

Institutional Readiness and Performance in Flood Risk Management in Southwest Nigeria

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ABSTRACT

Despite the efforts made to reduce risks, flood incidences in Nigeria have persistently led to loss of lives, property and infrastructure damage, as well as unsustainable environment. This study assessed the institutional readiness and performance in flood risk management in Southwest Nigeria. Survey research method was adopted, where data was collected from 66 respondents, selected purposely from Oyo, Ogun and Lagos states through the use of questionnaires. Descriptive statistics and multivariate probit model were used in the analysis of data with $\alpha = 0.05$. The findings revealed that the participants originated from different organizations, with Ministries of Environment (27.3%) and Ibadan Urban Flood Management Project (21.2%) representing the highest percentages. In the same vein, 83.3% of the personnel were male. However, the results from multivariate probit analysis suggested that the performance of intervention and personnel was significantly impacted by the existence of flood management facilities ($\beta = 0.633$), skills of personnel in flood management ($\beta = 0.638$), adequacy of the skills ($\beta = -1.022$), the availability of information ($\beta = 1.074$), and development of the personnel ($\beta = 0.605$). Marital status and awareness creation significantly influenced the performance of personnel. In conclusion, it was found out that the personnel in the forestry and environment agencies were highly prepared for flood mitigation interventions.

Received: 27 Aug. 2026

Accepted: 14 Sept. 2026

Published: 16 Sept. 2026

Keywords:

Adaptive governance, Awareness, Flood risk management, Institutional capacity, Personnel performance, Southwest Nigeria

INTRODUCTION

Flood is a hazard that occurs in places whereby there is excessive rainfall leading to an overflow of water due to exceeding the natural or artificial drainage capacity. In Nigeria, floods remain among the major natural hazards that cause death of people, destruction of infrastructure and socioeconomic activities and destruction of farmlands (Obeta, 2014). The country is highly susceptible to flooding because of its numerous rivers and other water bodies. This is mainly caused by heavy rainfall. Occurrence of floods in many states has led to displacement of population and economic losses.

In trying to reduce the impacts of flooding, a lot of structural measures have been taken by government authorities in Oyo state, Ogun state, and Lagos state through the provision of drainage, good solid waste management, floodplain management, and channelling of the rivers. Inefficiencies that are associated with such measures have arisen from inappropriate implementation and insufficient basin management (Odunola & Balogun, 2015). Poor channelling and lack of proper analysis of the vulnerable river basins have contributed to flooding (Ologunorisa & Tersoo, 2006).

Effective flood risk management involves adequate hazards and vulnerabilities assessment. Thus, the deployment of early warning mechanisms, public awareness initiatives, and geoinformation technologies like remote sensing (RS) and geographic information system (GIS) have become necessary in flood risk prediction, monitoring, and assessment (Agbonkhese et al., 2014; Aderoju et al., 2012). Flood reduction measures can either be structural or non-structural. Non-structural flood reduction measures include flood forecasting, land-use planning, public education, emergency preparedness, and flood insurance while structural mitigation

approaches include the installation of drainage systems, embankments, reservoirs, and flood control works amongst others (Kuntiyawichai, 2012; Li et al., 2016). Due to increasing risks of flooding in the country, the government of Nigeria has undertaken several flood control master plans, early warning programs, and disaster relief programs in areas prone to flooding (Adetunji & Oyeleye, 2018). Similarly, flood warning systems have been established in some selected river basins in Southwestern Nigeria (Okoruwa, 2014). Nonetheless, there are numerous studies suggesting that only engineering measures may not provide sustainable flood management solutions (Ogie et al., 2019).

To date, flood continues to be one of the most destructive natural disasters in Nigeria that results in numerous fatalities, destructions to physical facilities and loss of people's means of subsistence (Nwosu, 2014). In spite of the fact that it has not been possible to prevent flooding entirely due to the complex of interactions between climatic conditions, hydrologic characteristics and anthropogenic activities, it is crucial to prepare and mitigate floods (Abiodun et al., 2008). Traditional methods of flood control and mitigation included such measures as drainage, dyking, damming, channeling, and afforestation. Due to the impacts of rapid urbanization, the deterioration of the drainage system, and the destruction of floodplains, flooding has become much more vulnerable. The need to apply an integrated approach to flood management, which implies structural and non-structural measures, such as flood prediction and forecasting, environmental planning, education, and emergency preparation, has received considerable empirical support (Obebi, 2013). Deforestation, drainage channel clogging, littering, weak policy enforcement, and insufficient urban

planning have been contributing to the problem of flooding (Mfon et al., 2022; Okoye, 2019).

As the impacts of climate change, urbanization, and fragmentation become more prevalent, the relevance of Integrated Flood Risk Governance as a way to manage the

growing impacts of these factors has become much more relevant. The Integrated Flood Risk Governance approach has been developed through the use of three different dimensions that function collectively; these include institution interaction, actor relations, and policy mixes.

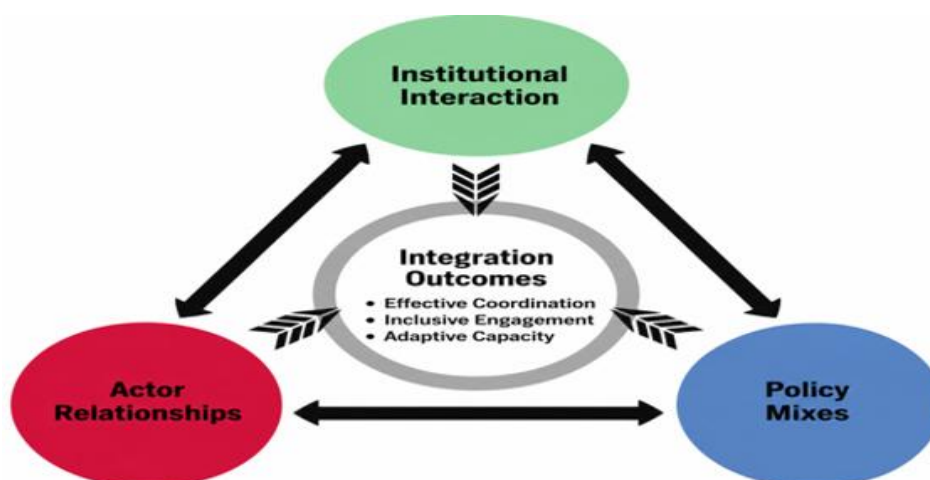


Figure 1: Adapted from Okunola *et al.* (2026)

There are still a few environmental and socioeconomic challenges posed by flooding in Southwest Nigeria, despite the efforts put in place.

The particular research objectives are to:

- i. Evaluate the socio-demographic background and institutional affiliations of the respondents;
- ii. Ascertain the preparedness of staff in the forestry and environmental institutions; and
- iii. Assess the performance of staff in the forestry and environmental institutions.

The following estimate was performed in order to understand how certain variables affect the performance of the staff in flood risk management.

Estimation: This study estimates the influence of certain variables on the performance of personnel in flood risk management.

MATERIALS AND METHODS

Study Area

The research was carried out in three flood-prone states in Southwestern Nigeria, namely Oyo, Ogun and Lagos, targeting employees of forestry and environmental authorities who manage floods. Southwestern Nigeria, being one of the six geopolitical areas of Nigeria, occupies about 114,271km² of area, representing 20.4% of the population of about 32.5 million people in Nigeria (N.B.S, 2006). This region is mainly populated by the Yoruba ethnic group, while there are other ethnic groups such as Hausa and Igbo in this region.

Sampling Procedure and Sample Size

Both purposive and simple random sampling methods were used. The purposive sampling technique was applied in the selection of institutions whose mandate includes participating in flood prevention. They include: Ministries of Environment in the States of Oyo, Ogun, and Lagos; Ogun-Oshun River Basin Development Authority; National Emergency Management Agency (NEMA); Nigerian Meteorological Agency (NiMet); National Environmental Standards and

Regulations Enforcement Agency (NESREA); Ibadan Urban Flood Management Project (IUFMP); and the Forestry Research Institute of Nigeria (FRIN). The data collected were based on structured questionnaires supported by personal interviews among the staff members of the chosen institutions. A total of 80 questionnaires were distributed, with 66 being returned, making up 82.5% effective response rate.

Methods of Analysis

Analysis of data involved the application of both descriptive and inferential statistic. The use of descriptive statistics involving frequency, percentage and mean scores helped in describing the socio-economic characteristics of the respondents as well as measuring the level of preparedness of the personnel in advocating flood management and their performance in regard to intervention from the Likert scale measures. Analysis of inferential statistics was carried out using multivariate probit (MVP) regression analysis to determine the factors that influenced the performance of personnel and intervention effectiveness in minimizing floods by the forestry and environmental institutions.

Operationalization of Likert Scale and Mean Scores

Readiness of the personnel for advocating for flood management related issues was evaluated using a five-point scale, where participants' responses could be: Strongly agree (5); Agree (4); Undecided (3); Disagree (2); and Strongly disagree (1). The threshold used was obtained from the following computation: $((5+4+3+2+1)/5=3.0)$. This means that those whose mean is below 3.0 had low readiness whereas those with 3.0 and above have high readiness in relation to flood management advocacy. On the other hand, the personnel and institutional intervention was evaluated using a five-point measurement scale which included excellent (5); very good (4); good (3); fair (2); and poor (1). Again, with the mean of 3.0, those whose mean is below 3.0 had low intervention performance while those whose mean is 3.0 and above had high intervention performance in relation to flood management activities.

Multivariate Discrete Choice Model

In this particular case, a multivariate probit (MVP) model has been utilized in order to analyze the factors that influence the personnel performance and organizational interventions in flood management. MVP takes into account all the possible correlation between all the dependent variables; hence, the efficiency and consistency of estimation become better than in the case of univariate estimation.

$$z_i = X_i\beta + \varepsilon_i \quad i = 1 \dots n \quad \dots \dots \quad (1)$$

Where:

Y_i = vector of the dependent variable (performance of the personnel)

X_i = vector of the independent variables (awareness)

β_i = vector of the coefficients

ε_i = error term with zero mean and unit variance.

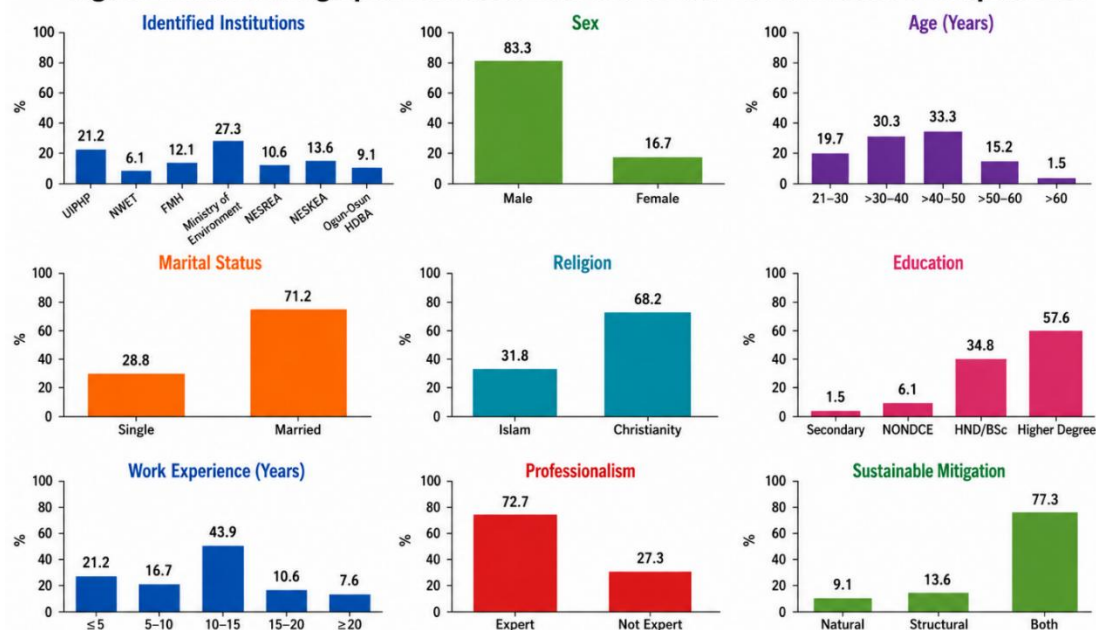
RESULTS AND DISCUSSION

Socio-demographic Characteristics of Personnel of Forestry and Environmental Agencies

Personnel of Flood Management Socio-demographic Profile: Figure 1. The participants of the study were recruited from different organizations. Ministry of Environment (27.3%) and Ibadan Urban Flood Management Project (21.2%) had the highest percentage of representation. Gender profile of the sample indicated that majority (83.3%) of the employees was male. With respect to age, majority of the respondents fell in the age bracket of 31-40 years (30.3%) and 41-50 years (33.3%). Furthermore, 71.2% of the employees were married, while 68.2% were Christians. As far as educational

qualification is concerned, 57.6% of the employees were graduates, while 43.9% of them had 11-15 years professional experience. Moreover, 72.7% of the respondents specialized in flood management. Only 9.1% considered land use planning as a sustainable mitigation measure. The comprehensive coverage of the institutions highlights the collaborative and multidisciplinary approach that is adopted in dealing with flooding in Southwestern Nigeria. The higher number of males as members means higher involvement of men in flood management activities since such tasks are technically oriented as compared to other tasks. This observation is consistent with the findings of Ogbogu (2017), which indicate that there was a similar gender composition of staff in environmental organizations in Southwestern Nigeria. The respondents being aged between 30 and 65 and having high levels of education and experience means that there is an experienced workforce available to manage flooding in the region. Moreover, the high proportion of flood management experts clearly demonstrates the technical capacity of the institutions. According to Fatmah (2023), older people with good flood knowledge are more likely to implement flood management measures than those with limited knowledge, underscoring the need to strengthen pre-flood knowledge to improve mitigation practices and preparedness among older adults. Besides, the choice of integrated mitigation strategy over land use strategy shows the shift towards flood risk management.

Figure 2. Socio-demographic Characteristics and Institutional Affiliation of Respondents



Note: Percentages may not total 100 due to rounding. UIPHP – University of Ibadan Public Health Programme; NWET – National Water and Environmental Training Institute; FMH – Federal Ministry of Health; NESREA – National Environmental Standards and Regulations Enforcement Agency; NESKEA – National Environmental Sanitation and Beautification Enforcement Agency; HDBA – Hydrological Data and Basins Authority.

Figure 2: Socio-demographic Characteristics and Institutional Affiliation of Respondents in Southwest Nigeria

Source: Field survey, 2024

Readiness of Personnel in Forestry and Environmental Agencies to Provide Flood Mitigation Advisory Services in Southwest Nigeria

Figure 3 shows the preparedness of the forest and environmental department's staff in undertaking advocacy for the prevention of flooding in communities in Southwestern Nigeria. Awareness through the distribution of flood management books received the highest average score ($\bar{x}$ =

4.6). Also, the availability of the GIS system to aid in the early detection of floods received the highest average score ($\bar{x}$ = 4.6). Second highest average score was that of educational posters hung in public places ($\bar{x}$ = 4.4), and third highest average score was that of staff training ($\bar{x}$ = 4.3). The high readiness for creating awareness highlights the crucial importance of information distribution in enhancing the preparedness and adaptation of communities to floods. Such

a conclusion can be made based on the results provided by Jeb & Aggarwal (2008), who state that flood hazards reduction is highly dependent on the level of awareness and information access. Meanwhile, the high availability of GIS technologies indicates the growing application of geospatial tools for observing and predicting floods. This conclusion is also consistent with the results presented by Aderoju et al. (2012). High importance of conducting educational campaigns and training personnel highlights the role of institutions in increasing the level of flood hazard management. Such a conclusion can be supported by the findings of Okoruwa (2014) and Nemine (2015) who highlight the formation of community-based flood early warning systems in Nigeria. In addition, the last-mentioned study indicates the continuous governmental efforts to enhance stakeholders' skills in

forecasting and warning. The very high scores for the variables of staff awareness and free flow of information imply that proper internal communication contributed positively to efficient staff performance in flood management. This is supported by Bateman & Snell (2004), who said that there was improvement in the performance of staff and the organization because of their proper level of awareness, achievement and being proactive. In addition, the very high scores for the variables of skill level in flood management and participation in flood management decisions imply that there exist competent staff and institutions that promote good flood management practices. This is supported by Ogbogu (2017), who concluded that staff in environmental organizations in Lagos State were motivated by professional development and flood management practices.

Figure 3. Readiness of Forestry and Environmental Agency Personnel for Flood Mitigation Advocacy

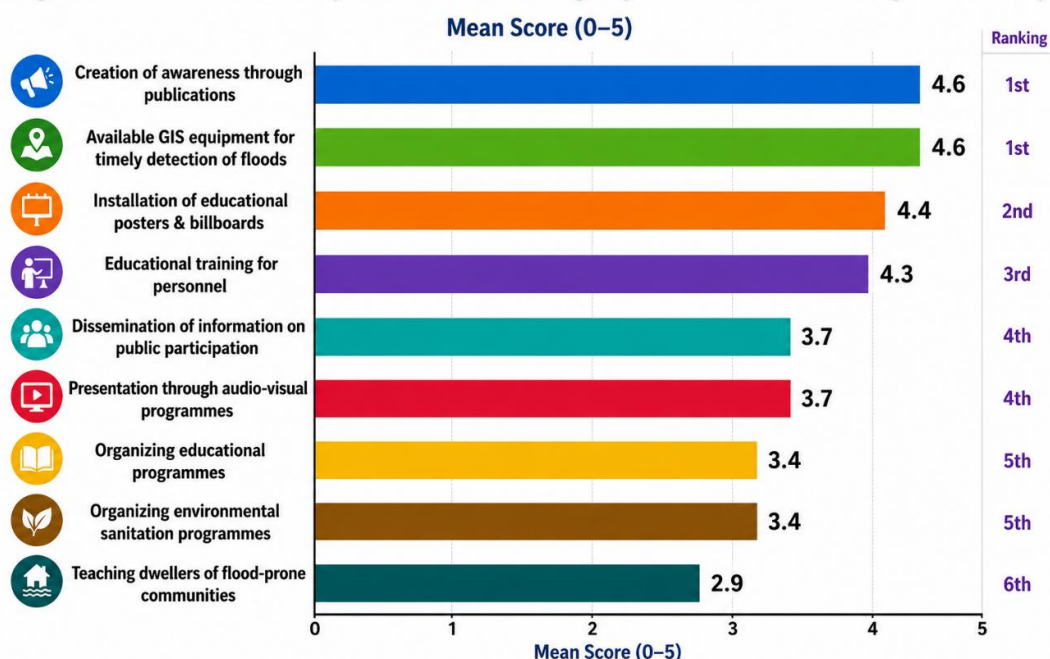


Figure 3: Readiness of Personnel in Forestry and Environmental Agencies to Provide Flood Mitigation Advisory Services in Southwest Nigeria

Source: Field Survey, 2024

Personnel Performance of Forestry and Environmental Mitigation Agencies

Figure 4 below depicts the performance of staff in Forestry and Environmental Agencies managing flood management in Southwest Nigeria. "Well-informed on events happening in their respective agencies" was the most significant mean ($\bar{x}=4.0$) in terms of performance of staff. "Free movement of information across administrative levels and subordinates" ranked second ($\bar{x}=3.7$). "Availability of flood management skills in staff" placed third ($\bar{x}=3.0$), while "Inclusion of all types of staff in flood management decision-making" placed fourth ($\bar{x}=3.0$). Given the impact of marital status as a positive predictor of personnel performance, it might be plausible that

the responsibility is likely to boost their commitment and effectiveness in handling the flood management activities. This finding agrees with findings reported by Aslam et al. (2025) whose study revealed that marital status is an important determinant of job performance, whereby the married staff members demonstrated high commitment and effectiveness. The vital importance of awareness creation through flood management publications underscores the need for regular risk communication for improving the availability of resources for the personnel. This finding agrees with findings reported by Ben-Enukora et al. (2025) who emphasized the importance of flood risk communication for preventive measures.

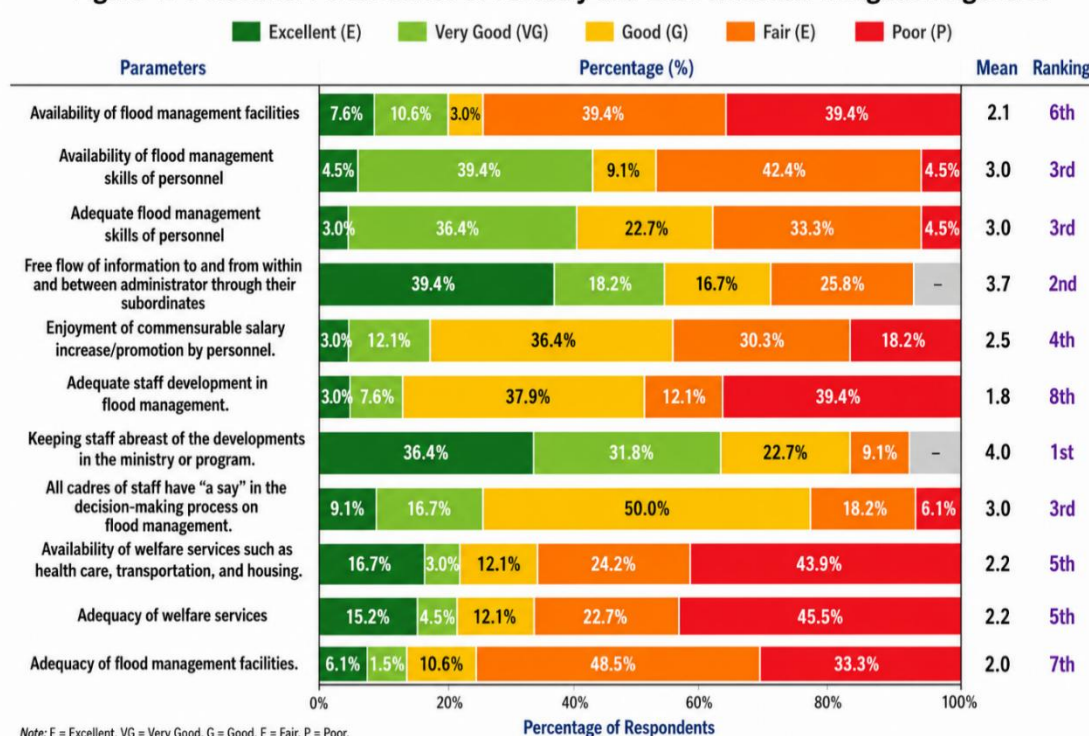
Figure 4. Personnel Performance of Forestry and Environmental Mitigation Agencies

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Note: F = Frequencies, (%) Percentages in parentheses. Source: Field survey, 2024

Factors Influencing Personnel Performance and Intervention Effectiveness

Table 1 below shows the determinants of performance of personnel and efficacy of intervention by forestry and environmental departments in Southwest Nigeria concerning flood management. From the results presented, there is a positive and significant effect of marital status on the performance of personnel, particularly regarding access to flood management facilities ($\alpha = 0.05$). Furthermore, awareness creation using literature on flood management had a positive and significant effect on the access to flood management facilities and development of staff. Educational training had a positive and significant effect on the access to flood management facilities and development of staff. On the other hand, posting and billboard had a negative and significant effect on the development of staff. Moreover, environmental sanitation had a negative and significant effect on the access to flood management skills, availability of flood management skills, flow of information, and development of staff. However, even if there is a significant influence of the explanatory variables on performance and efficacy of

intervention, the low coefficients of determination ($R^2 = 11.6\%$, 5.6% , 8.2% , 4.4% and 9.5% , respectively) show that the explanatory variables explain a very small percentage of variations in the performance indicators. The positive role of educational training highlights the importance of constant capacity building in terms of developing staff competence and enhancing effectiveness of flood management efforts. This is consistent with the results of Fazeli et al. (2024), according to which training and education contribute to disaster preparedness, adaptation and response at different stages of disaster management process. However, the negative association between the use of posters and billboards and development of personnel shows that passive approaches to communication are insufficient for improving performance of staff. Furthermore, the negative association between the level of environmental sanitation and the indicators of performance can have other explanations even though the role of environmental sanitation as the tool for decreasing floods through waste management and people's participation in sanitation is very significant, as was found out by Echendu (2023).

Table 1: Factors Influencing Personnel Performance and Intervention Effectiveness

Parameters	Accessible Flood Management Facilities	Accessible Flood Management Skills of Personnel	Sufficient Flood Management Skills of Personnel	Fluidity of Information	Sufficient Staff Development in Flood Management
Sex	.096 (0.39)	-.231 (0.55)	-.084 (0.81)	-.036 (0.93)	.486 (0.22)
Age	.264 (0.11)	-.112 (0.45)	-.145 (0.28)	.034 (0.84)	.146 (0.33)
Education	-.240 (0.34)	-.182 (0.43)	-.144 (0.49)	-.329 (0.21)	.221 (0.35)
Marital Status	.633 (0.03)*	.267 (0.31)	.243 (0.31)	-.093 (0.75)	.142 (0.59)
Years of Experience	-.054 (0.63)	-.109 (0.28)	-.130 (0.16)	.022 (0.85)	.129 (0.22)
Creation of awareness through publications	.803 (0.01)*	.397 (0.11)	.297 (0.18)	.356 (0.14)	.605 (0.01)*
Installation of posters & billboards	-.359 (0.11)	.098 (0.61)	.212 (0.21)	-.335 (0.08)	-.580 (0.00)

Parameters	Accessible Flood Management Facilities	Accessible Flood Management Skills of Personnel	Sufficient Flood Management Skills of Personnel	Fluidity of Information	Sufficient Staff Development in Flood Management
Educational training of personnel	.528 (0.01)*	-.244 (0.16)	-.266 (0.09)	-.786 (0.00)*	.479 (0.01)*
Organizing educational programs	-.326 (0.41)	-.076 (0.83)	.203 (0.51)	1.074 (0.00)*	-.106 (0.75)
Dissemination of information on public participation	-.387 (0.30)	.638 (0.05)*	.477 (0.09)	.429 (0.17)	-.689 (0.03)*
Organizing environmental sanitation	-.230 (0.64)	-1.190 (0.01)*	-1.022 (0.01)*	-1.078 (0.01)*	.802 (0.05)*
R²	.116	.056	.082	.044	.095

Note: β - Beta coefficient without parentheses, p-value in parentheses, * = Significant @ $\alpha_{0.05}$,
Source: Field survey, 2024.

CONCLUSION

The institutional capacity and adaptive governance of forestry and environmental organizations in the context of flood risk management were evaluated in this study. It was found that the performance and effectiveness of the intervention activities were influenced greatly by the individual's marital status, awareness creation through publication, posting of posters and billboards, education and training, and conduct of environmental sanitation activities. These variables contributed to the variance in the performance of flood risk management. It was also discovered that the individuals were adequately equipped in advocating for flood mitigation and participated in intervention activities but had shortcomings and were poor in flood risk management.

It is hereby recommended that the stakeholders promote sustainable, green, and forestry-based flood mitigation strategies, whereas policymakers and environmental technocrats should formulate and implement environmental adaptation policies.

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