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RESILIENCY MODEL OF RESIDENTS IN EARTHQUAKE-PRONE AREAS: ASSESSING COMMUNITY PREPAREDNESS AND ADAPTATION

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ABSTRACT
This study examines the resiliency of residents in an earthquake-prone area. An Exploratory Factor Analysis (EFA) was conducted from the survey among 150 residents. Using a survey questionnaire, data were collected and analyzed through exploratory factor analysis to identify key components of resilience. The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's test of Sphericity were used in factor analysis to assess the suitability of the data for factor analysis, and a Scree Plot was used to graphically identify the optimal number of factors that can be extracted from the survey. Based on the findings, three factors were determined that contributes to the resiliency of the residents when using EFA. Particularly, psychological and social resilience, awareness and preparedness, and structural and community preparedness. This study highlights the interplay between social capital, risk perception and actionable preparedness, providing insights for policymakers and disaster management practitioners aiming to enhance earthquake resilience at both the individual and community levels.

Keywords:
Adaptation, Earthquake, Preparedness, Resiliency

INTRODUCTION

Earthquakes are among the most sudden and destructive natural hazards, capable of damaging homes, taking lives, destroying livelihoods, and permanently altering communities. In the Philippines, the risk of earthquakes is particularly high because the country lies along the Pacific Ring of Fire, a region known for frequent seismic activity. The country is traversed by several active fault systems, including the Western Philippine Fault, Eastern Philippine Fault, South of Mindanao Fault, Central Fault, and the Marikina Valley Fault. According to the Philippine Institute of Volcanology and Seismology (PHIVOLCS), an average of 20 earthquakes are recorded daily, or approximately 100–150 felt earthquakes annually (Ong et al., 2021).

Communities located near these active faults, especially in Mindanao and other high-risk areas, face ongoing threats to their safety and sources of livelihood. Although government and local agencies have implemented disaster preparedness programs, levels of readiness vary among residents. Community responses to earthquakes are shaped not only by the characteristics of the hazard but also by the level of vulnerability within the community (Ipong et al., 2020).

This study aims to examine how residents in earthquake-prone areas develop resilience in the face of disasters. It aligns with the College Research, Development, and Extension (RDE) agenda on Disaster Risk Reduction and Climate Resilience, as well as the MSDC agenda on communication for disaster preparedness and resilience. The findings may assist local leaders and organizations in designing more effective initiatives that promote safer, stronger, and more resilient communities. Furthermore, this study contributes to the achievement of the Sustainable Development Goals, particularly SDG 11 (Sustainable Cities and Communities) and SDG 13 (Climate Action).

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OBJECTIVES

This study aims to examine how residents living in earthquake prone areas build resilience by assessing their awareness, preparedness, social connections and ability adaptive capacities in relation to disaster risks. Specifically, the study seeks to answer the following questions:

1. What dimensions of resilience are present among residents living near the Lacson Fault Line?
2. What is the level of disaster preparedness among residents living near the Lacson Fault Line?
3. How residents adapt and cope with earthquakes events within their community?

Significance of the Study

The findings of the study are beneficial to the following:

Local Community- This study will help residents understand how prepared they are for earthquakes and encourage them to work together in keeping their families and the whole community safe.

Local Government Units- It will guide local leaders in creating disaster plans that directly respond to what the people in their communities need.

Educational Institutions- The study will help schools and teachers promote a culture of safety and preparedness among students and their respective community.

Future researchers- It will serve as a reference for future studies that aim to improve how communities adapt and recover from disasters.

Scope and Limitation

This study focuses on the people living in earthquake prone areas and aims to understand how prepared they are when facing earthquakes. The study will only focus to the Lacson community where the Lacson Fault line is located. It will include adult residents who have lived in the selected community for at least a year as they are more likely to have direct experience or knowledge of the local disaster conditions. Visitors, minors and individuals who recently moved into the area will be excluded from the study. The study will use a survey questionnaire as the main research instrument which may limit the depth of the responses since it relies on self-reported data. The research findings will therefore represent the specific context of the chosen community and may not be generalized to all earthquake prone areas in the country. Despite this identified limitations, the study aims to provide meaningful insights that can guide community programs in building resilient and prepared communities.

Definition of Terms

To understand and clarify the terms used in this study, the following terms are defined operationally:

Resilience- ability to prepare, adapt and recover from disasters.

Residents- this refers to the people living near the Lacson Fault line.

Earthquake prone area- this refers to the Lacson, Calinan Davao City where the Lacson Fault line is located and considered as the one area that experience frequent seismic activity.

Community preparedness- this focuses of the actions, knowledge and habits of the residents practice daily to stay safe when an earthquake takes place.

Adaptive strategies- the practical and creative ways people in the area adjust their lives to survive and recover from earthquakes.

Social Cohesion- this refers to the trust and willingness of neighbors to help each other during and after the disaster struck.

Education and Training- it focuses on lesson, drills or programs that helps prepare residents with the skills and confidence to safely face earthquakes.

Coping Mechanism- this refers to the actions that the residents use in order to handle stress and challenges caused by earthquakes.

Institutional support- this refers to the guidance and help provided by local government that will protect and assist focus community.

METHODOLOGY

This chapter discusses the Research design, Data Sources, Data collection tools, Sampling Method, Study Procedure and Statistical Data Analysis used in the study.

Research Design

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The study will employ a quantitative research design. According to Setia (2016), cross-sectional study measures the outcome and exposure in the study participants at the same time. This design is suitable because data are collected at a single point in time. This design is appropriate because it captures residents current levels of resilience, awareness, and preparedness rather than changes across time. It allows for the collection of measurable and numerical data that can be analyzed statistically, providing an objective assessment of how preparedness and adaptive capacities contribute to community resilience in earthquake-prone areas.

Data Sources

The primary sources of data will be the residents living in areas directly affected or situated close to the Lacson Fault Line. These residents have firsthand experiences with earthquake risks and local preparedness activities, making them suitable respondents for the study. Primary data will be collected through a structured survey questionnaire that measures disaster preparedness, adaptation practices and resiliency. This approach help the researcher assess residents exposure and existing disaster management efforts in the community.

Data Collection Tools

The primary instrument for data collection is a researcher-developed structured survey questionnaire designed by the researcher. As noted by Thomas and Zubkov (2023) survey design is often the tool used to collect data for correlation research. The questionnaire will be based on existing frameworks on disaster preparedness and community resiliency. Each item will be rated using a five point Likert scale ranging from “strongly disagree”(1) to “strongly agree” (5). The instrument underwent content validation by the research adviser and was pilot-tested among a small group of residents from nearby areas to ensure clarity appropriateness and reliability.

To identify the underlysing factors that influence the resiliency of residents living nearby the Lacson Fault line, the study utilized the Exploratory Factor Analysis (EFA), a statistical technique used to uncover latent constructs among observed variables (Fabrigar et al., n.d.). All analysis will be performed using Jamovi statistical software.

Sampling Method

A stratified random sampling technique was employed to select a total of 150 respondents to ensure equal representation of residents from different purok located along or near the Lacson Fault line for the survey questionnaire. Each purok will serve as a stratum and respondents will be randomly selected to enhance balance and minimize sampling bias. The sample size of 150 respondents is considered adequate for EFA. Eligible respondents were adult residents who had lived in the area for atleast one year and were familiar with earthquake related experiences and community preparedness programs.

Study Procedure

The study followed a systematic process. First, approval was obtained from the research adviser, followed by permission from the local government units and barangay officials in the communities near Lacson Fault Line. After authorization, the questionnaire was finalized, validates and pilot-tested to establish reliability.

The researcher personally administered the survey to selected respondents. Prior to participation, the purpose of the study was explained and respondents were assured that participation was voluntary and that all responses would be treated with confidentiality. Ethical considerations were strictly observed throughout the research process. Collected date were then organized, encoded and subjected to statistical analysis for interpretation and conclusion.

Statistical Data Analysis

The following statistical tools were utilized:

Exploratory Factor Analysis. This was used to measure the identified dimensions of resiliency of the residents in earthquake prone areas when assessing awareness and adaptation.

RESULTS AND DISCUSSION

Presented in this chapter are the results of the Jamovi as well as the interpretation and the analysis of the respective results. The tables were used to illustrate the findings of the study and the discussion and interpretation of tabular and graphical data were made for easy understanding.

Sampling Adequacy Requirement. The data gathered was subjected to Jamovi. The table 1 presents the analysis of the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy.

In this case, the result of the Kaiser-Meyer-Olkin provided a value of 0.643 which falls in the range of mediocre but acceptable for factor analysis. This suggest that while sample size and item correlations are sufficient for extracting meaningful factors, there is room for improvement in sampling adequacy or item

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selection. Therefore, it is reasonable to carry out the factor analysis. According to Kaiser (1974), accepting values higher than 0.6 are barely acceptable which indicates that there is no need to collect more data.

The KMO result confirms that the dataset is adequate for conducting exploratory factor analysis.

Table 1: KMO

KMO Measure of Sampling Adequacy	
	MSA
Overall	0.643

Table 2 presents the Bartlett's test of Sphericity, used in factor analysis to assess the suitability of the data for factor analysis. In relation, Bartlett's test of Sphericity yielded a chi-square value of 731 with 435 degrees of freedom and a significance level of less than 0.001 which means that the correlations between items are statistically significant and not an identity matrix confirming that the variable are related enough to perform factor analysis. Bartlett's test confirms that the correlation structure of the data supports factor extraction.

Table 2: Barlett's Test

Bartlett's Test of Sphericity		
χ^2	**df**	**p**
731	435	<.001

Meanwhile, the scree plot was used to graphically determine the number of the constructs that made the residents of the Lacson Fault line resilient.

Figure 2 demonstrate the utility of the scree plot in determining the optimal number of hidden items to retain in the analysis. Eigenvalues with a coefficient of one or above indicate the presence of three (3) distinct components in this analysis (Yong & Pearce, 2013) mentioned by (Jumilla, n.d.). The scree plot supports the extraction of three resilience dimensions.

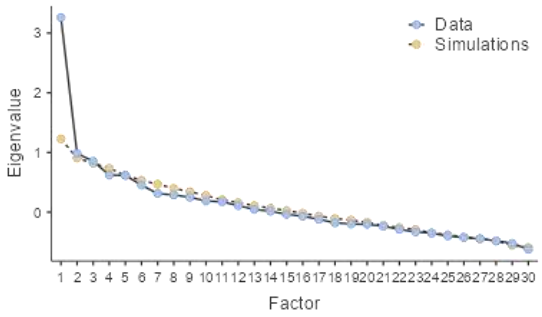

Figure 2. The Scree Plot

This study was made to develop a framework based on the dimensions of resiliency of the residents near Lacson Fault line as well as assessing community preparedness and adaptation. In relation, the first objective is to determine the different dimensions. By employing the Jamovi, three dimensions were extracted from the data collected through a 30-item survey questionnaire given to the respondents of the study.

Psychological and Social Resilience. Table 3 shows five items that fall under the first dimension, the psychological and social resilience and their corresponding coefficients. As shown, the item 'I encourage my family to stay calm and follow safety protocols during earthquakes' obtained the highest loading coefficient of 0.596. This is supported by succeeding items pertaining to psychological and social resilience of residence.

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The item 'I am willing to participate in future programs that aim to strengthen our community's resiliency' obtained a loading coefficient of 0.561. The item 'I remain calm and focused when dealing with earthquake-related challenges' obtained a loading coefficient of 0.526. The item 'I believe that preparedness helps reduce fear and panic during earthquakes' obtained a loading coefficient of 0.489. The item 'I trust that our community can work together to overcome earthquake impacts' obtained a loading coefficient of 0.428.

The findings if this study imply that residents resilience is rooted in emotional stability, preparedness-oriented thinking and trust in collective action, reinforcing the idea that psychological and social resilience emerges from both individual mindset and community cohesion. These results highlight the value of disaster education initiatives that improve community trust, family communication and emotional coping abilities in order to increase earthquake resistance.

This findings affirms with Aldrich and Meyer (2015) that social infrastructure and social capital are central to disaster resilience rather than reliance on physical infrastructure alone. Moreover, residents willingness to participate in community programs, belief in preparedness and trust in community cooperation further claim that resilience is strengthened through social networks, shared norms and collective action. In summary, psychological and social resilience among residents is driven by emotional control, preparedness beliefs and strong community trust.

Table 3: Rotated Matrix with Group Attributes under Psychological and Social Resilience.

Item No.	Attributes	Factor Score	Dimension
17	I encourage my family to stay calm and follow safety protocols during earthquakes.	0.596	Psychological and Social Resilience
30	I am willing to participate in future programs that aim to strengthen our community's resiliency.	0.561	
25	I remain calm and focused when dealing with earthquake-related challenges.	0.526	
29	I believe that preparedness helps reduce fear and panic during earthquakes.	0.489	
24	I trust that our community can work together to overcome earthquake impacts.	0.428	

Awareness and Preparedness. Table 4 shows four items that fall under the second dimension, the awareness and preparedness and their corresponding coefficients. As shown, the item 'I am aware that my home is located near the Fault Line' obtained the highest loading coefficient of 0.487. This is supported by succeeding items pertaining to awareness and preparedness of residence.

The item 'I know the nearest evacuation site in my community' obtained a loading coefficient of 0.477. The item 'I make sure important documents are kept in a safe and easy-to-carry place' obtained a loading coefficient of 0.453. The item 'I feel confident that our barangay is ready to respond in case of an earthquake' obtained a loading coefficient of 0.405

The findings if this study imply that awareness and practical preparedness behaviors are key components of residents' earthquake resilience. The highest factor score suggest that understanding personal exposure to hazard is the strongest indictor of preparedness as it shaped how individuals perceive risk and motivates protective action. In general, the pattern of score suggests that preparedness is not only about having plans and resources but also about knowing one's risks, knowing what to do and believing that the community can respond effectively.

These findings affirms with the point of (Demir & Aydemir, 2025) that perceived barriers, fatalism and limited behavioral control can prevent individuals from acting on their knowledge. This supports that preparedness requires both knowledge and empowerment. Additionally, it suggest that interventions should not only provide information but also enable residents to move from awareness to action addressing psychological and social factors that influence earthquake preparedness. In summary, awareness of risk and confidence in community response play a crucial role in shaping preparedness behaviors.

Table 4: Rotated Matrix with Group Attributes under Awareness and Preparedness

Item	Attributes	Factor Score	Dimension

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No.			
1	I am aware that my home is located near the Fault Line.	0.487	Awareness and Preparedness
5	I know the nearest evacuation site in my community.	0.477	
16	I make sure important documents are kept in a safe and easy-to-carry place.	0.453	
10	I feel confident that our barangay is ready to respond in case of an earthquake.	0.405	

Structural and Community Adaptation. Table 5 shows 3 items that fall under the third dimension, the awareness and preparedness and their corresponding coefficients. As shown, the item 'I participate in community programs related to disaster preparedness and risk reduction' obtained the highest loading coefficient of 0.393. This is supported by succeeding items pertaining to awareness and preparedness of residence.

The item 'I consider earthquake risks when planning home improvements or repairs' obtained a loading coefficient of 0.377. The item 'I have made adjustments in my home's structure to make it safer during earthquakes' obtained a loading coefficient of 0.307.

The findings if this study imply that active engagement in disaster preparedness and risk reduction is present but moderate among residents with community participation being the strongest indicator in this dimension. This further imply that residents are more likely to participate in social, community-based preparedness initiatives than to proactively invest in structural or personal safety improvements, indicating the need to increase awareness as well as the ability and drive to convert this awareness into practical, home-level preparedness measures.

The findings affirm on the study of (Türkdoğan Görgün & Mclennan, 2024) that participation in safety meetings, exposure to educational materials and prior earthquake experiences were associated with higher preparedness. The weak relationship between risk perception and physical preparedness reported this the study also resonates with the lower score for home adjustments. This suggest that awareness alone does not automatically translate into action. In summary, community participation is stronger than household-level structural adaptation, highlighting the need to translate awareness into physical preparedness.

Table 5: Rotated Matrix with Group Attributes under Structural and Community Adaptation.

Item No.	Attributes	Factor Score	Dimension
13	I participate in community programs related to disaster preparedness and risk reduction.	0.393	Structural and Community Adaptation
18	I consider earthquake risks when planning home improvements or repairs.	0.377	
11	I have made adjustments in my home's structure to make it safer during earthquakes.	0.307	

Psychological and Social Resilience. This reflects how well residents cope with stress, recover from trauma and support one another when earthquake strike. It measures people's emotional and mental strength as well as social networks in the community. This factor is crucial because earthquakes don't just damage buildings but also affect people's feelings, thoughts and relationship. Research shows that people with higher resilience after disaster tend to experience lower levels of anxiety and distress and better mental well-being that helps them face future risk. For example, the study of (Yılmazer, 2025) found that those with stronger resilience had fewer psychological problems like PTSD and were more likely to adapt and recover effectively after disaster. Further, emotional coping and social support are vital foundations of disaster resilience.

Awareness and Preparedness. This factor focuses on how much people know about earthquake and how ready they are before it occur. This includes knowing that they live in an earthquake-prone area, understanding what to

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do when an earthquake occurs. This factor is necessary because awareness leads to action. However, recent studies show that lack of awareness remains a big issue in high-risk areas. In connection, Nagarkoti (2025) found that a high percentage of residents could not even tell the difference between a hazard and a disaster and many had never participated in drills. Additionally, awareness is necessary but must be paired with action-oriented preparedness.

Structural and Community Adaptation. It refers to the physical and organized changes that help communities live safely in earthquake-prone areas. This includes earthquake resistant construction, community planning, adaptation if houses and infrastructure, local policies for safer buildings and communal strategies to easily recover. Studies on community adaptation emphasize that resilience is not just about individual or household readiness. According to Lin et al. (2025) disaster adaptation frameworks focus on evaluating infrastructure and planning improvements that make communities stronger against seismic threats. In general, long-term resilience depends on both individual readiness and community-level structural adaptation.

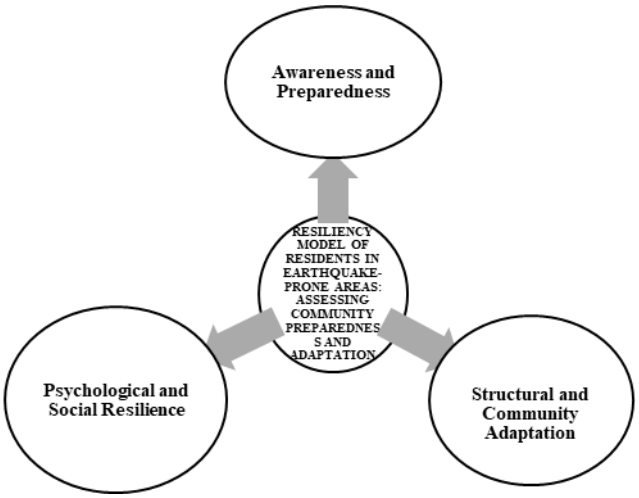

Figure 3. Resiliency Model of Residents in Earthquake-Prone Areas: Assessing Community Preparedness and Adaptation.

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CONCLUSION

This quantitative research identified a resiliency model among residents in earthquake-prone areas by also assessing community preparedness and adaptation. Using thirty-item (30) survey questionnaire was administered to one hundred fifty respondents. The result of KMO value is 0.643, surpassing the suggested value of 0.5 and Bartlett's test demonstrated that the p-value is statistically significant ($p<0.001$), suggesting the presence of structured relationship in the data. The findings of the study reveal three significant dimensions that made the residents in the Lacson Fault Line resilient: Psychological and Social Resilience, Awareness and Preparedness, and Structural and Community Adaptation.

The results have important implications for local Government Units (LGUs) and Disaster Risk Reduction and Management (DRRM) Offices. Strengthening disaster education programs, promoting regular drills, enhancing community participation, and encouraging household-level structural safety measures can significantly improve overall resilience.

RECOMMENDATIONS

Based on the findings and conclusions discussed above, the following recommendation are formulated:

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- The Local Community should support one another, share safety tips and take part in community drills or preparedness programs. Simple actions like making an emergency kit, knowing evacuation routes and checking your homes for earthquake safe structures can make a big difference. Remember to stay calm, informed and connected as it helps everyone to recover faster when disaster strike.
- The Local Government Unit should continue strengthening disaster preparedness programs and ensure that infrastructure is safe and resilient. Providing accessible training sessions, emergency drills and clear evacuation plans can help communities stay ready.
- Educational Institutions can play a key role in teaching students about earthquake safety and disaster preparedness. Integrating disaster awareness into lesson, conducting regular drills and organizing community outreach projects can build knowledge and confidence.
- Future Researchers may use the result of the study as a baseline information in working for future research attempts that investigate the resilience of residents in an earthquake prone area specially their awareness and adaptation. They can expand this research by including more communities or exploring additional factors that affects resilience such as technology use, economic resources or social media in disaster communication.

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