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RESILIENCY OF HOMEOWNERS IN FLOOD-PRONE AREA: A BASIS FOR INTERVENTION

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ABSTRACT
Homeowners in flood-prone areas continue to face significant difficulties as a result of flooding, which impacts their security, safety, and capacity to recover from calamities. This study explored the resiliency of homeowners in Jade Valley Homes Subdivision, Davao City**,** to serve as a basis for developing appropriate interventions. Using a quantitative survey among homeowners who have experienced flooding, the study identified key aspects that shape community resilience. Findings revealed that homeowners' resilience is influenced by their access to reliable information and preparedness measures, their ability to practice safety and protective actions, their cooperation with and trust in institutional support, and their awareness of flood-related risks and emergency responses. Despite recurring flood events, residents demonstrated adaptive behaviors that help them cope with and respond to disasters. However, gaps remain in sustained preparedness and coordinated long-term resilience efforts. Based on these findings, a community-based intervention program is proposed to strengthen homeowners' capacity to prepare for, respond to, and recover from flooding in flood-prone communities.

Keywords:
Jade Valley Homes, Davao City, Flood Resilience, Homeowners, Flood-Prone Areas, Preparedness, Community Intervention

INTRODUCTION

Flooding is recognized as the most common and destructive natural disaster worldwide, characterized by the temporary inundation of normally dry land due to river overflow, heavy rainfall, high tides, or inadequate drainage systems (Dulawan et al., 2024). In Davao City, flooding has repeatedly affected thousands of residents, including those in Jade Valley Homes Subdivision, Barangay Tigatto, which is situated along the Davao River. Notable flood events include the widespread evacuations caused by Tropical Storm Vinta in 2017 (Saveron, 2017) and the devastating impacts of Tropical Storm Odette in 2021, which resulted in significant casualties, displacement, and infrastructure damage across the Davao Region (OCHA, 2021).

The vulnerability of Jade Valley Homes Subdivision is largely attributed to its geographical and historical context, as the area was formerly part of the river channel and was developed without adequate risk assessment or elevation measures (Manalo, 2024). Despite ongoing mitigation efforts by local authorities, including drainage clean-up initiatives and the installation of pumping stations by the Department of Public Works and Highways, flooding continues to persist in the community (DXDC 621 Davao, 2021; Gumantason, 2025). Interestingly, many residents choose to remain in the area despite recurring flood risks.

Given the continued exposure of Jade Valley Homes Subdivision to flooding and the limited research on why homeowners persist in residing in such high-risk areas, this study seeks to examine homeowners' resilience and identify appropriate interventions to strengthen their capacity to cope with and recover from flood events.

OBJECTIVES

The study aims to examine the resiliency of the homeowners living in flood prone areas and how the findings can serve as a basis for intervention that strengthen their capacity to cope with flooding events. Specifically, it seeks to answer the following research questions:

1. What is the level of resiliency among the homeowners in flood-prone areas?
2. What factors influence the homeowners' decision to remain in the area despite the recurring floods?
3. What interventions can be proposed to strengthen the resiliency of homeowners in flood-prone areas?

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REVIEW OF RELATED LITERATURE

Concept of Resilience

Resilience refers to the capacity of individuals, households, and communities to anticipate, absorb, adapt to, and recover from the impacts of hazards such as flooding. It is a dynamic process that is continuously strengthened through environmental, social, and economic adaptation (UNDRR, 2017). Although widely applied in contemporary disaster risk reduction and development studies, the concept of resilience has longstanding roots, originating in ecological research and gaining prominence in discussions on natural disasters, sustainability, and global change (Costache, 2017). Additionally, early contributions by Holling (1973) emphasized resilience as the ability of systems to absorb disturbances while accommodating uncertainty and change, rather than merely maintaining stability. This perspective underscores perseverance, adaptability, and the capacity to navigate multiple pathways amid unexpected events. In today's highly interconnected world, resilience has become increasingly vital, as rapid and complex human activities generate new and unpredictable risks that affect communities differently across locations and contexts (Folke, 2016).

Flooding and Its Impact on Households

Flooding is driven by a combination of natural and human-induced factors, including intense upstream rainfall, reduced river capacity due to sedimentation, loss of wetlands, and residential developments along riverbanks that obstruct natural drainage pathways. Communities located within floodplains are particularly vulnerable, as these areas naturally retain excess water during periods of high river levels, increasing flood risks when rivers overflow (Colina, 2025). The encroachment of settlements into these flood-prone zones further intensifies the severity and frequency of flooding events. Thus, household-level impacts of flooding extend beyond physical damage to include psychological distress, disrupted livelihoods, and prolonged recovery challenges. While residents in flood-affected areas of Davao City have demonstrated high levels of disaster awareness, preparedness, and adaptive behavior,highlighting the strong link between mitigation, adaptation, and disaster readiness (Avelino et al., 2024), recurring flood exposure continues to negatively affect communities such as Jade Valley. Flood events contribute to increased stress, anxiety, and temporary income loss, while inadequate precautionary measures exacerbate household vulnerability and recovery difficulties (Montebon, 2024).

Factors Influencing Homeowners' Decision to Remain

Flooding studies show that strong social ties and place attachment significantly influence residents' decisions to remain in flood-prone areas. Following the 2014 flood in Srinagar City, India, many residents temporarily relocated but quickly returned once floodwaters subsided. Factors such as social cohesion, satisfactory living conditions, adaptability to flooding, and a strong sense of community and place attachment were identified as key reasons for their return. These findings highlight the importance of considering social and psychological dimensions in disaster risk management and underscore the need for community-based programs that support vulnerable populations in building resilience (Wani et al., 2022). Similarly, research in flood-affected communities in Australia demonstrated that resilience is closely linked to social connectedness and a strong sense of place. Despite experiencing severe flooding associated with climate change, affected communities showed demographic and socioeconomic stability, indicating recovery and adaptation. Individual resilience was found to reduce residents' intentions to leave their communities, emphasizing the role of social bonds and community attachment in long-term recovery and disaster resilience (Boon, 2014).

Adaptive Capacity

Community resilience theory explains how communities adapt and continue to function effectively after disruptions by mobilizing interconnected adaptive capacities. These capacities—economic development, social capital, information and communication, and community competence—support disaster preparedness, recovery, and overall population well-being, reflected in stable mental and behavioral health and quality of life (Norris et al., 2008). Resilience, therefore, is not static but a dynamic process rooted in collective resources, coordination, and adaptability. In flood-prone communities, residents develop practical coping strategies based on repeated flood experiences, such as storing emergency supplies, elevating household items, prioritizing the evacuation of vulnerable members, and safeguarding property during flood events (Cayamanda, 2020). In Davao City, where major river systems drain into the Davao Gulf, strong social capital among communities and institutions remains evident despite gaps in formal communication management. This highlights the need for improved coordination

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and intergovernmental collaboration in climate change adaptation and flood risk reduction to reduce long-term community vulnerabilities (Cayamanda, 2022).

Policy and Community-Based Approaches to Resilience

The Philippine Disaster Risk Reduction and Management System was reinforced through Republic Act No. 10121, which expanded institutional frameworks to protect citizens' rights and enhance disaster preparedness (Antonio, n.d.). While typhoons and floods disproportionately affect vulnerable populations, effective implementation of DRRM programs and policies can mitigate their impacts. However, in many barangays, especially those in geographically isolated or rural areas, disaster management policies are often inadequately executed due to limited oversight, resources, and logistical support (Castillo, 2024). Conversely, the 2011 flashflood in Matina District demonstrated the positive effects of social capital and institutional coordination. Prompt mobilization of local government units, private organizations, and community groups facilitated efficient rescue and relief operations, supported by resources like the city's Central 911 system. This example highlights the critical role of community engagement, institutional alliances, and organized response systems in reducing casualties and improving disaster outcomes (Cayamanda, 2022).

METHODOLOGY

This study employed a non-experimental quantitative research design using Exploratory Factor Analysis (EFA) to identify underlying factors influencing the resiliency of homeowners in flood-prone areas. Data were collected from 150 homeowners of Jade Valley Homes Subdivision through a survey questionnaire guided by Cruz (2025), utilizing a five-point Likert scale to measure agreement on various resilience-related statements. Purposive sampling was applied to select participants with direct flooding experiences, ensuring relevant insights into resilience factors. The data gathering process involved securing approval, administering the survey with informed consent, and compiling responses for analysis. Statistical treatment included EFA to determine factor structures, Kaiser-Meyer-Olkin (KMO) to assess sample adequacy, Bartlett's Test of Sphericity to examine variable relationships, and Scree Plot analysis to identify the number of resilience factors (Sürücü, Yıkılmaz, & Maşlakçı, 2024).

RESULTS AND DISCUSSION

This section presents the five dimensions constituting resiliency among homeowners in flood prone areas. Data obtained from a survey questionnaire were analyzed using Exploratory Factor Analysis (EFA).

KMO and Bartlett's Test

The findings from Table 1 show the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity, both of which are critical pre-tests to ascertain the appropriateness of the dataset for factor analysis. The KMO value derived is 0.802, which indicates a meritorious sampling adequacy, implying that the data were highly suitable for factor analysis. This means the correlation among variables is sufficiently tight to allow factors to be extracted with reliability (Sreedhan et. al., 2024). Additionally, Bartlett's Test of Sphericity provides a chi-square approximation of 3502 with significance value (p-value) of <0.001. Since the significance level is less than 0.05, it validates the fact that variables would otherwise be unrelated. Thus, it implies that it enables factor analysis to unveil the dimensions of resiliency among homeowners of flood-prone areas.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.80
Bartlett's Test of Sphericity	Approx. Chi-Square	3502
	Df	435
	Sig.	<.001

Table 1. KMO and Bartlett's Test

Scree Plot

Figure 2 displays the total variance explained and the graph of the eigenvalues against all the factors. This plot is important for deciding how many components to keep by showing the point where adding more components increases the value to a certain level, after which the added contribution starts to decline. The scree plot indicated a clear change in trend after the third or fourth factor. This suggests that these factors explain the most variance in the data. After this point, the eigenvalues flattened out, indicating that later factors contribute less. Therefore,

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three to four factors were kept for further analysis. This reflects the key aspects of the resilience of homeowners in Jade Valley Homes Subdivision.

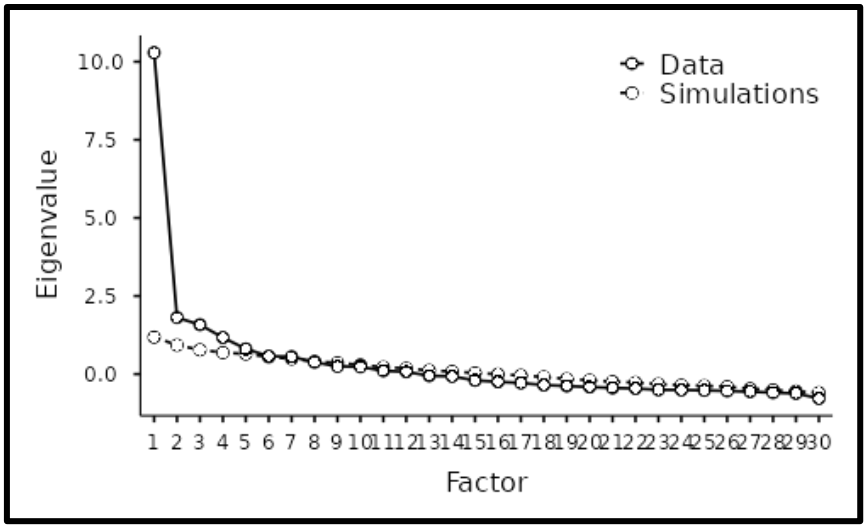

Figure 1. Scree Plot Rotated Component Matri

Analysis of Variance Percentage

Table 2 reveals that four factors were extracted from the dataset. The first factor, with an eigenvalue of 4.51, accounts for 15.02% of the total variance, indicating it is the most dominant dimension influencing homeowners' responses in the Jade Valley Subdivision. The second factor (eigenvalue = 4.46) explains an additional 14.88% of variance, bringing the cumulative variance explained to 29.9%, which suggests that it also plays a substantial role in shaping perceptions or behaviors. The third factor (4.19; 13.96%) and the fourth factor (2.74; 9.12%) contribute progressively smaller portions, increasing the cumulative variance explained to 43.9% and 53.0%, respectively. Overall, these four factors collectively account for slightly over half of the variance in the data, indicating that while they capture the major underlying dimensions of risk awareness, emergency readiness, and related resilience behaviors, there remains additional variability that could be influenced by other contextual or personal factors not fully captured by this analysis. This pattern reflects the multifaceted nature of preparedness and resilience among homeowners in a flood-prone community, where no single factor dominates entirely.

Factor	SS Loadings	% of Variance	Cumulative %
1	4.51	15.02	15.0
2	4.46	14.88	29.9
3	4.19	13.96	43.9
4	2.74	9.12	53.0

Table 2. Total Variance Explained

Rotated Component Matrix

Information and Preparedness. Table 3 reveals the homeowners' readiness to take the necessary precautions both before and during flood events, as well as their capacity to obtain, comprehend, and act upon trustworthy information about flooding. The highest loading item, *Item 1* (Factor Score=0.736), highlights the central role of early warning awareness in strengthening homeowners' preparedness. Similarly, items related to receiving real-time updates (Item 2, Factor Score=0.684), accurate disaster information (Item 12, Factor Score=0.631), and expectations of organized emergency response (Item 4, Factor Score=0.624) reflect the importance of timely communication and trust in local authorities. Additionally, behavioral preparedness actions such as evacuating when advised (Factor Score=0.606), using sandbags (Factor Score=0.558), and informing family members of one's whereabouts (Factor Score=0.530) further demonstrate that access to information translates into protective and proactive responses. Additionally, expectations regarding the restoration of essential infrastructure (Factor Score=0.520) indicate that preparedness is closely linked to confidence in post-disaster recovery efforts.

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Dimension	Attributes	Factor Loadings
Information and Preparedness	Item 1. Regularly monitor weather forecasts and flood warnings.	0.736
	Item 2. Listen to real-time updates and instructions from local authorities.	0.684
	Item 12. Receive accurate and timely information about the disaster, relief efforts, and available resources.	0.631
	Item 4. Expect a prompt and organized emergency response from local authorities.	0.624
Information and Preparedness	Item 3. Evacuate immediately if advised by authorities.	0.606
	Item 20. Use sandbags to create barriers around your home.	0.558
	Item 13. Inform family and friends of your whereabouts.	0.530
	Item 7. Anticipate efforts from local authorities to restore essential infrastructure such as roads, bridges and utilities.	0.520

Table 3. Rotated Component Matrix with Grouped Attributes of Information and Preparedness

Safety and Protective Preparedness. Table 4 shows the homeowners' knowledge of personal safety precautions and their capacity to take proactive steps to lessen damage and losses during flooding incidents. All items resulted to high factor loadings, indicating a strong relationship between the observed variables and the underlying factor. The highest loading item, *Item 25* (Factor Score = 0.794), emphasizes the importance of personal safety awareness in post-flood situations. This suggests that homeowners who prioritize avoiding hazardous environments demonstrate higher levels of resilience. Similarly, securing important documents in waterproof containers (Factor Score = 0.760) reflects anticipatory planning and asset protection, which are essential for minimizing losses during flooding events. The act of turning off gas, electricity, and water supplies before leaving the home (Factor Score = 0.648) highlights preventive behavior aimed at reducing secondary hazards, such as fires or electrocution. Knowing the nearest safe shelter or evacuation center (Factor Score = 0.635) further indicates readiness for safe evacuation. This dimension illustrates how homeowners in the Jade Valley Homes Subdivision put safety and risk mitigation first when confronted with flood threats.

Dimension	Attributes	Factor Loadings
Safety and Protective Preparedness	Item 25. Avoid entering damaged buildings.	0.794
	Item 8. Secure important documents in a waterproof container.	0.760
	Item 9. Turn off gas, electricity, and water supplies before leaving your home.	0.648
	Item 5. Know the nearest safe shelter or evacuation center.	0.635

Table 4. Rotated Component Matrix with Grouped Attributes of Safety and Protective Preparedness

Institutional Support and Compliance. Table 5 relates to the homeowners' cooperation and dependence on official institutions both during and after floods. The highest loading item, *"Follow evacuation routes and signs"* (Factor Score = 0.737), underscores the importance of adherence to officially designated safety procedures during flood events. Additionally, access to financial assistance and relief funds (Factor Score = 0.713) highlights the significance of external support in enabling households to cope with and recover from flood-related losses. Cooperation with emergency services (Factor Score = 0.577) and staying tuned to official communication channels (Factor Score = 0.566) further demonstrate the importance of coordination and trust between homeowners and authorities. Furthermore, expectations regarding the provision of emergency shelter, food, and medical aid (Factor Score = 0.532), along with receiving guidance on future resilience-building measures (Factor Score = 0.513), indicate that resilience extends beyond immediate response to include recovery and long-term preparedness. Lastly, returning home only after authorities declare it safe (0.508) reflects responsible decision-making that prioritizes safety over urgency. Thus, this shows how much homeowners in the Jade Valley Homes Subdivision adhere to coordinated disaster management efforts and have faith in institutional systems.

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Dimension	Attributes	Factor Loadings
Institutional Support and Compliance	Item 21. Follow evacuation routes and signs.	0.737
	Item 26. Receive financial assistance and/or relief funds from local authorities, non-governmental organizations (NGOs), agencies or entities.	0.713
	Item 27. Cooperate with emergency services and follow their instructions.	0.577
	Item 17. Stay tuned to official communication channels.	0.566
	Item 18. Expect the provision of emergency shelter, food, and medical aid.	0.532
	Item 29. Receive guidance on future resilience-building measures	0.513
	Item 16. Only return home when authorities declare it safe.	0.508

Table 5. Rotated Component Matrix with Grouped Attributes of Institutional Support and Compliance

Risk Awareness and Emergency Readiness. Table 6 shows the homeowners' knowledge of secondary flood hazards like debris flow and landslides, as well as their preparedness to act quickly in life-threatening circumstances. The highest loading item, reflecting the importance of moving to higher ground when signs of landslides are observed (Factor Score = 0.824), emphasizes the value homeowners place on immediate and proactive behavioral responses during emergencies. Equally strong, awareness of potential mudslides or debris flow (Factor Score = 0.823) highlights the critical role of hazard recognition and cognitive preparedness in reducing risk. The moderate loading for having a signaling device like a whistle (Factor Score = 0.519) suggests that while physical preparedness tools are acknowledged, they are considered less central to overall readiness. Collectively, these findings indicate that homeowners in the Jade Valley Subdivision prioritize situational awareness and prompt action, demonstrating a practical approach to flood- and landslide-related emergencies.

Dimension	Attributes	Factor Loadings
Risk Awareness and Emergency Readiness	Item 24. Move to higher ground if you observe signs of landslides.	0.824
	Item 22. Be aware of potential mudslides or debris flow.	0.823
	Item 15. Have a signaling device like a whistle.	0.519

Table 6. Rotated Component Matrix with Grouped Attributes of Risk Awareness and Emergency Readiness

Framework Developed Based on the Findings. The responses of the 150 homeowners in this study revealed five factors associated with the resiliency among homeowners in Jade Valley Subdivision, Davao City. As illustrated in Figure 3, these five factors are the following: Information and Preparedness, Safety and Protective Preparedness, Institutional Support and Compliance, and Risk Awareness and Emergency Readiness. These dimensions underscore that homeowners' preparedness is shaped not only by individual knowledge and proactive behaviors but also by access to institutional support, adherence to safety protocols, and awareness of potential hazards, reflecting a comprehensive approach to coping with and responding to flood-related risks.

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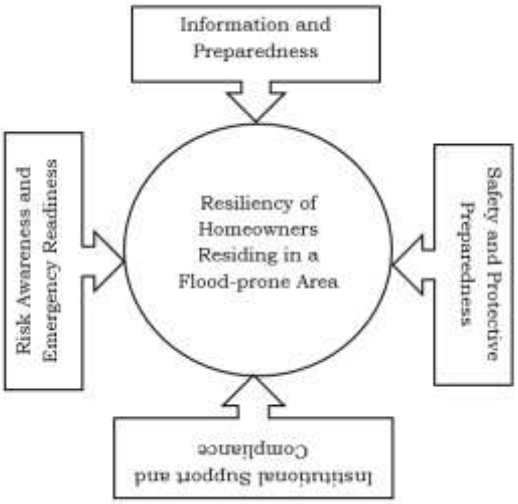

Figure 2. Study Framework Revealing the Extracted Five Dimensions

Intervention Program Title: Community Flood Resilience Improvement Program (CFRIP)

The program focuses on providing timely information, promoting safety practices, strengthening coordination between institutions, and raising awareness about risks and emergency preparedness. Using a hands-on approach, CFRIP aims to help households prepare for, respond to, and recover from flooding. The program is based on research that highlights four important aspects of homeowner resilience: access to information and preparedness, safety practices, support from institutions, and awareness of risks and emergency readiness. Although residents show some awareness and compliance, there are gaps in ongoing preparedness, teamwork, and long-term planning for resilience. CFRIP aims to close these gaps by turning existing knowledge into consistent actions and promoting cooperation between homeowners and local institutions to decrease vulnerability and improve adaptability. CFRIP is managed by the Local Government Unit (LGU) and the Barangay Disaster Risk Reduction and Management Committee (BDRRMC) of Barangay Tigatto in Davao City, with support from the Jade Valley Homeowners' Association. Help from disaster management offices, health units, and relevant non-profits provides technical support, while community leaders aid in communicating with households and carrying out the program. The implementation consists of four stages: planning and coordination through discussions with stakeholders, building capacity and raising awareness through preparedness sessions and safety briefings, engaging the community with drills, simulations, and distributing preparedness materials, and ensuring sustainability by integrating resilience activities into regular barangay programs. Monitoring and evaluation are ongoing, using records of participation, activity reports, checklists, pre- and post-intervention surveys, and feedback from stakeholders. The program's success is measured by improvements in preparedness behaviors, increased awareness of flood risks, and better coordination with authorities.

Objectives	Key Activities	Responsible Units	Expected Outcomes
Enhance access to timely and accurate flood information	Early warning sessions; information dissemination	LGU, BDRRMC	Improved awareness and preparedness
Strengthen safety and protective behaviors	Household preparedness training; safety briefings	Barangay officials, Health Units	Reduced risk and property damage
Improve institutional coordination and compliance	Evacuation drills; coordination meetings	LGU, Emergency Services	Increased compliance and trust
Increase risk awareness and emergency readiness	Hazard awareness campaigns; response guidance	BDRRMC, NGOs	Faster and safer emergency responses

Figure 3. Proposed Intervention Program Matrix

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CONCLUSION

This study explored how homeowners in the flood-prone Jade Valley Homes Subdivision manage challenges, aiming to establish a basis for intervention. Factor analysis revealed that resilience is multi-dimensional, shaped by behavioral, cognitive, and institutional factors. Four key dimensions were identified: Information and Preparedness, Safety and Protective Preparedness, Institutional Support and Compliance, and Risk Awareness and Emergency Readiness. Homeowners rely on timely information, adopt safety measures, trust institutional support, and respond proactively to risks, though gaps remain in long-term preparedness and recovery planning. The findings highlight the need for targeted, community-based interventions to enhance information sharing, household safety, coordination with institutions, and risk awareness, ultimately promoting resilience and reducing vulnerability in flood-prone communities.

RECOMMENDATION

Homeowners' active engagement in disaster preparedness activities, including participation in early warning briefings, evacuation drills, and household safety trainings, is critical to enhancing community resilience. Essential measures include safeguarding important documents, preparing emergency kits, and establishing coordinated family communication plans. Local government units (LGUs) are tasked with implementing comprehensive community resilience programs that ensure timely dissemination of information, effective coordination of evacuation procedures, and provision of post-disaster support, while incorporating community input into urban planning and housing policies. Disaster Risk Reduction and Management Offices (DRRMOs) should strengthen community-based initiatives through regular drills, simulations, and training sessions, improve coordination with residents, and increase awareness of secondary hazards, supported by accessible preparedness guides and communication materials. Urban planners and development practitioners must prioritize flood-resistant infrastructure, enhanced drainage systems, sensible zoning, and sustainable land use planning grounded in local vulnerability and coping capacity data. Future research should extend to multiple flood-prone communities, evaluate long-term changes in resilience, and examine additional determinants of homeowners' decisions to remain in high-risk areas, including financial constraints, social networks, and cultural attachments.

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