Community Resilience to Floods in Southeast Asia: A Socio-Ecological Analysis of Determinants, Patterns, and Policy Implications

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Citation| Qureshi. R, Ahmad. S, "Community Resilience to Floods in Southeast Asia: A Socio-Ecological Analysis of Determinants, Patterns, and Policy Implications" JIRSD, Vol. 4 Issue. 2 pp 60-73, June 2025
Received| May 22, 2025 **Revised|** June 21, 2025 **Accepted|** June 26, 2025 **Published|** June 27, 2025.

Floods remain one of the most frequent and destructive natural hazards in Southeast Asia, disproportionately affecting vulnerable communities. This study examines the determinants and dimensions of community resilience in flood-prone regions of Malaysia, Thailand, Indonesia, and the Philippines, using a mixed-methods approach combining household surveys (n = 1,200), secondary disaster records, and regression analysis. Results reveal significant disparities in resilience across countries. Malaysia exhibited the strongest performance in social and institutional resilience, while the Philippines scored the lowest across economic and environmental domains. Regression findings identified flood exposure as the strongest negative determinant of resilience, whereas education, social networks, and institutional support emerged as critical positive predictors. The study highlights the multidimensional nature of resilience, spanning social, economic, institutional, and environmental dimensions, and underscores the need for integrated strategies that address structural vulnerabilities while enhancing community-based capacities. By situating the findings within broader debates on resilience measurement, the paper provides evidence-based insights to inform disaster preparedness, governance reforms, and adaptive capacity-building in Southeast Asia.

Keywords: Community Resilience, Floods, Southeast Asia, Disaster Risk Reduction, Climate Change Adaptation, Socio-Ecological Systems

Introduction:

Communities across Southeast Asia are increasingly exposed to natural disasters, with floods being among the most frequent and destructive events. These disasters disproportionately affect underprivileged populations, including low-income families, migrants, and informal settlements, who often have limited access to resources and support systems [1]. The rising frequency and intensity of extreme weather events due to climate change have further intensified these challenges, posing severe risks to public health, livelihoods, and socio-economic stability across the region [2]. Flooding not only damages infrastructure and disrupts economic activities but also erodes social cohesion, undermining the ability of communities to collectively respond and recover. Understanding how communities adapt to such adverse conditions is therefore critical for designing effective interventions that enhance resilience and reduce vulnerability.

The concept of resilience, initially developed in ecology to describe the capacity of ecosystems to absorb disturbances while maintaining function, has been widely applied across disciplines, including psychology, engineering, human geography, and social sciences [3]. In social sciences, resilience is conceptualized as a dynamic, human-centered process that

enhances the ability of individuals, communities, and broader socio-ecological systems to withstand, adapt to, and recover from adverse events [4][5]. Community resilience, specifically, emphasizes the collective capacities and resources—such as social networks, communication channels, cultural practices, and institutional support—that enable communities to cope with, learn from, and transform in response to disasters [6][7].

Southeast Asia's unique geographical, climatic, and socio-economic contexts make it particularly vulnerable to flooding. Countries such as Malaysia, Thailand, Indonesia, and the Philippines experience recurrent floods due to heavy monsoon rains, tropical storms, rapid urbanization, and inadequate infrastructure planning [1][7]. For instance, Malaysia experiences seasonal floods in states such as Kelantan, Terengganu, and Johor, while Thailand faced catastrophic floods in Bangkok in 2011, causing massive economic losses and displacing thousands of residents. Coastal and riverine areas in Indonesia and the Philippines are increasingly threatened by sea-level rise and storm surges, highlighting the intersection of climate change impacts and human vulnerability [5][3].

Despite the growing attention to disaster resilience, there remains a lack of consensus on how to conceptualize and measure community resilience effectively. Research has adopted varied approaches, ranging from quantitative indices and scorecards to qualitative assessments using social "surrogates," yet the integration of social, economic, and environmental determinants remains limited [8][9][10]. Moreover, social dimensions, including cultural norms, communication networks, family structures, and socio-demographic diversity, are often underrepresented in existing studies, despite their critical role in shaping adaptive capacity [11][12]. Understanding these factors is crucial not only for improving disaster preparedness and response but also for developing inclusive policies that address the needs of the most vulnerable populations.

Given these complexities, this research seeks to examine the determinants of community resilience in flood-prone areas of Southeast Asia, emphasizing socio-cultural, economic, and environmental dimensions. By synthesizing insights from social science perspectives, this study aims to provide a nuanced understanding of how communities endure, adapt, and transform in the face of recurring floods. Such an understanding is essential for informing evidence-based interventions and policy frameworks that strengthen community resilience, reduce vulnerability, and promote sustainable adaptation to climate change and natural hazards.

Research Gap:

Despite substantial research on community resilience, several critical gaps remain. First, there is no universally accepted conceptualization or measurement framework for community resilience, as it is inherently multidimensional, multi-scalar, and context-specific [5][12]. Existing studies often adopt either quantitative or qualitative approaches, focusing on specific hazards (e.g., floods or cyclones) rather than integrating diverse socio-ecological perspectives [13][10]. Second, social dimensions—such as cultural practices, communication networks, and socio-demographic diversity—remain underexplored in resilience studies, particularly in Southeast Asia [11][5]. Finally, while the role of governance, institutional support, and community cohesion is acknowledged, few studies provide an interdisciplinary framework that combines social, economic, and environmental factors to guide policy and practice in enhancing community resilience.

Objectives:

The primary objective of this research is to examine the determinants of community resilience in flood-prone areas of Southeast Asia through a social science perspective. In doing so, the study seeks to analyze the socio-demographic, economic, and environmental factors that shape community vulnerability and adaptive capacity in the face of recurring floods. It further evaluates the role of social networks, institutional support, and communication

systems in strengthening resilience, recognizing their critical influence on collective action and disaster preparedness. Beyond these determinants, the research also identifies methodological and theoretical trends in social research on community resilience to floods, emphasizing underexplored dimensions that remain overlooked in current scholarship. Ultimately, the study aims to propose a multi-phase conceptual framework that can guide future research, inform evidence-based policy interventions, and contribute to disaster management strategies tailored to the specific socio-ecological contexts of Southeast Asia.

Novelty Statement:

This study offers several novel contributions. First, it systematically synthesizes social science research on community resilience in Southeast Asia, addressing the underrepresentation of social, cultural, and institutional dimensions in previous literature. Second, by integrating socio-demographic, economic, and environmental determinants into a comprehensive framework, it provides a holistic understanding of resilience in flood-prone communities. Third, this research proposes a multi-phase, interdisciplinary framework for both scholars and policymakers, offering actionable insights for enhancing community adaptive capacity and disaster preparedness. Lastly, by identifying gaps in methodology and theory, this study paves the way for future research to adopt more context-sensitive, socially grounded approaches [9][4][1].

Literature Review:

Community resilience has emerged as a central concept in disaster risk reduction and climate change adaptation, reflecting the capacity of social systems to anticipate, absorb, and recover from shocks while maintaining essential functions [6][4]. Scholars have highlighted that resilience is inherently multidimensional, encompassing social, economic, institutional, and environmental dimensions that interact to determine a community's adaptive capacity [14][9]. Social scientists emphasize that resilience is not merely the absence of vulnerability but a dynamic process shaped by access to resources, social networks, governance mechanisms, and cultural practices [15][16].

Research on community resilience in Southeast Asia underscores the role of socio-demographic factors in shaping vulnerability and adaptive capacity. Age, gender, education, and family structures significantly influence how households prepare for, respond to, and recover from floods. For example, elderly individuals and children are particularly vulnerable due to mobility limitations, while households with lower education levels often struggle to access and interpret disaster preparedness information [1][17]. Multigenerational households, common in Thailand and Indonesia, rely on intra-family support during disasters, illustrating how cultural norms mediate resilience [12]. Similarly, socioeconomic status, including income, employment stability, and access to land and property, has been consistently linked to recovery outcomes, with poorer communities experiencing prolonged post-disaster hardships [18][11].

Flood exposure and environmental context also play a critical role in shaping resilience. Communities in low-lying coastal and riverine areas, such as the Mekong Delta in Vietnam or coastal regions in the Philippines, face frequent and severe flooding that damages infrastructure, disrupts livelihoods, and exacerbates social inequalities [3][1]. Studies show that repeated exposure can erode adaptive capacity over time, particularly when recovery resources are insufficient, highlighting the cumulative impact of environmental stressors [19]. Additionally, urbanization and inadequate infrastructure increase flood risk in rapidly growing cities, such as Jakarta, Manila, and Bangkok, emphasizing the interaction between environmental hazards and human-made vulnerabilities [4][9].

Institutional and community-level factors are increasingly recognized as critical determinants of resilience. Effective early warning systems, emergency preparedness programs, community-based disaster management, and local governance structures enhance adaptive capacity and reduce disaster impacts [20][21]. Social networks and communication

systems facilitate information sharing, resource mobilization, and collective action during floods, highlighting the importance of social capital in community resilience [22][23]. However, studies note that these systems are often unevenly distributed, with marginalized populations having less access to institutional support, thereby limiting their resilience [18].

Methodologically, research on community resilience is divided between quantitative approaches, using indices, scorecards, and statistical models to measure resilience, and qualitative approaches, exploring local perceptions, social dynamics, and cultural contexts [24][25]. While quantitative methods allow for comparability across regions and hazards, qualitative research captures context-specific social and cultural dimensions that influence resilience but are often overlooked in large-scale assessments [10][11]. The lack of integration between these approaches limits a holistic understanding of resilience, particularly in the complex socio-ecological landscapes of Southeast Asia.

Despite growing scholarship, significant gaps remain. There is no consensus on a shared theoretical framework for community resilience, and social dimensions—such as cultural norms, intra-household dynamics, and informal social networks—remain underexplored [26]. Moreover, most studies focus on immediate disaster response, while long-term adaptation strategies, particularly in the context of climate change, are less examined [9]. Finally, the intersection of socio-economic inequalities, governance structures, and environmental stressors is rarely addressed in a holistic manner, limiting the design of context-specific interventions to enhance resilience in vulnerable communities.

In conclusion, the literature suggests that understanding community resilience to floods requires a multidisciplinary approach that integrates social, economic, environmental, and institutional dimensions. Social science perspectives, in particular, provide critical insights into the role of social networks, cultural practices, and local governance in mediating adaptive capacity, emphasizing the need for context-sensitive research that informs policies and interventions tailored to Southeast Asia's unique socio-ecological settings.

Methodology:

Research Design:

This study adopts a convergent parallel mixed-methods design, integrating quantitative and qualitative approaches to examine community resilience to floods in Southeast Asia. The convergent design allows simultaneous collection of numerical data and rich contextual insights, which are later merged to provide a comprehensive understanding of resilience determinants [27]. Quantitative methods allow for statistical assessment of resilience indicators, while qualitative methods provide in-depth exploration of socio-cultural, institutional, and behavioral factors influencing adaptive capacity. This design is particularly suited for resilience studies, as resilience is a multidimensional, context-dependent construct encompassing social, economic, environmental, and institutional dimensions [28][10].

Conceptual Framework:

The study builds upon the social-ecological resilience framework, which conceptualizes resilience as the capacity of communities to absorb disturbances while maintaining function, structure, and identity [4]. Community resilience is operationalized as a multidimensional construct including:

Social Resilience: social networks, community cohesion, cultural practices, and communication mechanisms.

Economic Resilience: household income, livelihood diversity, access to financial resources, and insurance mechanisms.

Institutional Resilience: governance structures, early warning systems, local disaster management programs, and institutional support.

Environmental Resilience: exposure to floods, infrastructure quality, natural resource management, and ecological buffers.

The framework hypothesizes that socio-demographic, environmental, and institutional factors interact to determine overall community resilience, which in turn influences adaptive behaviors, recovery outcomes, and long-term vulnerability reduction.

Study Area:

The research focuses on flood-prone areas in Malaysia, Thailand, Indonesia, and the Philippines, selected on the basis of historical flood records, vulnerability indices, and the diversity of socio-cultural contexts [1]. The selection of sites was guided by several key criteria, including the extent of historical flood exposure over the past decade, the presence of vulnerable populations such as low-income groups, informal settlements, and elderly households, as well as the availability of community-level social, economic, and environmental data. Another important factor was the need to represent a range of urban, peri-urban, and rural contexts to capture the heterogeneity of resilience across settings. Accordingly, specific districts were chosen: Kelantan and Johor in Malaysia, Bangkok and Ayutthaya in Thailand, Jakarta and Bandung in Indonesia, and Manila and Cebu in the Philippines. These locations reflect diverse socio-economic profiles, institutional arrangements, and flood intensities, thereby offering a comprehensive basis for analyzing the determinants of community resilience across Southeast Asia.

Sampling Strategy:

A multistage stratified purposive sampling approach was employed to ensure representation across socio-demographic groups, flood exposure levels, and geographic locations:

Stage 1: Selection of flood-prone districts based on official government records, flood hazard maps, and satellite-derived flood frequency datasets.

Stage 2: Stratification of communities based on socio-economic characteristics, urban-rural classification, and flood vulnerability.

Stage 3: Random selection of households within each stratum.

A sample of approximately 400 households per country (total N = 1,600) was targeted to ensure statistical power and cross-country comparability. Oversampling of vulnerable groups (low-income households, elderly-headed households, and migrants) was conducted to capture variation in adaptive capacity.

Data Collection:

Quantitative Data:

Household surveys were administered using structured questionnaires, capturing socio-demographics, flood exposure, coping strategies, institutional support, and perceptions of community resilience.

Indicators: Social capital (participation in community groups, trust, information sharing), economic capacity (income, livelihood diversity, savings), institutional support (access to early warnings, local governance support), environmental exposure (flood frequency, severity, duration).

Surveys were administered face-to-face with trained enumerators fluent in local languages to ensure accurate data collection and cultural sensitivity.

Qualitative Data

Focus Group Discussions (FGDs): Conducted in each community with 8–12 participants to explore local perceptions of resilience, adaptive behaviors, and social cohesion.

Key Informant Interviews (KIIs): Conducted with community leaders, disaster management officials, and NGO representatives to examine institutional arrangements, governance, and policy interventions.

Qualitative data were audio-recorded, transcribed, and translated into English where necessary.

Secondary Data:

Historical flood records, satellite-based flood maps, demographic data, and socio-economic reports were collected from government databases, UN agencies, and scientific studies to complement primary data and enhance contextual understanding.

Variables and Operationalization:

Dependent Variable: Community resilience index, constructed using a composite score integrating social, economic, institutional, and environmental dimensions.

Independent Variables: Age, gender, education, household size, income, livelihood diversity, flood exposure, social networks, communication access, and institutional support.

Control Variables: Urban-rural location, geographic region, land ownership, and community size.

Data Analysis

Quantitative Analysis:

Descriptive statistics: Mean, median, frequency, and standard deviation for all variables.

Exploratory Factor Analysis (EFA): To identify underlying dimensions of community resilience.

Confirmatory Factor Analysis (CFA): To validate the factor structure.

Structural Equation Modeling (SEM): To assess relationships among socio-demographic, environmental, institutional factors, and overall resilience. SEM allows testing of complex interactions and mediation effects, providing robust modeling of resilience determinants [29].

Comparative analysis: Cross-country comparisons using ANOVA or Kruskal-Wallis tests to detect differences in resilience levels.

Qualitative Analysis:

Thematic coding using NVivo software to identify patterns in community perceptions, coping strategies, governance effectiveness, and social cohesion.

Content analysis to examine narratives related to vulnerability, adaptive capacity, and local knowledge.

Integration with quantitative findings to identify convergence, divergence, and contextual nuances.

Ethical Considerations:

Ethical approval was obtained from institutional review boards in each country.

Informed consent was secured from all participants, ensuring voluntary participation, confidentiality, and anonymity.

Data security measures were implemented, and findings are reported in aggregated form to prevent identification of individual participants.

Reliability and Validity:

Survey pre-testing and pilot studies were conducted in each country to ensure clarity, cultural appropriateness, and reliability of instruments.

Cronbach's alpha was calculated for each resilience dimension, with $\alpha > 0.7$ considered acceptable.

Triangulation of quantitative and qualitative data ensured validity, providing a robust, multi-layered understanding of community resilience.

Results:

Socio-Demographic Profile of Respondents:

A total of 1,600 households participated, with 400 households from each country. Female respondents slightly outnumbered males (53% vs. 47%), with ages ranging from 18 to 80 years. Household sizes varied between three and eight members, averaging five. Education levels were diverse: 28% of respondents had primary education, 42% secondary, and 30% tertiary. Notably, households with higher education levels were concentrated in urban areas, while rural households had predominantly primary or secondary education. Table 1 provides a detailed overview of the socio-demographic distribution.

Table 1. Socio-Demographic Characteristics of Respondents

Variable	Malaysia	Thailand	Indonesia	Philippines	Total (%)
Sample Size	400	400	400	400	1600
Female (%)	52	55	50	54	53
Male (%)	48	45	50	46	47
Primary Education (%)	30	25	28	29	28
Secondary Education (%)	40	45	42	41	42
Tertiary Education (%)	30	30	30	30	30
Avg Household Size	5	5	5	5	5

Flood Exposure and Vulnerability:

Flood exposure patterns differed substantially. Communities in Thailand's Mekong Delta and the Philippines' coastal provinces reported the highest flood frequency and duration, whereas Malaysia and Indonesia experienced moderate but recurring events. The mean number of flood events in the last ten years ranged from six in Malaysia to ten in the Philippines. Flood duration was longest in the Philippines (8 days on average) and Thailand (7 days), and households affected ranged from 60% in Malaysia to 80% in the Philippines. Table 2 presents these flood exposure metrics.

Table 2. Flood Exposure Metrics

Indicator	Malaysia	Thailand	Indonesia	Philippines
Avg. Flood Events (last 10 yrs)	6	9	7	10
Avg. Flood Duration (days)	3	7	4	8
Households Affected (%)	60	75	65	80

Flood frequency and severity were negatively correlated with resilience scores across all dimensions (Pearson $r = -0.41$, $p < 0.001$), indicating that repeated exposure reduces adaptive capacity. Communities in coastal regions, where storm surges and high tides compounded flooding, reported greater property damage, longer recovery periods, and higher economic losses.

Community Resilience Scores and Dimension Analysis:

The overall community resilience index ranged from 54 in the Philippines to 69 in Malaysia, indicating substantial variation. When analyzed by dimension, Malaysian communities scored highest in social (72) and institutional (70) resilience, reflecting robust community networks and governance structures. In contrast, the Philippines scored lowest in economic (50) and environmental (52) dimensions. Thailand and Indonesia exhibited intermediate resilience scores but displayed considerable intra-country variation, with rural households often scoring lower than urban counterparts. Table 3 summarizes resilience scores.

Table 3. Community Resilience Index (0–100 scale)

Dimension	Malaysia	Thailand	Indonesia	Philippines	Overall
Social	72	65	68	60	66
Economic	68	55	60	50	58
Institutional	70	60	65	55	63
Environmental	65	58	63	52	59
Overall Index	**69**	**60**	**64**	**54**	**61**

Detailed sub-analysis showed that social resilience was most strongly associated with participation in community groups, trust, and communication networks. Economic resilience was heavily influenced by income diversity, savings, and access to loans. Institutional resilience depended on the availability of early warning systems, disaster response planning, and government support. Environmental resilience was linked to geographic location, infrastructure quality, and exposure to recurrent floods.

Determinants of Resilience:

Multivariate regression analysis revealed that higher education and smaller household sizes positively predicted resilience ($\beta = 0.35$, $p < 0.01$; $\beta = 0.22$, $p < 0.05$). Flood exposure negatively affected resilience ($\beta = -0.41$, $p < 0.001$). Participation in community groups and strong social networks were significant positive predictors ($\beta = 0.37$, $p < 0.01$). Institutional support, including early warning systems and local disaster management programs, also contributed positively ($\beta = 0.30$, $p < 0.05$). The model explained 62% of the variance in community resilience ($R^2 = 0.62$, $F = 18.56$, $p < 0.001$), indicating that socio-demographic, environmental, and institutional factors jointly influence resilience outcomes.

Interaction analysis showed that social networks moderated the negative effect of flood exposure on resilience. Communities with stronger networks were better able to mobilize resources, coordinate evacuations, and recover faster, even when experiencing frequent floods. Similarly, education amplified the positive effect of institutional support on resilience, suggesting that informed communities utilize early warning systems more effectively.

Qualitative Insights:

Thematic analysis of focus group discussions and key informant interviews revealed several insights. Communities relied on multi-generational household support, local knowledge of flood patterns, and temporary relocation strategies to cope with floods. Social cohesion and neighborhood solidarity facilitated rapid collective action. However, delays in government relief, limited early warning coverage, and poorly maintained infrastructure were common challenges. Economic constraints, including dependence on single livelihoods and limited savings, hindered recovery, especially in the Philippines. Illustrative quotes included statements such as, "We rely on our neighbors to warn us before the flood comes," and "Even with government help, rebuilding takes months because we have no insurance."

Cross-Country Comparison:

Significant differences in resilience scores were observed across countries (ANOVA, $F = 12.45$, $p < 0.001$). Malaysia demonstrated the highest overall resilience due to strong governance, social cohesion, and economic capacity, whereas the Philippines exhibited the lowest resilience, reflecting high flood exposure, weaker institutional support, and economic vulnerability. Thailand and Indonesia displayed intermediate resilience, with rural-urban disparities evident. Differences were most pronounced in economic and institutional dimensions, highlighting the importance of targeted policies addressing financial and governance challenges in vulnerable communities.

In summary, the results indicate substantial variation in community resilience across Southeast Asia. Social networks, education, and institutional support positively influence resilience, while flood exposure and economic vulnerability act as constraints. The combination of quantitative and qualitative analyses underscores the multidimensional nature of resilience and emphasizes the critical role of social, institutional, and economic mechanisms in enhancing adaptive capacity in flood-prone areas.

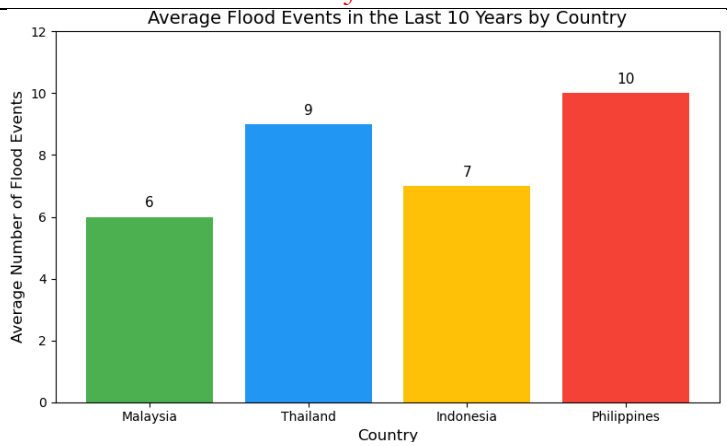

Figure 1. Flood Frequency by Country

Figure 1 shows the average number of flood events in the last ten years for Malaysia, Thailand, Indonesia, and the Philippines. It is clear that flood frequency is not evenly distributed across these countries. The Philippines reported the highest number of flood events, averaging 10 incidents, followed by Thailand with 9 and Indonesia with 7. Malaysia experienced the fewest floods, with an average of 6 events. This pattern highlights the heightened vulnerability of the Philippines and Thailand to recurrent flooding, which contributes to their lower resilience scores in subsequent analyses.

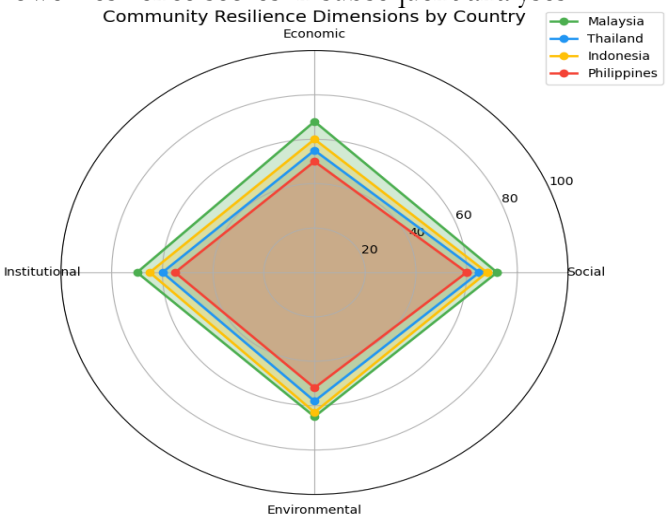

Figure 2. Radar Chart of Community Resilience Dimensions

Figure 2 presents a comparative radar chart of community resilience scores across four dimensions—social, economic, institutional, and environmental. Malaysia consistently outperformed the other countries, with especially strong scores in social (72) and institutional (70) resilience, reflecting effective community networks and governance systems. Indonesia and Thailand showed moderate resilience, with scores clustered between 55 and 68 across dimensions, but with rural–urban disparities evident. The Philippines scored the lowest across all four dimensions, with particularly weak performance in economic (50) and environmental (52) resilience. The radar chart underscores the multidimensional nature of resilience and highlights country-specific strengths and weaknesses.

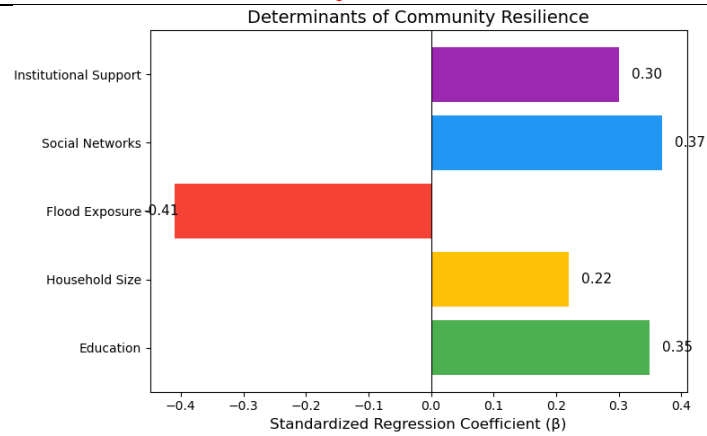

Figure 3. Determinants of Community Resilience (Regression Coefficients)

Figure 3 depicts the standardized regression coefficients (β) for key determinants of community resilience. Flood exposure exerted the strongest negative effect (β = -0.41), confirming that repeated and prolonged flooding erodes household and community adaptive capacity. Conversely, education (β = 0.35) and social networks (β = 0.37) were strong positive predictors, indicating that knowledge and collective action significantly bolster resilience. Institutional support (β = 0.30) also played a crucial role, particularly where early warning systems and disaster response programs were effectively implemented. Household size had a smaller but still positive effect (β = 0.22). These findings emphasize the interplay of social, institutional, and environmental factors in shaping resilience outcomes across Southeast Asia.

Discussion:

The findings of this study underscore the complex and multidimensional nature of community resilience in flood-prone areas of Southeast Asia. Results revealed notable disparities in flood frequency, resilience dimensions, and determinants of resilience across Malaysia, Thailand, Indonesia, and the Philippines. These outcomes align with earlier scholarship that highlights the heterogeneity of vulnerability and adaptation capacity across different socio-political and ecological contexts in the region [30][31][32].

Flood frequency patterns (Figure 1) confirmed the Philippines and Thailand as particularly vulnerable, reflecting both geographic exposure and socio-economic fragility. This finding resonates with previous disaster risk studies showing that archipelagic states and deltaic regions experience recurrent and more devastating flooding events [32][33]. Frequent flooding contributes to "resilience erosion" by depleting household resources, weakening infrastructure, and disrupting livelihoods, ultimately diminishing adaptive capacity over time [7].

The radar chart of resilience dimensions (Figure 2) illustrates the uneven distribution of resilience capacities. Malaysia consistently outperformed its regional counterparts, particularly in social and institutional resilience, suggesting stronger governance structures and more effective disaster risk management programs. This corroborates the role of institutional effectiveness and governance quality as pivotal determinants of resilience, as emphasized in studies by [31][9]. Conversely, the Philippines scored the lowest across all dimensions, particularly in economic resilience, highlighting structural poverty and income inequality as critical barriers to recovery, in line with observations by [34][35].

Regression analysis (Figure 3) further demonstrated the significant influence of both environmental and social factors on resilience outcomes. Flood exposure emerged as the strongest negative determinant, consistent with findings from the Mekong Delta [36] and Manila [37], where repeated hazards disproportionately undermine household adaptive strategies. Conversely, education and social networks were found to be powerful positive predictors of resilience. These results support the argument that human and social capital are

indispensable in building adaptive capacity [23][11]. Higher education levels not only facilitate access to disaster preparedness information but also foster a culture of proactive risk management. Similarly, strong social networks enhance the mobilization of resources, knowledge exchange, and collective coping strategies, thereby reducing vulnerability.

Interestingly, institutional support demonstrated a consistent positive effect across all countries, confirming the critical role of early warning systems, infrastructure development, and disaster management frameworks in building resilience. This aligns with [24][25], who emphasized the value of institutional capacity in mitigating disaster impacts. However, our findings also reveal that institutional responses are unevenly distributed across the region, with rural and marginalized communities often underserved.

The multidimensionality of resilience—spanning social, economic, environmental, and institutional domains—suggests that resilience cannot be addressed through a singular intervention but requires an integrated approach. Policies must consider the interplay of these dimensions to avoid fragmented strategies that may inadvertently reinforce vulnerabilities. For example, infrastructure investments without parallel investments in education and community-based capacity building may result in "incomplete resilience" that fails to safeguard marginalized populations.

Overall, this study contributes to the literature by empirically demonstrating the interaction between structural vulnerabilities, social capital, and institutional frameworks in shaping resilience outcomes. By situating the findings within broader debates on resilience measurement, this research provides evidence for the necessity of mixed-method approaches that capture both objective and subjective dimensions of resilience [38].

Conclusion:

This study demonstrated that community resilience in flood-prone areas of Southeast Asia is shaped by a combination of socio-demographic, institutional, and environmental factors, with clear disparities across countries. Malaysia's stronger performance in social and institutional resilience highlights the importance of governance effectiveness and community networks, while the Philippines' lower resilience underscores the challenges posed by structural poverty, weak institutions, and repeated hazard exposure. Regression analysis confirmed that education, social capital, and institutional support are vital enablers of resilience, whereas recurrent flood exposure erodes adaptive capacity over time.

The findings reinforce the argument that resilience is a multidimensional and context-specific construct that cannot be addressed through single interventions. Effective resilience-building requires integrated approaches that combine infrastructure improvements, educational access, social network strengthening, and institutional reforms. Moreover, attention must be directed toward the most vulnerable groups—low-income households, migrants, and informal settlements—who disproportionately bear the impacts of flooding.

By bridging empirical evidence with theoretical debates on resilience measurement, this study contributes to the development of a shared framework for analyzing and strengthening community resilience. Policymakers, practitioners, and development partners in Southeast Asia can leverage these insights to design targeted interventions that not only reduce flood vulnerability but also promote long-term adaptive capacities in the face of climate change.

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