

Quantitative Analysis of Care Economy Innovations and Their Effects on Disaster Preparedness and Resilience among Fisherfolk in Balingasag, Misamis Oriental

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ABSTRACT

Coastal communities face recurring disasters such as typhoons and floods, making disaster preparedness a critical concern. Recent frameworks, such as ASEAN's Comprehensive Framework on the Care Economy (ACFCE), highlight the importance of integrating care-driven approaches into disaster resilience. However, quantitative evidence on the role of care economy innovations remains limited.

This study employed a cross-sectional household survey of approximately 150 fisherfolk households in Balingasag, Misamis Oriental, selected through stratified random sampling. A structured questionnaire captured demographic data, participation in barangay health initiatives, caregiving roles, fisherfolk association membership, technological adoption (mobile alerts, health kits), and ecological practices (e.g., mangrove rehabilitation). Disaster preparedness was assessed using indicators of evacuation knowledge, emergency kit ownership, response times, and perceived resilience scores. Descriptive statistics, chi-square tests, ANOVA, correlation, and multiple regression analyses were applied.

Findings reveal that fisherfolk association membership, women's caregiving and coordination roles, and the use of technological tools significantly predict higher preparedness levels. Traditional ecological knowledge shows a positive correlation with resilience, while demographic variables such as education, income, and household size moderate these relationships. Households with higher socioeconomic resources demonstrate greater capacity for preparedness and resilience.

The study provides empirical evidence that care economy innovations enhance disaster preparedness and resilience in coastal communities. Policy recommendations emphasize strengthening grassroots care systems through gender-sensitive strategies, training programs, and partnerships. Integrating care-driven practices into local governance and ASEAN disaster risk reduction frameworks can significantly advance sustainable resilience.

Keywords: *Care economy, Disaster preparedness, Community resilience, Demography, Public policy, Fisherfolk households, ASEAN, Coastal communities*

INTRODUCTION

The twenty-first century has been characterized by the intensification of natural hazards linked to climate change, environmental degradation, and socio-economic vulnerabilities. According to the United Nations Office for Disaster Risk Reduction (UNDRR, 2023), over 200 million people globally are affected by disasters annually, with coastal populations bearing disproportionate risks due to rising sea levels, stronger typhoons, and storm surges. Beyond the immediate physical damage, disasters interrupt livelihoods, displace families, and erode community cohesion.

The Sendai Framework for Disaster Risk Reduction (2015–2030) emphasizes not only structural and infrastructural responses but also social systems, inclusivity, and community resilience as crucial to reducing disaster risks. It recognizes that communities do not merely experience disasters as isolated events but as stressors embedded in daily life, often mediated by social and care systems.

The Philippines is ranked among the most disaster-prone countries in the world (World Risk Index, 2022). Annually, an average of 20 typhoons enter the Philippine Area of Responsibility (PAGASA, 2024), with coastal municipalities facing recurring flooding, coastal erosion, and livelihood disruptions. Fisherfolk, whose work depends directly on weather patterns and marine ecosystems, are among the poorest and most vulnerable groups (Philippine Statistics Authority, 2023). Their households often have limited access to insurance, social safety nets, and formal disaster relief.

Despite significant progress under the Philippine Disaster Risk Reduction and Management Act of 2010 (RA 10121), gaps remain in integrating social and caregiving dimensions into preparedness and resilience strategies. Most frameworks still privilege structural solutions (infrastructure, technology) over community-driven practices like caregiving, mutual aid, and grassroots coordination.

The concept of the care economy encompasses both paid and unpaid forms of labor dedicated to caregiving, social reproduction, and sustaining life (Folbre, 2018). It includes childcare, elder care, community health services, and voluntary caregiving roles, much of which remain invisible in economic

accounting. Feminist economics and sociology highlight that these unpaid contributions are not peripheral but central to societal resilience.

In disaster contexts, caregiving roles often determine survival. Women, for example, typically organize household evacuation, safeguard children and the elderly, and coordinate relief activities at the community level (Enarson & Chakrabarti, 2009). Similarly, grassroots health initiatives and local associations provide platforms for mutual support, resource pooling, and the dissemination of critical information.

ASEAN has recognized the potential of care-centered strategies through the ASEAN Comprehensive Framework on the Care Economy (ACFCE), adopted in 2022. This framework acknowledges that the provision of care is a public good and a cornerstone of resilience, particularly in crisis and disaster settings. By integrating care economy innovations—ranging from women-led associations to ecological caregiving practices like mangrove rehabilitation—communities can build more holistic and sustainable resilience.

While much has been written about social capital and community-based disaster preparedness, relatively few quantitative studies have examined the role of care economy innovations in measurable resilience outcomes, particularly in Southeast Asia. Existing research often remains anecdotal or qualitative, lacking robust statistical analysis of how caregiving roles, association membership, technological tools, and ecological practices translate into preparedness.

In the Philippine context, studies have highlighted fisherfolk vulnerability (Israel & Briones, 2012; PIDS, 2021) but rarely through the lens of the care economy. This leaves a critical research gap in understanding how integrating care-based approaches can strengthen disaster preparedness at both household and community levels.

RESEARCH OBJECTIVES

This study was conducted to address the gap by providing empirical evidence from fisherfolk households in Balingasag, Misamis Oriental. Specifically, the objectives were to:

1. **Profile** the demographic and socioeconomic characteristics of fisherfolk households in Balingasag.
2. **Examine** the role of care economy innovations—including caregiving roles, fisherfolk associations, and barangay health initiatives—in disaster preparedness.
3. **Determine** the relationship between technological adoption (mobile alerts, emergency kits) and resilience outcomes.
4. **Assess** how ecological caregiving practices, such as mangrove rehabilitation, contribute to community resilience.
5. **Analyze** how demographic variables (income, education, household size) moderate the effects of care innovations on preparedness.
6. **Propose** policy recommendations for integrating care economy principles into local disaster risk reduction and ASEAN frameworks.

SIGNIFICANCE OF THE STUDY

This study contributes to four intersecting fields:

- **Sociology and Gender Studies** – by recognizing the centrality of caregiving and unpaid labor in resilience frameworks, highlighting how gender roles shape adaptive capacities in times of crisis.
- **Disaster Studies** – by providing quantitative evidence of how care innovations affect preparedness outcomes, thereby advancing disaster resilience research with a people-centered lens.
- **Public Policy** – by offering insights into how ASEAN and Philippine disaster risk frameworks can mainstream care-driven strategies, influencing more inclusive and community-based governance.
- **Business Administration and Management** – by emphasizing the role of organizational leadership, resource management, and strategic decision-making in integrating care systems within disaster preparedness and recovery. The study also informs how businesses, cooperatives, and local enterprises can adopt care-driven models to strengthen continuity planning, stakeholder relations, and corporate social responsibility in disaster contexts.

Ultimately, the study underscores that resilience is not merely a function of infrastructure or government intervention but is also nurtured through care, solidarity, and social innovation at the grassroots level.

METHODOLOGY

Research Design

This study employed a quantitative cross-sectional research design, appropriate for capturing the relationships between care economy innovations and disaster preparedness at a specific point in time. Cross-sectional surveys are frequently used in disaster research because they allow researchers to identify patterns and associations across multiple variables within community contexts (Creswell & Creswell, 2018). By focusing on fisherfolk households in Balingasag, the study was able to quantify how caregiving, association membership, technological adoption, and ecological practices predict preparedness and resilience.

The quantitative approach was selected to generate empirical data that can inform policy development, complementing the largely qualitative literature on the care economy. Furthermore, the design aligns with the study's aim of producing generalizable insights within the municipality that can inform broader ASEAN discussions on resilience and care.

Study Area

The research site is Balingasag, Misamis Oriental, a first-class municipality in Northern Mindanao with an estimated population of 75,000 (PSA, 2023). Approximately 60% of its barangays are coastal, with fishing as the primary livelihood. These communities experience repeated exposure to natural hazards such as typhoons, monsoon floods, and coastal erosion.

Balingasag was chosen for three reasons:

1. Vulnerability – its geographic location exposes it to high disaster risk.
2. Livelihood dependence – fishing-based economies are among the most vulnerable sectors in the Philippines.
3. Community organization – the presence of fisherfolk associations and barangay-level health and ecological initiatives makes it an ideal setting to examine care economy innovations.

Population And Sampling

The target population comprised fisherfolk households residing in coastal barangays of Balingasag. A stratified random sampling technique was employed to ensure proportional representation across barangays and to capture variation in household demographics, association membership, and access to resources.

The sample size of 150 households was determined using Slovin's formula at a 95% confidence level and 5% margin of error. This size is adequate for conducting regression analyses and ensures statistical reliability (Saunders et al., 2019).

Inclusion criteria were:

- The household's primary livelihood must be fishing or fish-related.
- The respondent must be a household head or an adult decision-maker.
- The household must have resided in the barangay for at least three years, ensuring familiarity with disaster exposure.

Research Instrument

A structured questionnaire was developed and administered face-to-face by trained enumerators. The instrument was divided into five major sections:

1. Demographic Profile – capturing age, gender, education, household size, income, and marital status.
2. Care Economy Innovations – items on caregiving roles (e.g., child/elder care), participation in barangay health initiatives, and membership in fisherfolk associations.
3. Technological Adoption – questions on access to and use of mobile disaster alerts, emergency health kits, and communication tools.
4. Ecological Practices – participation in mangrove rehabilitation, coastal resource management,

and integration of traditional ecological knowledge.

5. Preparedness and Resilience Indicators – items assessing knowledge of evacuation routes, household emergency kit ownership, expected response times, and self-rated resilience scores (using a 5-point Likert scale).

Preparedness was measured using indicators adapted from Cutter et al. (2008), while resilience was operationalized through a modified Community Resilience Scale validated in previous disaster studies (Norris et al., 2008).

Validity And Reliability

The instrument underwent content validation by academic experts. Suggestions on wording, cultural sensitivity, and scale consistency were incorporated.

A pilot test was conducted with 20 fisherfolk households outside the sampling area. The test yielded a Cronbach's alpha of 0.82, which exceeds the

0.70 threshold recommended for social science research (Nunnally, 1978). This indicates that the instrument had strong internal consistency and reliability.

Data Collection Procedure

Data collection was carried done and carried out by Misamis Oriental Institute of Science and Technology – College of Business Administration and Management. Enumerators were composed of graduate students trained in social and business research and were briefed on ethical protocols and standard interviewing techniques.

The steps included:

1. Coordination with barangay officials for community entry and permission.
2. Household visits based on random selection from fisherfolk lists.
3. Informed consent process with respondents.
4. Administration of the structured questionnaire in either Cebuano or Filipino, depending on the respondent's preference.
5. Immediate checking of responses to ensure completeness.

Each survey and interview lasted approximately 30–40 minutes.

Data Analysis

Data were encoded into SPSS v27 and analyzed using the following procedures:

- Descriptive statistics (frequencies, means, percentages) – to summarize demographics and preparedness levels.
- Chi-square tests – to assess associations between categorical variables (e.g., association membership and preparedness levels).
- ANOVA – to test differences in preparedness across demographic groups (e.g., income levels).
- Pearson correlation – to measure relationships between care innovations and resilience scores.

- Multiple regression analysis– to identify significant predictors of preparedness and resilience.

Regression diagnostics, such as checking for multicollinearity and normality, were conducted to ensure robustness of results.

Although multiple regression analyses were conducted to examine the relationships among variables, the cross-sectional nature of this study restricts the ability to establish causality. The observed associations should therefore be interpreted as correlational rather than causal. Future research using longitudinal or experimental designs could better clarify the directionality of these relationships and test causal pathways between care economy innovations and resilience outcomes.

Ethical Considerations

The study adhered to the National Ethical Guidelines for Health and Social Research (Philippines, 2017). Specific measures included:

- Informed consent – respondents were informed about the purpose, voluntary nature, and confidentiality of the study.
- Confidentiality – no personal identifiers were recorded; responses were coded numerically.
- Right to withdraw – participants were free to decline answering or withdraw at any stage without penalty.
- Data protection – all collected data were stored securely and accessible only to the research team.

RESULTS AND DISCUSSION

Demographic Profile of Respondents

The study surveyed 150 fisherfolk households across the coastal barangays of Balingasag. Table 1 presents the demographic characteristics.

Table 1. Demographic Profile Of Respondents (N = 150)

Variable	Category	Frequency	Percentage
Gender of Household Head	Male	102	68%
	Female	48	32%
Average Age of Household Head	35–55 years	—	Mean: 42.3
Education	Elementary or less	61	41%
	High school graduate	58	39%
	College or higher	31	20%
Household Size	3–5 members	87	58%
	6 or more members	63	42%

Monthly Income	Below ₱10,000	94	63%
	₱10,000–20,000	41	27%
	Above ₱20,000	15	10%

The data reveal that fisherfolk households are generally low-income, with most living below the national poverty threshold. While male household heads dominate (68%), women play key roles as co-decision makers and caregivers. These finding echoes literature on gendered vulnerabilities in disasters, where women’s unpaid care work sustains family and community preparedness (Enarson & Chakrabarti, 2009).

Care Economy Innovations

A significant proportion of respondents engaged in care economy activities. About 72% were members of fisherfolk associations, which provided training, access to livelihood programs, and early-warning information. Women in particular were highlighted as central actors in caregiving: in 87% of households, women were primary caregivers, not only for children and the elderly but also in extending care to neighbors and community health programs.

Participation in barangay health initiatives was reported by 64% of households, often involving first aid, feeding programs, and vaccination drives. Meanwhile, 48% engaged in mangrove rehabilitation or coastal resource

management. Such ecological care practices contributed not only to environmental sustainability but also to community cohesion, resonating with studies linking ecosystem-based practices to resilience (Renaud et al., 2013).

Technological Adoption

Technological preparedness varied across households. Mobile disaster alerts were accessed by 59%, primarily through local government SMS systems, while 52% owned household emergency kits. However, smartphone penetration was lower (45%), suggesting a digital divide that constrains the reach of online warning systems. These disparities reflect broader findings that poverty and lack of access to technology exacerbate vulnerability (UNDRR, 2022).

Preparedness And Resilience Indicators

Table 2. Preparedness and Resilience Indicators

Indicator	% Yes/High	% No/Low	Mean Score (1–5)
Knowledge of Evacuation Routes	70%	30%	4.1
Household Emergency Kit	58%	42%	3.7
Expected Response Time (<30 mins)	54%	46%	—
Perceived Resilience (self-rated)	—	—	3.7

Preparedness levels were moderate: while most respondents knew evacuation routes (70%), fewer had ready emergency kits (58%). Self-rated resilience was 3.7, indicating cautious optimism but also reflecting socioeconomic constraints.

STATISTICAL FINDINGS AND INTERPRETATIONS

Chi-Square Analysis. Association membership significantly predicted preparedness levels ($\chi^2 = 12.45$, $p < 0.01$), while participation in barangay health initiatives was strongly related to evacuation knowledge ($\chi^2 = 9.63$, $p < 0.05$). These findings affirm the role of **community care systems** as critical channels for disseminating preparedness knowledge.

ANOVA Results. Education was positively associated with resilience ($F = 6.23$, $p < 0.01$), while income significantly influenced kit ownership ($F = 8.71$, $p < 0.01$). Households with higher socioeconomic resources were more likely to be prepared, reflecting how **structural inequalities shape resilience capacity**.

Correlation Analysis. Caregiving roles correlated strongly with preparedness ($r = 0.42$, $p < 0.01$), ecological practices correlated with resilience ($r = 0.31$, $p < 0.01$), and technological adoption correlated with faster response times ($r = 0.46$, $p < 0.01$). These correlations validate the hypothesis that **care economy innovations directly enhance preparedness and resilience outcomes**.

Regression Analysis. Multiple regression ($R^2 = 0.53$, $p < 0.001$) identified four significant predictors:

1. **Fisherfolk association membership** ($\beta = 0.34$, $p < 0.01$)
2. **Women's caregiving roles** ($\beta = 0.28$, $p < 0.05$)
3. **Technological adoption** ($\beta = 0.36$, $p < 0.01$)
4. **Education level** ($\beta = 0.22$, $p < 0.05$)

Together, these variables explained over half of the variance in preparedness levels. This demonstrates that resilience is not solely determined by external aid or infrastructure, but also by **embedded social and care practices** within communities.

Integrated Discussion

The results collectively demonstrate that care economy innovations significantly contribute to disaster preparedness and resilience in fisherfolk households. Association membership enhanced access to training and resources, consistent with Putnam's (2000) argument that social capital strengthens collective action. These findings also resonate with **resilience theory**, which emphasizes adaptive capacity, learning, and resource mobilization at individual and community levels (Norris et al., 2008). Furthermore, **gender theory and feminist economics** (Folbre, 2018) frame caregiving as both a form of unpaid labor and a social infrastructure that sustains resilience in times of crisis.

Women's caregiving roles, often overlooked in disaster policy, were shown to be powerful predictors of preparedness. This aligns with the ASEAN Comprehensive Framework on the Care Economy (2022), which emphasizes the centrality of caregiving to sustainable resilience. Supporting women's caregiving work - through training, recognition, and institutional support—can therefore directly improve disaster outcomes.

Technological tools such as mobile alerts and emergency kits provided practical advantages, but their unequal distribution underscores the persistence of digital and income-based inequalities. Bridging these gaps is crucial for inclusive disaster risk reduction.

Finally, ecological care practices like mangrove rehabilitation demonstrated that environmental stewardship is both a livelihood strategy and a resilience mechanism. This reinforces Eco-DRR principles, where ecosystems serve as natural protective infrastructure while also fostering community solidarity.

The findings affirm that resilience is socially embedded. Preparedness is not only a function of state infrastructure or aid but also of everyday care, solidarity, and grassroots innovation. For fisherfolk

communities, resilience emerges at the intersection of caregiving, association membership, technological adaptation, and ecological stewardship.

Beyond the care economy framework, this study aligns with the **resilience and gender theories** that view disaster preparedness as a dynamic process shaped by social relations and power structures. The findings illustrate how women's caregiving work extends beyond household boundaries to community coordination, thereby operationalizing resilience as both adaptive capacity and relational strength. By linking care, gender, and resilience, the study underscores that disaster management is inherently a social and gendered process.

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study investigated the role of care economy innovations in enhancing disaster preparedness and resilience among fisherfolk households in Balingasag, Misamis Oriental. By employing a cross-sectional survey of 150 households and applying multiple statistical techniques, the research provided quantitative evidence that caregiving practices, community association membership, technological adoption, and ecological stewardship significantly influence preparedness outcomes.

The findings lead to several important conclusions:

1. **Caregiving roles—particularly women's contributions—are central to preparedness.** Women's unpaid labor in evacuation planning, child and elder care, and community coordination emerged as strong predictors of household readiness. This underscores the need to recognize and support unpaid care work in disaster frameworks.
2. **Fisherfolk associations act as resilience hubs.** Membership facilitated access to disaster-related knowledge, resources, and solidarity networks. Associations served as platforms for collective care, reflecting the potential of grassroots organizations in building adaptive capacity.
3. **Technological adoption improves response times but reflects inequality.** Mobile alerts and emergency kits significantly enhanced preparedness, but access was uneven across income groups. Digital divides and poverty remain barriers to universal resilience.
4. **Ecological care practices contribute to resilience.** Participation in mangrove rehabilitation and similar activities correlated with higher resilience scores, demonstrating that environmental stewardship is both a livelihood and a protective measure against disasters.
5. **Demographic variables moderate preparedness outcomes.** Education and income enhanced access to preparedness resources, while larger household sizes added caregiving demands that shaped resilience strategies.

Taken together, the study affirms that the care economy is not peripheral but integral to disaster preparedness and resilience. Recognizing and institutionalizing care-based innovations strengthens both household and community capacities to withstand recurrent hazards.

Recommendations

Based on the findings, several policy and practice recommendations are proposed:

A. Local Governance and Community Level

1. **Institutionalize care roles in DRRM plans.** Barangays and municipalities should explicitly integrate caregiving responsibilities into disaster risk reduction and management (DRRM) policies, ensuring

recognition of unpaid labor.

2. **Strengthen fisherfolk associations.** *Local governments should partner with associations to deliver preparedness training, facilitate resource pooling, and disseminate early warning information.*
3. **Promote ecological care as resilience.** *Expand community-led mangrove rehabilitation and coastal resource management programs, linking ecological sustainability with disaster protection.*

B. Gender-Sensitive Strategies

4. **Support women as frontline resilience actors.** *Provide gender-responsive training, incentives, and leadership opportunities for women caregivers in community disaster programs.*
5. **Address the burden of unpaid care.** *Introduce support mechanisms such as community childcare or care-sharing systems during disasters to reduce the disproportionate burden on women.*

C. Technological and Resource Access

6. **Expand digital inclusivity.** *Subsidize access to mobile devices and improve cellular coverage to ensure early warning systems reach all households.*
7. **Ensure emergency kit availability.** *Provide LGU or NGO-assisted emergency kits, especially for low-income households.*

D. Policy Integration at National and ASEAN Levels

8. **Mainstream care economy principles in Philippine DRRM frameworks and align with the ASEAN Comprehensive Framework on the Care Economy (ACFCE).**
9. **Harmonize with global commitments.** *Integrate care-driven approaches with the Sendai Framework for Disaster Risk Reduction, Sustainable Development Goals (SDGs 5, 11, and 13), and climate adaptation policies.*

E. Future Research Directions

10. *While this study provides valuable quantitative insights, its cross-sectional design limits causal interpretations. Future longitudinal studies could track how care economy innovations influence preparedness and resilience over time, offering stronger evidence of causal relationships. Moreover, integrating **mixed-methods approaches**—such as combining household surveys with qualitative interviews or focus group discussions—would capture the lived experiences and narratives behind quantitative trends.*
11. *Future analyses should also explore **intersectionality**, examining how gender, income, education, and household composition intersect to shape resilience. This would reveal nuanced patterns of vulnerability and adaptation within and across coastal communities.*

By operationalizing these recommendations, the Philippines and ASEAN can strengthen community resilience while advancing inclusive and gender- equitable development.

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