherewithal to rent or relocate to safer locations against the devastating impacts flooding. In addition, this could influence their capability to embark on structural mitigation measures such as construction of drainage system, reinforcement of embarkment and channelization of river course among others, without the intervention or support of government, humanitarian organizations among others.

Table 2: Socioeconomic Attributes of Residents in Flood Prone Area of Akure

Socioeconomic Variable	Freq.	Percentage
Gender Distribution		
Male	74	47.4
Female	82	52.6
Total	**156**	**100.0**
Distribution of Age Group		
20 – 39 years (Young Adult)	7	4.5
40 – 59 years (Elderly Adult)	100	64.1
60 years and above (Old People)	49	31.4
Total	**156**	**100.0**
Marital status		
Single	8	5.1
Married	96	61.5
Windowed	21	13.5
Divorced	7	4.5
Singe Parent	24	15.3
Total	**156**	**100.0**
Educational status of the respondents		
No Formal Education	43	27.6
Primary School Certificate	51	32.7
Senior School Certificate Examination (SSCE)	25	16.0
Tertiary School Education	37	13.7
Total	**156**	**100.0**
House type		
Bungalow	83	53.2
Storey Building	73	46.8
Total	**156**	**100**
Income Distribution		
Less Than 30,000.00	51	32.7
30,000.00 – 59,999.00	63	40.4
60,000.00 – 89,999.00	32	20.5
90,000.00 and above	10	6.4
Total	**156**	**100.0**

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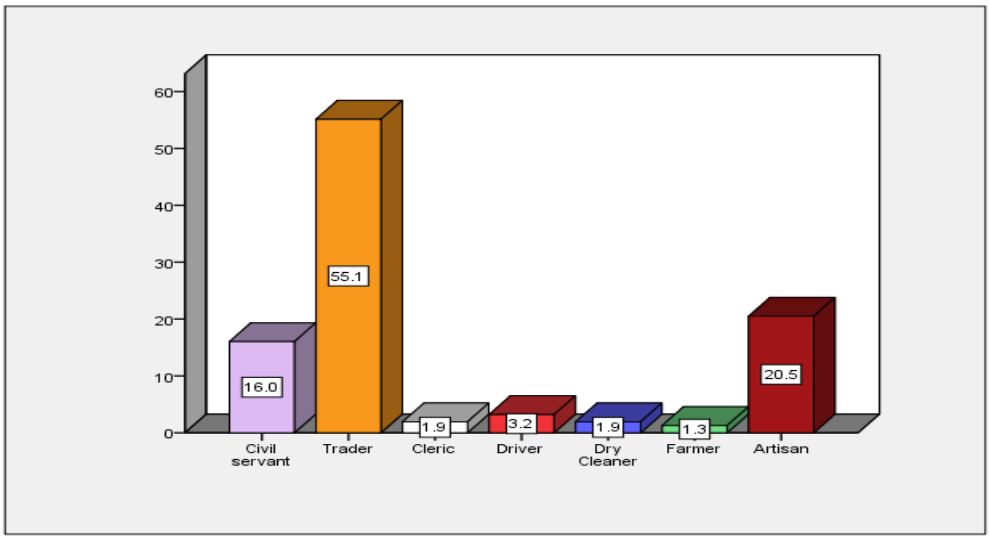

Figure 4: Occupational distribution of residents

Source: Authors' Field Survey, 2024

Sources and Frequency of receiving FEWs by the Residents

Assessment on means and frequency of receiving flood early warnings was based on two major seasons of the year that is peculiar to Nigeria; rainy and dry seasons. The residents' frequency of receiving FEWs were measured using five levels: *Weekly, At least twice in a month, Quarterly, Once in a Year, Rarely*. Each of these ratings were assigned a value of 5,4,3,2,1 respectively. The index of each response were derived by dividing the Summation of Weight Value (SWV) by the total number of responses to each rating. The summation for each rating were obtained through the addition of the product of the number of responses to each aspect and the respective weight value attached to each rating. The index "AWV'' represents an average value.

This was utilized to measure the frequency of flood warnings from the sources. The computed AWV was interpreted as follows: 0.00 – 0.90 represents *Rarely/Never*, followed by 1.00 – 1.99 which represents *Twice in the Season* while, 2.00 – 2.99, 3.00 – 3.99 and 4.00 – 5.00 represent *Every Other Month*, *Monthly (about twice in a month)* and *Weekly* respectively. In addition, rank was used to order the frequency of FEWs based on the value of AWV. There were six identified sources of receiving FEWs by the residents. These were National Emergency Management Agency (NEMA), Ondo State Emergency Management Agency (ODSEMA), Nigeria Meteorological Agency (NiMET), Nigeria Hydrological Services Agency (NHSA), National Orientation Agency (NOA) and Community Based Organizations (CBOs). Findings as presented in Table 3 showed that at the beginning of rainy season, residents ranked ODSEMA as the most consistent source of receiving FEWs with AWV of 1.23 indicating *Twice in the Season*. This is followed by NiMET ranked 2nd with AWV of 1.21, then Community Based Organization was ranked 3rd with an AWV of 1.06, while, NEMA and NOA were both ranked 4th position

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each with corresponding AWV of 1.03. However, NHSA ranked 5th position with an AWV of 0.97. Generally, residents received FEWs *Twice in the Season* during the rainy season. During the dry season, the rankings slightly changed, whereby ODSEMA ranked the 1st with AWV of 1.17, followed by NiMET which maintained the 2nd rank with AWV of 1.09.

NEMA moved up from 4th at the set in of rainy season to 3rd during the dry season with AWV of 1.03. It was further revealed that NOA and Community Based Organization ranked 4th and 5th with a corresponding AWVs of 1.02 and 1.00 respectively. In summary, the $AWV_{(Index)}$ for rainy season was commuted as 1.09 indicated the agencies embark on issuance on FEWs at *Twice in the Season* unlike the dry season with $AWV_{(Index)}$ of 0.90 implying that they *never/rarely* engage in communicating FEWs to the residents during the period. This indicated inconsistency in both season and may likely influence residents' preparedness against vulnerability to impacts of flood disasters as they could not engage in some activities particularly during the dry season in prior to the onset in of rain.

Table 3: Residents' Sources and frequency of Receiving Flood Early Warnings

S/N	Rainy Season			During Dry Season	
	Sources of Receiving FEWs	**AWV**	**Rank**	**AWV**	**Rank**
1	National Emergency Management Agency (NEMA)	1.03	4th	1.03	3rd
2	Ondo State Emergency Management Agency (ODSEMA)	1.23	1st	1.17	1st
3	Nigeria Meteorological Agency (NiMET)	1.21	2nd	1.09	2nd-
4	Nigeria Hydrological Services Agency (NHSA)	0.97	5th	0.06	6th
5	National Orientation Agency (NOA)	1.03	4th	1.02	4th
6	Community Based Organization	1.06	3rd	1.00	5th
		$AWV_{(Index)}$ = 1.09		**$AWV_{(Index)}$ = 0.90**	

Means and Frequency of Communicating FEWs during the Rainy Season

The study identified 12 various means utilised for issuing FEWs by the agencies and receiving same by the residents as presented in Table 4. Frequency of their utilisation was measured on five points Likert's scale of: 5- *Weekly, 4- monthly; 3- At least twice in a month; 2- Quarterly;* and *1 - Once in a Year*. Each of these ratings were assigned a value of 5,4,3,2,1 respectively. Thereafter, AWV was computed and interpreted as follows: 0.00 – 0.90 represents *Rarely*/*Never*, followed by 1.00 – 1.99 which represents *Twice in the Season* while, 2.00 – 2.99, 3.00 – 3.99 and 4.00 – 5.00 represent *Every Other Month*, *Monthly* (*about twice in a month)* and *Weekly* respectively. Findings revealed that during the rainy season, the most utilized means of disseminating FEWs by the agencies was Website having ranked 1st and with AWV of 3.22 indicating *Monthly* (*about twice in a month)*, followed by the use of Social Media channels such as Facebook, Instagram, and X (twitter) also with AWV of 3.11 and ranking 2nd. Warnings through Local Radio Stations ranked 3rd with AWV of 2.00, implying *Every Other Month*. Adoption of Sensitization Programs, Community Meetings and Television Stations as means of issuing warnings were ranked 4th, 5th and 6th respectively. In the contrary, the rarely used means by the agencies were Telephone, Flyers/leaflets, SMS, Cell broadcast and Religious Organization (Churches and Mosques). In the case of the residents, findings revealed that they mostly received FEWs from Local Radio Stations having ranked 1st.

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 58 Issue: 05:2025
DOI: 10.5281/zenodo.15480227

and with AWV of 4.20 indicating such is received *Weekly*. This is followed by Television Station ranked 2nd with an AWV of 3.12 indicating that FEWs is received *Every Other Month, w*hile Telephone and Newspaper ranked 3rd and 4th with AWVs of 1.15 and 1.14 respectively but implying that warnings are received *Twice in the Season.*

The three means that are least in the order of receiving FEWs by the residents were Sensitization Programme, Cell Broadcast and Public Address System. By implication, there was a gap in the communication of FEWs between the government agencies and residents who are supposed to utilise such information in their preparedness against imminent risk of flood disasters. Prioritising Websites and social media (Whatsapp, Facebook, Instagram, X (formerly twitter)) as the major means of communicating FEWs by the agencies may not be farfetched from the understanding they are cost effective and less laborious as it will only require providing information on these platforms within the comfort of their offices. This is in addition to the benefits of wider reach and range of access of audience to such warnings anywhere across the world. However, the residents seems to be more at the home with Local Radio and Television Stations as the means of receiving FEWs, which may not be unconnected to their socioeconomic attributes as they are mostly adults (as much as 94.9%) and married, who may not really be tech-savvy with limited access to internet unlike those who are younger ones and single. Notwithstanding, there is a seeming common ground between the agencies and the residents, which could be further leveraged upon and that is utilisation of local radio. It was noted that while it ranked 3rd most used means of communicating FEWs by the agencies, it ranked 1st on the part of the residents, although with varying degrees of usage.

Table 4: Means and Frequency of Issuing FEWs by Agencies and Receiving FEWs by the Residents the during the Rainy Season

S/N	Means and frequency of Issuing Warning by the Agencies			Means and frequency of Receiving Warnings by the Residents	
		AWV	Rank	AWV	Rank
1	Newspaper	1.12	8th	1.14	4th
2	Local radio station	2.00	3rd	4.20	1st
3	Television station	1.33	6th	3.12	2nd
4	Telephone	0.67	11th	1.15	3rd
5	Flyers/leaflets	0.67	11th	1.08	7th
6	Cell broadcast	0.89	10th	1.02	12th
7	Community meetings	1.44	5th	1.04	9th
8	Sensitization programme	1.67	4th	1.03	11th
9	Short message Services (SMS)	0.67	11th	1.05	8th
10	Website	3.22	1st	1.03	10th
11	Public Address System	1.11	9th	1.02	12th
12	Acquaintances	1.22	7th	1.10	6th-
13	Social Media (Whatsapp, Facebook, Instagram, X (formerly twitter))	3.11	2nd	1.10	6th
14	Religious organization – Churches and Mosque	0.66	12th	1.12	5th
	AWV_{Index} = 1.41			**AWV_{Index} = 1.44**	

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 58 Issue: 05:2025
DOI: 10.5281/zenodo.15480227

Means and Frequency of Communicating FEWs during the Dry Season

In the dry season, there seems not to be notable difference in the choice of means of communicating FEWs between the rainy and dry seasons by the agencies. Findings showed that Websites maintained the 1st rank with AWV of 3.33, followed by Social Media (Whatsapp, Facebook, Instagram, X (twitter)) with AWV of 3.32 both indicating *Monthly* (*about twice in a month)* usage in reaching out to the general audience (see Table 5). Moreover, Local Radio Station ranked 3rd which is mostly used with AWV of 2.89 and most utilised means by the agencies and mostly used *Every Other Month.* Other means such as Newspapers, Public Address System, Community Meetings, Television Station and Sensitization Programmes ranked 4th, 5th, 6th, 7th and 8th resecptively with AWV of 1.56, 1.55, 1.44, 1.33 and 1.22 in the same order indicating they were mostly used *Twice in the Season.* The remaining means that were *Rarely/Never* used included Flyers/leaflets (0.89), Religious Organizations (Churches and Mosque) (0.67), Cell Broadcast (0.67), Telephone, Short Message Services (SMS) (0.67) and Acquaintances (0.67).

In the case of the residents, Local Radio Stations remained the most frequent means of receiving FEWs, with AWV of 3.21 indicating *Monthly* (*about twice in a month)* while, Television Stations and Newspapers ranked 2nd and 3rd respectively with AWV of 1.97 and 1.18 in the same order implying *Twice in the Season*. Moreover, other means of receiving warnings by the residents which were mostly *Twice in the Season* included Religious Organizations (Churches and Mosques) ranked 4th, social media (Whatsapp, Facebook, Instagram, X (formerly twitter)) ranked 5th, while Acquaintances ranked 6th. Furthermore, residents received FEWs mostly *Twice in the Season* through Telephone (1.04), Flyers/leaflets (1.03), Public Address System (1.02), Website (1.01), Sensitization programme (1.01), Cell Broadcast (1.00), Community Meetings (1.00) and Short Message Services (SMS) (1.00) with respective ranks of 7th, 8th, 9th, 10th, 10th, 12th and 12th. Meanwhile, the use of telephone as means receiving flood warnings had an AWV of 1.04 drops significantly to the 7th rank. Religious organizations had a slight increase in use, ranking 4th in the dry season with AWV of 1.17 compared to 5th at the onset of rainy season.

Table 5: Means and Frequency of Early Warnings during the Dry Season

S/N	Means and frequency of Issuing Warning by the Agencies			Means and frequency of Receiving Warnings by the Residents	
		AWV	Rank	AWV	Rank
1	Newspaper	1.56	4th	1.18	3rd
2	Local radio station	2.89	3rd	3.21	1st
3	Television station	1.33	7th	1.97	2nd-
4	Telephone	0.67	10th	1.04	7th
5	Flyers/leaflets	0.89	9th	1.03	8th-
6	Cell broadcast	0.67	10th	1.00	12th
7	Community meetings	1.44	6th	1.00	12th
8	Sensitization programme	1.22	8th	1.01	10th
9	Short Message Services (SMS)	0.67	10th	1.00	12th-
10	Website	3.33	1st	1.01	10th
11	Public address system	1.55	5th	1.02	9th

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 58 Issue: 05:2025
DOI: 10.5281/zenodo.15480227

12	Acquaintances	0.67	10th	1.06	6th
13	Social Media (Whatsapp, Facebook, Instagram, X (formerly twitter))	3.32	2nd	1.08	5th
14	Religious organization – Churches and Mosque	0.67	10th	1.17	4th
	AWV_{Index} = 1.41			**AWV_{index} = 1.49**	

Languages of Communicating FEWs

According to Ashfaq *et.al.*, (2023), language inclusivity and cultural sensitivity of the residents in flood prone areas is very imperative in ensuring effective communication towards appropriate response and preparedness for flooding incidents. Findings as presented in Table 6 revealed that 55.8% of the residents received flood warnings in Yoruba Language, 12.8% accounted for those who received in English Language, while 21.8% were those in the local dialect. Moreover, 0.6% and 9.0% accounted for Pidgin and those who did not specify respectively. Thus, the language commonly used in communicating flood warnings is Yoruba (55.8%), which indicates a likely reliance on it for communication. In another sense, the adoption of different languages indicates a conscious effort at reaching a larger audience, including non-local speakers or those unfamiliar with the local dialect. The proportion of local dialect (21.8%) suggests a conscious effort to consider adequate comprehension of the warnings within the affected community towards ensuring appropriate response in reducing the vulnerability of the residents to effects of flooding. The percentage of "no response" (9.0%) could reflect various factors such as reluctance to disclose language preferences or challenges on the part of respondents in assessing language usage accurately among others.

Table 6: Languages of Communicating Flood Warnings

Language	Frequency	Percentage (%)
Yoruba	87	55.8
English	20	12.8
Local dialect	35	21.8
Pidgin	1	0.6
No response	14	9.0
Total	**156**	**100**

Residents' Satisfaction with the Sources and Means of FEWs

Findings as presented in Figure 5 showed that 13.5% of the residents were Not Satisfied at All with the sources and means of communicating FEWs, while 38.5%; 34.0% and 13.5% accounted for those that indicated not Satisfied, Just Satisfied and Satisfied respectively. This finding suggests that a significant proportion of the population (52.0%), which is the aggregate of residents that indicated "not satisfied at all" and "not satisfied" felt that their expectations about flood warnings were not met particularly based on the sources and means. The remaining 48.0% comprised both residents that were "just satisfied" and "satisfied". This observation is important and could be leveraged upon by agencies or organizations responsible for disaster management and response planning, indicating areas where improvements are needed to enhance residents' satisfaction and overall safety.

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 58 Issue: 05:2025
DOI: 10.5281/zenodo.15480227

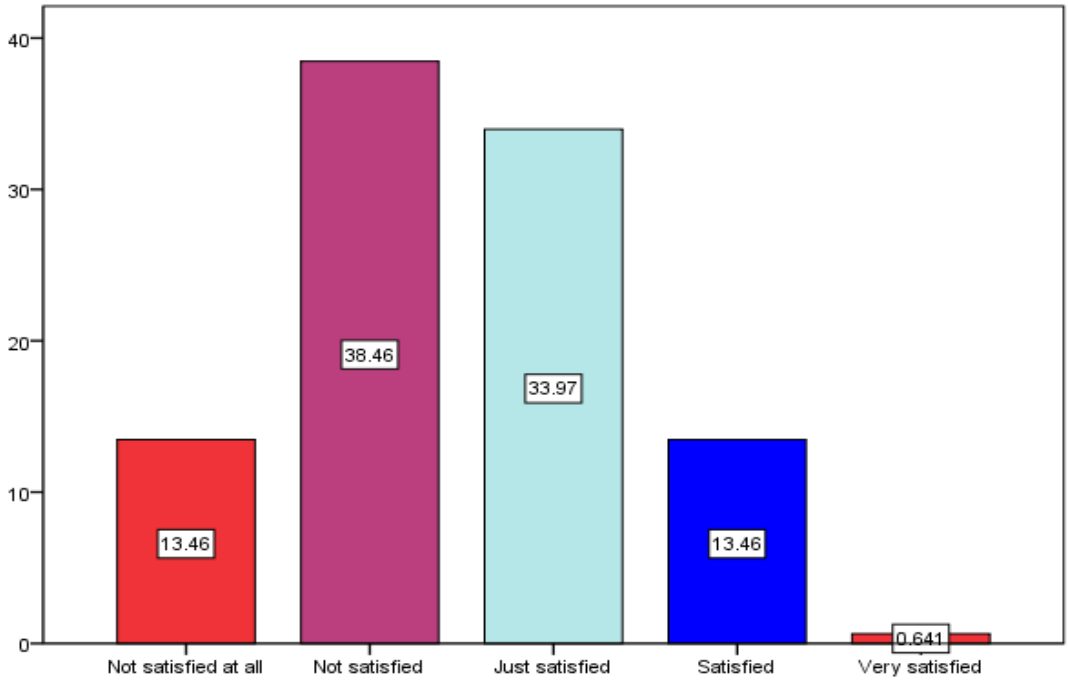

Figure 5: Residents satisfaction with the sources and means of flood early warnings

Preparedness Activities/Measures

The residents' preparedness activities/measures adopted were assessed both before and after receiving FEWs on five points scale. The scale was represented with the following: 5 - *Weekly, 4-At least twice in a month, 3-Quarterly, 2-Once in a Year, 1- Never*. Each of these ratings were assigned a value of 5,4,3,2,1. The index of each response were derived by dividing the summation of weight Value (SWV) by the total number of responses to each rating.

Findings presented in Table 7 showed that before the issuance of warning, *moving of valuable to safe zone* ranked 1st with AWV of 1.39 as the most practiced preparedness activity against venerability to impacts of flood disasters. The next practice is *temporary relocation to dry land* which ranked 2nd with an AWV of 1.27, while *use of concrete floors* (Plates 1 and 2) ranked 3rd with AWV of 1.13. Moreover, *switching off gas and electricity supplies, first aid provision*, *stockpiling of relief materials to dry land or safe zone* and *engagement in community meeting* ranked 4th, 5th, 6th and 7th respectively. Importantly, these activities were engaged *Twice in the Season*.

After receiving warnings, it was observed that *moving valuable to safe zone* ranked 1st with an AWV of 1.72, followed by *use of concrete* (1.43) and *switching off gas and electricity supplies* (1.37) which ranked 2nd and 3rd respectively. Findings further revealed that r*elocation to dry land, stockpiling of relief materials to dry land or safe zone, acquiring training on safety practices and first aid provision* ranked 4th, 5th, 6th, 7th and 8th respectively.

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 58 Issue: 05:2025
DOI: 10.5281/zenodo.15480227

Notably, *moving of valuables to a safe zone* consistently ranked 1st both before and after the warnings as the most engaged activity, indicating priorities placed on personal belongings, which may include their sources/means of livelihood. This may not be far from the previous observation whereby as much as 60.3% of the residents earned not more than ₦45,000.00 in a month.

Change in rank for *Relocation to dry land* from 2nd before the warning to 4th after the warning may be attributed to the information received during the warnings as such practice may not be sustainable bearing other potentials of loss, damages and other unexpected eventualities that may undermine the safety/longevity of such valuables.

Thus, other practice – *Use of concrete floor* may have been recommended as more reliable and effective approach to reduce their level of vulnerability to impacts of flood disasters, which possibly informed its movement from 4th position before the warning to 2nd after the warning. Moreover, the improvement in response to FEWs seems to also raise safety concern.

Specifically, it was observed that *Switching off gas and electricity supplies* improved in ranking from 4th to 3rd before and after the warning respectively. Similarly, *Acquiring training on safety practices* improved in rank from 7th to 6th before and after the warning. These practices include such activities rescue strategies and moving of valuables to a safe zone, which further emphasises the earlier findings where *moving of valuables to a safe zone* was most prioritised.

Based on these findings, it could be deduced that issuance of FEWs is somewhat effective based on residents' responses in preparation for possible incidence of flooding, although not as much would have desired.

This is particularly based on the marginal increase in AWV_{Index} from 1.11 before the warning to 1.24 after the warnings, which implied the practices are done *Twice in the Season*. This could be attributed to the possible gap in the choice of means of communication between the agencies and the residents.

Table 7: Residents' Preparedness Activities/Measures

S/N	Before the Warning			After the Warning	
	Preparedness Activities/Measures	**AWV**	**Rank**	**AWV**	**Rank**
1	Acquiring training on safety practices	1.01	7th	1.08	6th
2	Relocation to dry land	1.27	2nd	1.35	4th
3	Moving valuable to safe zone	1.39	1st	1.72	1st
4	Engagement in community meeting	1.01	7th	1.04	7th
5	Stockpiling of relief materials to dry land or safe zone	1.02	6th	1.10	5th
6	First aid provision	1.03	5th	1.03	8th
7	Use of concrete floor	1.13	3rd	1.53	2nd
8	Switching off gas and electricity supplies	1.12	4th	1.37	3rd
		AWV_{Index} = 1.11		**AWV_{Index} = 1.24**	

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
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E-Publication: Online Open Access
Vol: 58 Issue: 05:2025
DOI: 10.5281/zenodo.15480227

Plates 1 and 2: Use of Concrete Floors/Walls

CONCLUSION AND RECOMMENDATIONS

Flood early warnings (FEWs) plays critical role against flood disaster risk with the overall goal of reducing the venerability of residents, particularly those in the flood prone areas. Utilisation of appropriate means of communicating FEWs that are easily accessible and comprehensible to the residents by the concerned authorities enhances their capacity towards preparedness and mitigation activities. The study noted that the frequency of issuing FEWs is somewhat inadequate and there is visible gap between the statutory agencies and residents in communicating FEWs. Consequently, majority of the residents were not satisfied the means and frequency of issuing FEWs, thus they could not improve on their preparedness and mitigation activities against flood risk disasters both before and after the warnings, which could have reduced their vulnerability to flood risk disasters.

Based on the findings, the following are hereby put forward towards

- As noted that residents mostly received FEWs from the local radio and television stations, robust synergy and collaborative efforts between the agencies responsible for issuing FEWs and these media houses is imperative in order to optimise the desired reduction in the vulnerability to flood disasters risk by the residents. Particularly, the local radio station has wider reach and immediate delivery of news with or without electricity. This will greatly assist to drive the message closer to the people and such information would be customised based on the peculiarity of the local audience.
- Flood awareness and preparedness campaigns should be maintained year-round with messages that would give the residents against flood disaster risk. This should be done emphasising on information that could enhance their preparedness, mitigation and adaptation activities/measures.
- The agencies needs to explore and extend strategic partnership with religious organisation, particularly during special programmes of major religious organisations. It was observed that religious organisations ranked fourth in terms of means

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 58 Issue: 05:2025
DOI: 10.5281/zenodo.15480227

frequency by which they receive warnings. So, this platform should be well harnessed for wider dissemination of information.

- There seems to be no priority on the need to acquire training on safety practices by the residents. It thus becomes imperative for the agencies and other stakeholders such as NGOs who are disaster responders to emphasise and include training on safety practices in moments of flood incidence.

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