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Adaptive capacity, vulnerability, and community resilience in selected relocated coastal barangays in a Philippine municipality

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ABSTRACT

Building resilience has become increasingly important as coastal communities cope with the effects of climate change. This study examined the association between adaptive capacity and vulnerability and community resilience in four relocated coastal barangays in the Philippine municipality of Basey, Samar. Cochran's formula was used to determine a sample size of 360 participants through stratified random sampling. Descriptive statistics (weighted mean, frequency, and percentage distribution) were used to determine the type and degree of adaptive capacity and vulnerability in relation to community resilience. The findings indicate that the four relocated barangays have great adaptive potential but exhibit varying degrees of vulnerability. Despite being located in coastal areas, the communities demonstrate very high resilience. A slight positive correlation was found between adaptive capacity and community resilience, while no significant correlation was found between vulnerability and community resilience. These findings suggest that while adaptive capacity and vulnerability are important determinants of community resilience, other factors, such as cultural capital, political capital, and topographical position, also merit consideration. Furthermore, sustainable livelihoods that reflect the adaptive capacity and vulnerability of local people are essential for long-term community sustainability.

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1. Introduction

Local communities bear the greatest burden during natural disasters. They are the first to respond as direct victims and are central to recovery and preparedness efforts. While they stand to lose the most, they also gain the most when disaster impacts are reduced through strengthened local capacity (Imperiale and Vanclay, 2021). Disaster resilience is developed through a systems-based approach that evaluates a community's capacity (its strength, resourcefulness, and adaptability) across various forms of capital: human, social, physical, financial, and natural. Systems thinking emphasizes not only the availability of resources and existing gaps, but also the relationships and interconnections within the community (Zaman and Raihan, 2023).

In the context of disaster risk reduction, vulnerability refers to the characteristics or conditions of a system that increase its susceptibility to environmental hazards. It encompasses a community's limited capacity to withstand the impacts of disasters, its exposure to potential harm, and its capacity to recover from adverse events (Graveline and Germain, 2022). The sustainable livelihoods framework defines vulnerability in relation to the assets or capitals that communities rely on for everyday survival, which are commonly categorized into human, financial, physical, social, and natural capital (Daniel et al., 2022). Adaptive Capacity, on the other hand, is a fundamental element in assessing a community's ability to adjust to external threats, pressures, and changes. It reflects how well a system can prepare for anticipated or potential disasters, take advantage of opportunities, and reduce possible losses. Within the sustainable livelihood framework, adaptive capacity is shaped by the community's human, social, financial, physical, and natural assets (Jamshed et al., 2019; Lv et al., 2024).

This paper examines the relationship between adaptive capacity, vulnerability, and community

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resilience, particularly within the context of a capital-based approach applied to four relocated barangays in Basey, Samar, Philippines. It further investigates the long-term outcomes associated with post-disaster relocation, given its significant social and environmental implications. Specifically, the study explores how adaptive capacity can mediate vulnerability, shaping a community's ability to absorb and recover from shocks, often influenced by its capital resources and socio-ecological interactions (Hutagalung, 2023; Zhai and Lee, 2024). This framework acknowledges that vulnerability and resilience are not static concepts but are dynamically influenced by disparity in access to diverse forms of capital (economic, social, human, physical, cultural, and ecosystem), which collectively determine a community's capacity to respond to hazards. While the capital-based approach offers a robust framework for assessing these capacities, recent scholarship highlights its limitations, particularly in accounting for intangible factors like place attachment and the complex interplay of power dynamics (Spoon et al., 2023).

Rural coastal communities such as those in Basey, Samar, Philippines, are highly exposed to risks due to their often unstable livelihoods. Pandey et al. (2017) stressed that vulnerability is lower in communities with better infrastructure and stronger household livelihoods, meaning that good-quality facilities help reduce vulnerability. Furthermore, Gyawali et al. (2020) emphasized that after a disaster, supporting livelihood projects is one of the most practical and important forms of assistance for affected communities.

2. Literature review

2.1. Understanding community, resilience, and community resilience

The concept of community traditionally refers to people living in the same place who interact closely with one another, a form described by Tönnies (2001) as Gemeinschaft. With industrialization, relationships became more formal and impersonal, which they called Gesellschaft. Communities depend on various resources – human, social, economic, financial, physical, and natural – to function effectively (Daniel et al., 2022; Panzarella et al., 2023).

Resilience, on the other hand, is a broad concept with definitions that vary across disciplines. In disaster risk reduction, it generally refers to the ability of the system, community, or society to withstand, adapt to, and recover from hazards while maintaining essential functions. Many scholars describe resilience as the capacity to cope with risks, recover from disasters, adapt to change, and even "bounce forward" by improving after crises (Graveline and Germain, 2022). Over time, resilience has become an important focus in research and public policy, with various tools and approaches developed to measure it, often linking it to adaptive capacity, vulnerability, infrastructure, and livelihood systems.

Community resilience refers to a community's ability to function well during adversity, manage change, and remain self-reliant. It depends heavily on social networks, cooperation, shared resources, and mutual support among members. From a systems perspective, resilience also involves the strength of interconnected subsystems, the learning capacity of systems, and the reliability of critical infrastructure such as water systems, flood control systems, information technology, and other physical structures (Yusoff and Yusoff, 2021).

2.2. Factors affecting a resilient community: Adaptive capacity and vulnerability

Community Resilience is shaped through the interplay between adaptive capacity and vulnerability, two important factors that determine how well a community can withstand, respond to, and recover from disasters (Basu et al., 2024). These constructs highlight the strengths and the weaknesses that dictate a community's ability to succeed despite harsh conditions.

Adaptive capacity refers to the ability of a community to adapt to climate unpredictability, adjust, or accommodate shocks and stresses (Jank-Humann, 2024; Lin and Lee, 2024). Vulnerability refers to the community capital's exposure to hazards (Yusoff and Yusoff, 2021) described through three dimensions: (1) the exposure of the community to hazardous conditions; 2) the susceptibility of the community to being affected; and (3) the ability of a system to recover from certain circumstances (Lanlan et al., 2024; Myagmarsuren and Batkhuyag, 2021).

Essentially, adaptive capacity and vulnerability are interdependent constructs that together define community resilience. A community with strong adaptive capacity can lessen its vulnerability by utilizing its capitals to prepare for and respond to hazards. Conversely, high vulnerability can erode resilience by limiting a community's ability to adapt. Promoting community resilience, therefore, entails not only strengthening adaptive capacity through capacity development, social cohesion, and resource management, but also minimizing vulnerabilities by reducing inequalities, building infrastructure, and enhancing risk awareness.

The "Capital-Based Approach" or "Community Capital Framework" operationalizes capacity by analyzing the community's endowment of various capitals, which serves as a foundational asset for enhancing resilience. However, recent studies have evaluated the efficacy of solely capital-oriented measures in fully capturing livelihood resilience, particularly in post-disaster relocation settings, often highlighting their limitations for government-led interventions and institutional processes. The overreliance on capital-based metrics can obscure the varying impact of deliberate transformation initiatives, such as post-disaster relocation, which

may redistribute resilience unevenly across affected communities (Ensor et al., 2021). While the Community Capitals Framework remains a dominant lens for evaluating adaptive capacity, researchers have proposed new dimensions of capital. For instance, the inclusion of social ecosystem capital integrates the reciprocal relationship between human societies and their natural environment within resilience frameworks.

Post-disaster relocation often presents a complex adaptive challenge, requiring a delicate balance between immediate recovery needs and long-term sustainability goals. The absence of adequate adaptive capacity at the household level can exacerbate negative outcomes, particularly where disaster preparedness remains inadequate at both household and community levels, emphasizing the critical need for socio-political support (Hutagalung, 2023). Research has thus begun to critically examine the long-term outcomes of post-disaster relocation, scrutinizing how these initiatives, often framed within capital-based resilience paradigms, frequently overlook critical social and cultural dimensions such as the profound impact of place attachment on mobility aspirations (Tinoco, 2023) and the intricate ways pre-existing economic resources and social networks shape household-level recovery options.

Fig. 1 depicts the study's framework. Adaptive capacity and vulnerability, anchored in the Capital-Based Approach or Community Capital Framework, were related to community resilience. The framework captures the interplay between the five community capitals (human, social, financial, physical, and natural) as determinants of adaptive capacity and vulnerability, and their collective influence on community resilience as measured by the four thematic priorities of the Sendai Framework for Disaster Risk Reduction.

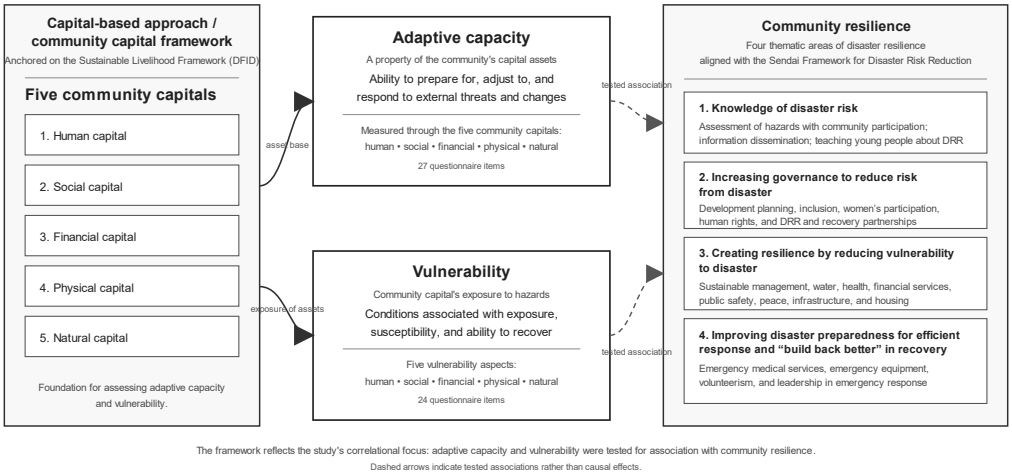

Fig. 1: Conceptual framework linking community capitals, adaptive capacity, vulnerability, and community resilience

In the study, the following hypotheses were investigated:

H_{o1}: Adaptive capacity and community resilience are not significantly correlated.
H_{o2}: Vulnerability and community resilience are not significantly correlated.

The following terminology was defined to aid in understanding and analyzing the study's findings.

Adaptive capacity: This is defined as a property of the community's capital assets, such as its human, social, financial, physical, and natural capital. This is anchored in the Sustainable Livelihood Framework, Department for International Development (DFID).

Human capital: This refers to physical health conditions, access to good nutrition, possession of multiple skills, and knowledge of the community people on the disaster evacuation routes. Social capital: This includes active membership/involvement in community organizations; community cohesion, trust, and confidence; access to effective and visionary leadership; linkages to LGUs and other external agents; and the community's ability to receive early warning advisories for upcoming disasters.

Financial capital: This relates to community members' access to the thriving marketplace, their capacity to bargain reasonable market rates for their products, gainful employment, availability of sources of income other than agriculture, and the local people's access to financial credit.

Physical capital: This indicates accessibility to an effective health care system, community access to a basic educational system, access to potable water, and availability of good road transport infrastructure. Natural capital: This includes access to communal farming; ownership of the lots the local people cultivate; good soil conditions; and the ability to freely harvest the crops, vegetables, and other produce they have planted. Vulnerability: This pertains to the community capital's exposure to hazards (Yusoff and Yusoff, 2021). Human aspect: This is based on the likelihood of certain hazard-related situations occurring in the community, such as the loss of infants, children, or the elderly during/after a typhoon; psychological stress or trauma after the typhoon; the likelihood that basic

education will be disrupted for an extended period; the inability of household members with medical conditions to seek medical treatment; and the lack of understanding of the emergency protocol. Social aspect: This refers to the disruption of social roles, leading to the instability of social routines, including the inability to seek support from other family members, friends, neighbors, or relatives; the inability of neighbors and barangay workers to mobilize a rescue team; the inability of the LGU to respond to the call for help; and the likelihood that future typhoons will drastically change the lifestyle of the community members. Financial aspect: This refers to the likelihood that livelihood and economic sources will be lost after a typhoon; the scarcity of external financial aid from the LGU, NGOs/INGOs, religious organizations, and private individuals; and the inability to convert personal assets to cash when needed due to limited savings or high debts after the calamity.

Physical aspect: This refers to the likelihood that houses, schools, basketball courts or covered courts, and barangay halls or health centers will be destroyed during typhoons; the number of days electrical connections, water supply, and internet connections will be interrupted; and the number of days that highways and national roads will be impassable due to road obstructions or destruction that may prevent movement of food, medicine, and emergency medical care.

Natural aspect: This refers to the frequency and intensity of strong typhoons; the recurrence of flash floods or landslides, communal backyards being washed out, and water quality degradation after a typhoon. Community resilience: According to the Sendai Framework for Disaster Risk Reduction, the elements of disaster resilience are classified into four thematic areas: (1) Knowledge of Disaster Risk; (2) Increasing Governance to Reduce Risk from Disaster; (3) Creating Resilience by Reducing Vulnerability to Disaster; and (4) Improving Disaster Preparedness for Efficient Response and Build Back Better in Recovery.

3. Methods

3.1. Participants

The participants were 360 residents of four relocated coastal barangays who were awarded a housing facility by the National Housing Authority (NHA). The number of participants was determined through stratified random sampling, with the barangays serving as the strata. A unique number code was assigned to each household based on the designated house number. The sample size was calculated using Cochran's formula. The data provided by the National Housing Authority (NHA), as indicated in Table 1, served as the basis for the sample population.

3.2. Measurement

A modified questionnaire was adapted from three different studies to measure the adaptive capacity, vulnerability, and community resilience. Questions on adaptive capacity were adapted from Akamani and Hall (2019), and vulnerability from Rana and Routray (2018). These were anchored in the Sustainable Livelihood Framework. Community resilience was structured around four thematic areas of disaster resilience, consistent with the Sendai Framework for Disaster Risk Reduction. Table 2 presents the thematic areas and their constituent parts.

Table 1: Distribution of the sample by relocated community

No.	Relocated community	Number of housing units	Sample size (n)	Percentage (%)
1	NHA Barangay Tingib	3,325	214	59.36
2	NHA Barangay San Antonio	562	36	10.03
3	NHA Green Park 1 (Brgy. Sawa)	913	59	16.30
4	NHA Green Park 2 (Brgy. Roxas)	801	51	14.30
	Total	5,601	360	100

Table 2: Four thematic areas of disaster resilience and their components

No.	Thematic area	Component
1	Knowledge of disaster risk	Assessment of hazards with community participation Information about DRR dissemination Teaching young people about DRR DRR in planning for development
2	Increasing governance to reduce risk from disaster	Disadvantaged groups' inclusion Women participation Promoting and educating about human rights DRR and recovery partnerships
3	Creating resilience by reducing vulnerability to disaster	Green and sustainable management Managing and securing the water supply Awareness of and access to health Availability of financial services Public safety Conflict resolution and promoting peace
4	Improving disaster preparedness for efficient response and "build back better" in recovery	Essential infrastructure Housing Emergency medical services Equipment for emergencies Volunteerism and leadership in emergency response

There were four sections to the questionnaire: demographic characteristics; 27 items on adaptive capacity (Human capital = 5; Social capital = 6; Financial capital = 5; Physical capital = 5; Natural capital = 6); 24 items on vulnerability (Human aspect = 4; Social aspect = 5; Financial aspect = 5; Physical aspect = 6; Natural aspect = 4); and 19 items on community resilience aligned with the four thematic areas of the Sendai Framework for Disaster Risk Reduction. A validity test was conducted on the instrument, which was pre-tested on 30 participants from the study area. The instrument's internal consistency was examined using Cronbach's Alpha Reliability/Item Analysis after the modified questions were added.

3.3. Procedures

A letter seeking permission to gather data was sent to the municipal mayor and the respective barangay heads. Letters were also provided to the president of the homeowners' association (HOA), requesting a list of households and household heads in the study barangays.

The descriptive and correlational research method was used in this study. The nature and degree of adaptive capacity, vulnerability, and community resilience were assessed using descriptive statistics (weighted mean, percentage, and frequency count). The association between adaptive capability, vulnerability, and community resilience was established using Pearson's r correlation. Version 25 of the Statistical Package for the Social Sciences (SPSS) program was employed.

4. Results and discussion

4.1. Socio-demographic characteristics of the participants

Table 3 presents the socio-demographic profile of the 360 participants. The participants are primarily of middle age, with the 30–39 age group accounting for 24%, followed by those aged 40–49 (23%). Young adults (18–29) and older adults (50–59) each comprise approximately 19% of the sample, while those aged 60 and above represent 15%, yielding a mean age of 46 years. The majority of participants (69%) were female, primarily because most men were working outside the home at the time of data collection. Seventy-seven percent of participants were married, and most households were of the nucleus type (97%) with an average size of 6-7 members. In terms of educational attainment, elementary school graduates comprised the largest group (26%), followed by high school graduates (24%), indicating that the majority of participants have low levels of formal education, with less than 10% having completed college. Notably, all participants (100%) reported owning the homes they currently reside in, all of which were built with full support from the National Housing Authority (NHA) following the devastation caused by Super Typhoon Haiyan (locally known as Yolanda).

Table 3: Socio-demographic characteristics of the participants

Characteristic	Category	Frequency (n)	Percentage (%)
Age	18–29	68	19
	30–39	85	24
	40–49	84	23
	50–59	69	19
	60–87	54	15
	Mean: 46.1	—	—
	Total	360	100
Sex	Female	248	69
	Male	112	31
	Total	360	100
Civil status	Married	276	77
	Common law	47	13
	Others (separated/widow)	28	8
	Single	9	3
	Total	360	100
Household size	1–4	198	55
	5–8	149	41
	9–12	13	4
	Mean: 6.5	—	—
	Total	360	100
Type of household	Nucleus	349	97
	Extended	11	3
	Total	360	100
Owner of the lot currently residing?	Yes	360	100
	No	0	0
	Total	360	100
NHA-provided support for the construction of the house?	Yes	360	100
	No	0	0
	Total	360	100

4.2. Adaptive capacity of the four relocated barangays

Table 4 presents the adaptive capacity levels of the study barangays. The overall adaptive capacity is very high (4.55) as perceived by the constituents, with human capital emerging as the topmost asset (M=4.91), followed by physical capital (M = 4.84), social capital (M = 4.77), financial capital (M = 4.15), and natural capital (M = 4.08). These results indicate

that the communities are well-endowed in human, physical, and social resources, while financial and natural capital represent comparatively weaker areas requiring sustained attention.

Table 4: Adaptive capacity level of the study barangays in Basey, Samar (N = 360)

No.	Adaptive capacity dimension	Min	Max	Mean	SD
1	Human capital	3.40	5.00	4.9094	0.25535
2	Social capital	3.33	5.00	4.7699	0.35151
3	Financial capital	2.60	5.00	4.1511	0.53890
4	Physical capital	2.80	5.00	4.8378	0.33366
5	Natural capital	1.83	5.00	4.0781	0.87892
	Overall adaptive capacity	3.53	5.00	4.5496	0.27523

The extremely high human capital score reflects that more than half of the community residents enjoy good physical health, have access to adequate nutrition, are literate, possess multiple skills, and are familiar with disaster evacuation routes. This is consistent with Myagmarsuren and Batkhuyag (2021), who emphasized that education is a fundamental driver in strengthening community resilience, and with Laurien et al. (2020), who found that human capital often compensates for deficiencies in financial or physical resources within the broader system of community capitals.

The very high social capital score indicates that residents collaborate closely, trust one another, maintain strong kinship networks extending beyond their barangay, and perceive their community leaders as capable and approachable. This finding aligns with the broader literature on social capital as a powerful buffer against long-term well-being losses after disasters. As Budría et al. (2025) and Xiong and Li (2024) affirmed, social capital expressed through trust, networks, and social bonds extends beyond economic compensation and is one of the most critical intangible assets in post-disaster recovery. The Filipino cultural values of mutual assistance and reciprocity further reinforce this social capital by fostering solidarity and collective action during trying times.

Despite adequate financial access to markets and employment, the relatively lower scores in financial capital (M = 4.15) and natural capital (M = 4.08) reveal structural vulnerabilities in these domains. Access to credit remains constrained by borrowers' repayment capacity, and residents reported that loan amounts are insufficient to offset the damage caused by powerful typhoons—serving only as temporary stopgap solutions. Natural capital is similarly limited by restricted access to communal land and the general instability of agricultural and coastal resources. These findings are consistent with Pandey et al. (2017), who argued that vulnerability is lower in communities with stronger household livelihoods and better infrastructure, implying that improvements in financial and natural capital remain a priority for building long-term resilience.

The very high overall adaptive capacity (M = 4.55) reflects a community that is largely organized, structured, and process-driven in its approach to disaster risk. However, it is important to acknowledge that perceived adaptive capacity is a subjective construct, as highlighted by Elrick-Barr et al. (2017) and Jones and Tanner (2017). Individual traits such as optimism or prior disaster experience can significantly influence self-assessment, meaning that capacity scores may reflect perceived rather than actual capability. Social connectedness and cohesion further act as psychological anchors, where the perceived strength of a community's network can be as influential as its actual resource-sharing capacity. Thus, while the scores are encouraging, they must be interpreted alongside objective vulnerability indicators and the broader socio-political context in which these communities function.

4.3. Vulnerability of the four relocated barangays

Table 5 presents the vulnerability levels of the study barangays. The overall vulnerability score is moderate-to-high (M = 3.22), indicating that these communities remain dependent on external resources and buffers against unfavorable weather conditions. Among the vulnerability aspects, the social dimension records the highest score (M = 4.20), followed by physical vulnerability (M = 3.75), financial vulnerability (M = 3.67), natural vulnerability (M = 2.43), and human vulnerability (M = 2.04).

Table 5: Vulnerability level of the study barangays in Basey, Samar (N = 360)

No.	Vulnerability aspect	Min	Max	Mean	SD
1	Human aspect	1.00	3.00	2.0410	0.31758
2	Social aspect	2.00	5.00	4.1954	0.61727
3	Financial aspect	2.05	5.00	3.6742	0.51497
4	Physical aspect	2.00	5.00	3.7549	0.65319
5	Natural aspect	1.00	4.75	2.4285	0.45660
	Overall vulnerability	1.99	4.42	3.2194	0.30166

The topmost vulnerability score in the social aspect (M = 4.20) indicates that social roles are likely to be severely disrupted during and after a typhoon. Residents acknowledged that their neighbors, barangay officials, and LGU may not be able to mobilize immediate rescue operations or respond promptly to calls for help, and that future strong typhoons would likely alter their way of life significantly. This social vulnerability is compounded by the physical (M = 3.75) and financial (M = 3.67) aspects, wherein homes, community structures, utilities, and road networks are at extreme risk of damage or destruction during typhoons, and livelihoods and income sources are expected to be disrupted with limited access to external financial assistance from LGUs, NGOs/INGOs, or private organizations.

In contrast, the human (M = 2.04) and natural (M = 2.43) aspects show moderate vulnerability levels. Residents expressed confidence that vulnerable populations—including the elderly, persons with disabilities, pregnant women, and children—would be evacuated to designated evacuation zones during future typhoons. Similarly, the recurrence of extreme events comparable to Super Typhoon Yolanda is

perceived as unlikely within an individual's lifetime. However, this perception may also reflect an inadequate appreciation of actual risk levels. The residents have adapted to coastal life over generations, which may have cultivated a degree of risk tolerance or complacency, reinforcing a pattern of coping rather than proactive risk reduction.

The overall vulnerability score of 3.22 is noteworthy when viewed alongside the very high adaptive capacity score of 4.55, as this appears to contradict Cardona et al.'s (2012) proposition that increased capacity results in decreased vulnerability. The present findings are better explained by the concept of "abrupt vulnerability" described by Spoon et al. (2023), wherein communities that have undergone post-disaster relocation may demonstrate formal adaptive capability while remaining fundamentally vulnerable due to disconnection from their traditional socio-ecological environment. Coastal communities in Basey, Samar, remain chronically exposed to land inundation, ocean flooding, shoreline erosion, storm surges, and the compounding effects of rising sea levels and climate variability. These structural geographic conditions sustain high vulnerability regardless of improvements in community capital—a reality that capital-based metrics alone cannot fully capture. The findings thus reinforce the argument that measuring adaptive capacity requires a deeper understanding of the cultural, political, and ecological ties that historically anchor community resilience (Ensor et al., 2021; Spoon et al., 2023).

4.4. Community resilience of the four relocated barangays

Table 6 presents the community resilience levels across the four Sendai Framework thematic areas. Thematic Area 1 (Knowledge of Disaster Risk) records the highest mean score (M = 4.58), followed by Thematic Area 2 (Increasing Governance to Reduce Risk, M = 4.21), Thematic Area 3 (Creating Resilience by Reducing Vulnerability, M = 4.19), and Thematic Area 4 (Improving Disaster Preparedness and Build Back Better, M = 4.08). The overall community resilience score is 4.26, indicating a very high level of perceived resilience across all four thematic areas. The very high overall resilience score (M = 4.26) suggests that these communities possess strong latent features—inherent capacity and adaptive potential—that allow them to maintain functionality during disturbances (Guimaraes et al., 2025). While all four thematic areas reflect long-standing DRR actions, systemic gaps in implementation remain, particularly in disaster preparedness and governance, as reflected in the comparatively lower scores for Thematic Areas 3 and 4. Notwithstanding these gaps, the communities' resilience appears to be driven substantially by their strong social capital and accumulated experience with typhoon-related hazards.

Coastal communities with repeated hazard exposure often develop very high resilience through a "learning capacity"—the ability to organize and act collectively when change is recognized—which is a key component of adaptive capacity (Hutagalung, 2023). Social capital, expressed through horizontal linkages among neighbors and vertical linkages to governance structures, is a well-documented foundation for high resilience in such contexts (Tinoco, 2023). The present findings confirm this: residents attribute their sense of resilience to the immediate assistance received from INGOs, NGOs, private organizations, and religious institutions, alongside NHA-provided housing facilities, which together provided a physical and social buffer from which communities could rebuild. This is consistent with the finding of Budría et al. (2025) that social capital is the primary buffer mitigating long-term well-being losses after disasters, and with Zhou et al. (2010), who identified social connections as fundamental to a community's capacity to adjust and evolve.

However, this very high resilience must be interpreted with appropriate caution. As Jones and Tanner (2017) noted, subjective resilience measured through self-reported perception can be significantly influenced by individual characteristics such as optimism or prior experience, and may not fully reflect objective conditions. The Filipinos' well-documented cultural disposition toward optimism and the capacity to endure hardship while maintaining a positive outlook may contribute meaningfully to elevated resilience scores. Additionally, the receipt of NHA housing and external aid may have enhanced residents' perceived resilience without necessarily reducing their objective geographic vulnerability—a paradox that recent research has increasingly confirmed (Spoon et al., 2023).

Table 6: Level of community resilience of the study barangays (N = 360)

No.	Thematic area	Min	Max	Mean	SD
1	Thematic area 1: Knowledge of disaster risk	3.00	5.00	4.5806	0.42522
2	Thematic area 2: Increasing governance to reduce risk from disaster	3.20	5.00	4.2056	0.30770
3	Thematic area 3: Creating resilience by reducing vulnerability to disaster	3.38	5.00	4.1935	0.26563
4	Thematic area 4: Improving disaster preparedness for efficient response and "build back better" in recovery	3.00	5.00	4.0780	0.50315
	Overall community resilience	3.48	5.00	4.2637	0.24851

4.5. Association of adaptive capacity and the resilience of the community

Table 7 presents the correlational analysis between adaptive capacity, vulnerability, and community resilience. Results show a significant but weak positive correlation between adaptive capacity and community resilience ($r = 0.116$, $p = 0.027$), leading to the rejection of the first null hypothesis (H_{o1}). While the association is statistically significant

at the 0.05 level, the low coefficient indicates that adaptive capacity accounts for only a small portion of the variance in community resilience, suggesting that it is one of several contributing factors rather than a primary determinant.

Table 7: Correlations of adaptive capacity and vulnerability with community resilience

Variable	Pearson's r with community resilience	p-value	N
Adaptive capacity	0.116*	0.027	360
Vulnerability	−0.042	0.425	360

*: $p < 0.05$

The correlational analysis reveals no significant relationship between vulnerability and community resilience ($r = -0.042$, $p = 0.425$), resulting in the failure to reject the second null hypothesis (H_{o2}). This finding indicates that changes in vulnerability levels do not correspond systematically with changes in community resilience scores, and that these two constructs operate as distinct dimensions of community well-being rather than as inversely related variables. This result both challenges and extends the existing theoretical literature. Traditional models, such as that proposed by Gallopín (2006), suggest an inverse relationship wherein increasing resilience reduces vulnerability. Cutter et al. (2008) similarly positioned resilience as a function of vulnerability, with both concepts existing on a continuum of equilibrium. However, the present findings confirm that a community can be both robust and vulnerable at the same time, a reality that standard capital-based metrics frequently fail to capture.

The case of Japan serves as a compelling illustration of this coexistence. Located in the Pacific Fire Belt and sitting atop the world's most active tectonic zone, Japan is among the most geographically vulnerable nations on earth. Yet it is simultaneously one of the most disaster-resilient. Every smartphone in Japan carries an integrated tsunami and earthquake emergency alarm system. The country has earthquake-resistant structures, earthquake-ready bullet trains, and conducts frequent drills in schools where simulated vibrations are introduced to young children from their earliest years. Japan maintains museums dedicated to past catastrophes, specifically to prevent complacency and institutionalize disaster memory. It has even engineered water outflow tubes beneath cities so that unexpected tsunamis cannot overwhelm entire urban areas. Japan is a nation that is geographically vulnerable due to its exposure to hazards, yet it is equally capable of extraordinary resilience. This demonstrates precisely what the present study finds: vulnerability and resilience are not opposites on a single continuum but are independent dimensions that can coexist at high levels simultaneously.

This same paradox is evident in the case of the four relocated coastal barangays of Basey, Samar. The success of post-disaster recovery in these communities has been largely measured through capital-oriented metrics, most notably the provision of physical assets such as NHA housing and external financial aid. These assets function as a buffer, allowing communities to absorb and resist the immediate force of disaster, which in turn produces a higher sense of perceived resilience among residents. Recent studies argue that focusing on resilience capitals, such as new housing, is an intentional strategy to emphasize a community's agency, moving away from a deficit model of vulnerability. However, while external aid improves perceived latent capacity, it does not reduce objective vulnerability, which remains grounded in the community's pre-existing conditions and susceptibility to disruption due to its geographic location. In coastal communities like Basey, Samar, objective vulnerability remains a constant and persistent reality due to climate change and rising sea levels. Thus, the community can be both robust, expressing high perceived resilience because of aid and external support, and objectively vulnerable due to its geographic exposure at the same time (Spoon et al., 2023).

This is further supported by Bronfman et al. (2024), whose geospatial study confirmed that social vulnerability and community resilience are distinct constructs, noting that a community's high level of exposure to natural hazards does not statistically preclude it from possessing a high latent capacity to recover and adapt. Because vulnerability measures susceptibility and resilience measures agency, they are theoretically and empirically separable, and a direct statistical correlation between the two is neither expected nor necessary. Without political agency and cultural identity, the buffer of external aid and NHA housing remains a temporary solution that fails to translate into durable, self-generated resilience over the long term (Carvalho and Spataru, 2024; Ensor et al., 2021). These findings collectively underscore the importance of a place-based approach to vulnerability and resilience research (Cutter et al., 2008), and affirm that a community can remain geographically vulnerable while simultaneously becoming systematically more resilient through proactive infrastructure, continuous learning, and the strategic mobilization of diverse forms of capital (Lanlan et al., 2024; Lin and Lee, 2024).

4.6. Association of vulnerability and community resilience

The absence of a statistically significant association between vulnerability and community resilience ($r = -0.042$, $p = 0.425$) suggests that these constructs may operate as distinct dimensions of community well-being. In the present study, higher or lower levels of perceived vulnerability were not systematically associated with corresponding changes in perceived community resilience. This finding challenges the conventional assumption that vulnerability and resilience necessarily vary inversely.

Traditional models, such as that proposed by Gallopín (2006), suggest an inverse relationship wherein increasing resilience reduces vulnerability. Cutter et al. (2008) similarly positioned resilience as a function of vulnerability, with both concepts existing on a continuum of equilibrium. However, the present findings align more closely with recent empirical work by Bronfman et al. (2024), whose geospatial study confirmed that social vulnerability and community resilience are distinct constructs, noting that a community's high level of exposure to natural hazards does not statistically preclude it from possessing a high latent capacity to recover and adapt. In disaster-prone regions such as Nepal and Florida, even communities facing similar vulnerability levels demonstrate markedly different recovery outcomes based on their unique adaptive capacities (Basu et al., 2024).

The explanation for this independence lies in the fundamental difference between what vulnerability and resilience measure. Vulnerability captures pre-existing conditions and susceptibility to disruption, primarily a function of geographic and structural exposure. Resilience, by contrast, captures latent systemic features, a community's inherent capacity to resist, absorb, recover, and adapt (Guimaraes et al., 2025). Because these constructs measure different underlying conditions, susceptibility versus agency, they are theoretically and empirically separable. Japan illustrates this coexistence clearly: positioned in the world's most active tectonic zone, it faces extreme geographic vulnerability yet has developed one of the very highest levels of disaster resilience through earthquake-resistant infrastructure, early warning systems, regular simulations, and institutionalized disaster memory (Lin and Lee, 2024).

In the case of the four relocated barangays of Basey, Samar, the provision of NHA housing and sustained external aid from NGOs and religious organizations has created a physical and social buffer that elevates perceived resilience without reducing the communities' objective geographic vulnerability. While these capital-oriented buffers allow communities to absorb immediate shocks and report very high resilience, they do not address the structural conditions—coastal location, climate exposure, limited economic diversification—that sustain high vulnerability. Moreover, as Ensor et al. (2021) caution, government-led housing projects often overlook the lived experience and socio-ecological ties of relocated communities, particularly those who have been disconnected from traditional sources of income such as coastal fishing. This creates a situation of "defensive" resilience wherein communities depend on outside resources, reinforcing an unstable equilibrium rather than building self-sustaining, long-term adaptive capacity (Hutagalung, 2023). Without political agency and cultural identity, the buffer of external aid remains a temporary solution that fails to translate into durable, self-generated resilience (Carvalho and Spataru, 2024; Ensor et al., 2021).

These findings collectively underscore the importance of a place-based approach to vulnerability and resilience research (Cutter et al., 2008). In coastal zones such as Basey, Samar, the drivers of geographic vulnerability (location, climate, ocean dynamics) are fundamentally different from the drivers of recovery capacity (social organization, institutional support, adaptive knowledge), making a direct statistical correlation between the two constructs unlikely. A community can therefore remain geographically vulnerable while simultaneously becoming systematically more resilient through proactive infrastructure development, continuous learning, and the strategic mobilization of diverse forms of capital (Lanlan et al., 2024; Lin and Lee, 2024).

5. Conclusions

This study investigated the adaptive capacity, vulnerability, and community resilience of four relocated barangays in the municipality of Basey, Samar, Philippines, following the devastation of Super Typhoon Haiyan. The majority of participants are middle-aged, married women heading nucleus-type households of 6–7 members, with basic to secondary educational attainment. All respondents own their current residences, constructed with full support from the National Housing Authority.

The four relocated barangays demonstrate extremely high adaptive capacity (M = 4.55), led by the highest human capital (M = 4.91), physical capital (M = 4.84), and very high social capital (M = 4.77), with comparatively lower financial (M = 4.15) and natural capital (M = 4.08). Despite this strong adaptive capacity, the communities exhibit overall moderate-to-high vulnerability (M = 3.22), with the social aspect recording the highest vulnerability score (M = 4.20), followed by physical (M = 3.75) and financial (M = 3.67) dimensions, and moderate vulnerability in the human (M = 2.04) and natural aspects (M = 2.43). The coexistence of very high adaptive capacity and high vulnerability highlights the structural complexity of post-relocation coastal communities and challenges simplistic assumptions about the capacity–vulnerability relationship.

Community resilience is very high (M = 4.26), driven largely by strong social capital, accumulated hazard experience, external institutional support, and the Filipino cultural orientation toward optimism and mutual assistance. A statistically significant but weak positive correlation was found between adaptive capacity and community resilience ($r = 0.116$, $p = 0.027$), leading to the rejection of H_{o1}. No significant correlation was found between vulnerability and community resilience ($r = -0.042$, $p = 0.425$), failing to reject H_{o2}. These results indicate that adaptive capacity and vulnerability are related but insufficient sole predictors of community resilience, and that other factors, including political capital, cultural capital, governance structures, and place attachment, play important mediating roles that the present capital-based framework did not

fully capture. Based on these findings, livelihood program development for relocated communities should account for capital asset strengths and deficiencies, particularly by strengthening financial and natural capital while protecting and expanding human and social capital. Reduced vulnerability requires targeted protection of extremely at-risk populations, reduced social segmentation, improved financial safety nets, and strict enforcement of no-build zones in hazard-prone coastal areas. Future research should extend the analytical framework to include political capital, cultural capital, latent psychological dimensions, local experiential knowledge, and governance as additional determinants of community resilience, ensuring that the full complexity of resilience in post-disaster coastal communities is more accurately captured and addressed.

List of abbreviations

DFID	Department for international development
DRR	Disaster risk reduction
HOA	Homeowners' association
INGOs	International non-governmental organizations
LGU	Local government unit
NGOs	Non-governmental organizations
NHA	National housing authority
SPSS	Statistical package for the social sciences

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Compliance with ethical standards

Ethical considerations

Participation was voluntary, and written informed consent was obtained from all participants. Participants were informed of the purpose and procedures of the study, potential risks and benefits, and their right to withdraw at any time without penalty. Participant identities were kept anonymous, and confidentiality of the collected data was maintained.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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