PROJECT LEARN: CLIMATE CHANGE RISK MANAGEMENT AND ADAPTIVE STRATEGIES FOR FLOOD-PRONE COMMUNITIES

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Abstract

This study evaluates the climate change awareness, attitudes, impact risks, adaptation strategies, and mitigation responses of selected households in flood-prone areas of Nueva Ecija, the Philippines. Recognizing the complex interaction between socio-demographic factors and climate risk perceptions, this study addresses gaps in understanding how education, income, and geographic differences influence adaptive behaviors (Çıplak, 2022). Furthermore, climate-induced disasters are escalating globally, with vulnerable regions experiencing disproportionate impacts (Fawzy et al., 2020). Utilizing a descriptive research design, data was gathered from 900 household heads through questionnaires, informal interviews, and observations. The findings indicate that respondents have moderate climate change awareness, with rural households showing a higher frequency of adaptation and mitigation responses due to their perceived increased risks. Based on these insights, the study proposes project LEARN, a climate literacy program designed to enhance the knowledge and resilience of communities. This research contributes to local understanding of climate change and offers actionable strategies to improve adaptation and mitigation efforts in vulnerable regions (Fawzy et al., 2020).

Keywords: Climate Change Awareness, Adaptation Strategies, Mitigation Responses, Impact Risks, Climate Literacy

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1. INTRODUCTION

Acknowledging the need for greater education on local outcomes of socio-environmental factors, this study examines adaptive strategies and the need for transformation in open communities toward sustainability. Climate change, as defined by the United Nations Convention on Climate Change, refers to human-induced alterations in the global atmosphere, resulting in long-term changes in temperature, precipitation, and wind patterns (Destaw & Fenta, 2021). The impacts of climate change are far-reaching and vary across regions, with significant consequences for agriculture. In rain-fed agricultural areas, fluctuations in rainfall and temperature severely threaten productivity (Destaw & Fenta, 2021). Greenhouse gas emissions and the overexploitation of natural resources since the 1800s have been key contributors to climate change (Locke et al., 2023). However, research gaps remain in understanding how local communities, particularly those in vulnerable regions, perceive and respond to these risks.

In the Philippines, climate change has had a profound impact, especially in Nueva Ecija, an agricultural province known for rice and onion

production. The region faces increased exposure to droughts, floods, warming temperatures, and erratic weather patterns. A vulnerability mapping project identified Nueva Ecija as one of the top 20 provinces most at risk from changes in rainfall patterns and climate-related disasters (Gabriel et al., 2021). These changes pose major challenges to the agricultural sector, which faces decreased productivity and heightened risks to food security and livelihoods. Furthermore, there is limited understanding of how socio-demographic factors shape the climate change awareness and adaptation strategies of households in flood-prone areas.

This study addresses the existing literature gap by investigating the level of climate change awareness, attitudes, and adaptive and mitigation responses among households in Nueva Ecija's flood-prone areas. The research examines how socio-demographic factors, such as education, income, and geographic location (rural versus urban), influence climate change perceptions and preparedness. Using the Protection Motivation Theory as a framework, the study seeks to explain variations in household adaptation and mitigation behaviors based on perceived risks and self-efficacy. The study focuses on assessing the level of climate change awareness and attitudes among households in Nueva Ecija's flood-prone areas. It examines how socio-demographic factors, such as education, income, and geographic location, shape individuals' perceptions and adaptation strategies toward climate change. Additionally, the study explores the differences in responses between rural and urban respondents, particularly in their approaches to addressing climate risks and their capacity for adaptation and mitigation efforts.

The structure of this paper is as follows. Section 2 reviews the relevant literature on climate change awareness and adaptation strategies, emphasizing the gaps in understanding how local communities respond to climate threats. Section 3 details the methodology employed in this study, including the descriptive research design, data collection methods, and analytical techniques. Section 4 presents the results of the empirical research, highlighting the relationships between socio-demographic variables and climate change perceptions. Section 5 discusses the findings, offering insights into the implications for disaster risk preparedness and policy recommendations. Finally, Section 6 concludes the study, proposing project LEARN, a climate literacy initiative aimed at improving adaptive capacities in vulnerable communities.

2. LITERATURE REVIEW

The interaction between human activities and climate change has been widely studied, especially in relation to its impact on ecosystems and vegetation dynamics. Human-induced activities such as urbanization, ecological restoration, and agricultural expansion either mitigate or exacerbate the effects of climate change, making their influence on ecosystems both significant and complex (Yang et al., 2023). Understanding these interactions highlights the need for adaptive strategies that address the environmental challenges posed by such activities (Ma et al., 2021). Conservation efforts,

including soil and water conservation measures, also play a pivotal role in altering surface conditions, impacting runoff and sediment load mechanisms in river basins (Chen et al., 2022). These interventions are particularly important in regions like Nueva Ecija, where climate variability threatens agricultural productivity and community resilience (Gabriel et al., 2021).

Climate change adaptation and mitigation strategies are critical for global and local resilience. Short-term strategies may provide immediate relief, but long-term sustainability solutions are essential for ensuring resilience in the face of ongoing environmental change (Fawzy et al., 2020). Priya et al. (2023) underscore the importance of integrated approaches to managing climate change impacts on aquatic ecosystems, demonstrating the necessity of addressing both human-induced and natural challenges. Beyond ecosystems, the effects of climate change extend to other critical sectors, including agriculture, healthcare, and the economy. Education, particularly in the form of climate literacy, plays an essential role in fostering awareness and prompting proactive adaptation behaviors (Çıplak, 2022; Lestari et al., 2023). Studies by Puaschunder (2017) and Yeung et al. (2018) emphasize the value of integrating climate change education into school curricula to build a more resilient future generation capable of responding to environmental threats.

In the Philippines, the country is highly vulnerable to climate change, particularly typhoons and floods, which result in significant economic losses and disrupt local communities (Suh & Pomeroy, 2020). The increased frequency and intensity of these events have intensified challenges such as flooding and landslides, which adversely affect agricultural productivity and well-being in rural and urban areas alike (Tanay et al., 2023). This heightened vulnerability necessitates robust governance and adaptation frameworks, such as those proposed by De Lara and Santos (2024), who argue for improved service delivery and governance to foster resilience in educational institutions during crises. Similarly, Jacoba et al. (2024) examine the alignment of institutional frameworks with performance standards, demonstrating the role of governance in bolstering resilience.

The role of socio-demographic factors, such as education and income, in shaping climate change awareness and adaptation behaviors is well-documented. Çıplak (2022) and Lestari et al. (2023) argue that public knowledge of climate change significantly influences individuals' willingness to engage in adaptation efforts. This is particularly relevant for regions like Nueva Ecija, where vulnerability to climate-induced disasters, such as flooding, is high. Comprehensive disaster preparedness and climate adaptation strategies, therefore, need to be integrated into local and national development plans to reduce vulnerability and enhance resilience (Gabriel et al., 2021). De Lara and Santos (2024) further emphasize the importance of integrating disaster preparedness into governance structures to build resilient communities capable of responding to future climate risks.

Finally, the importance of education and awareness in promoting resilience is highlighted by initiatives such as project LEARN. This climate

literacy program aims to address the knowledge gaps within vulnerable communities by fostering resilience through education on climate-related issues. Santiago et al. (2023) discuss the psychological impacts of climate-related stress, such as lockdown fatigue during the COVID-19 pandemic, drawing parallels to the mental and physical strain experienced by communities in prolonged climate disasters. Educational initiatives like project LEARN seek to address both the psychological and physical impacts of climate change, enhancing communities' capacity to adapt and mitigate the effects of environmental risks.

3. RESEARCH METHODOLOGY

3.1. Research design

This study utilized the descriptive method of research to comprehensively examine the existing state of flood vulnerability and adaptation strategies in selected areas of Nueva Ecija. Descriptive research, as defined by Blay (2007), aims to describe phenomena accurately. The normative study method was used, focusing on summarizing characteristics of household heads' perceptions and responses to climate change. This method was chosen because it allows the identification of trends and patterns in behavior without manipulating variables, which aligns with the study's objective of assessing natural perceptions and adaptive behaviors. Alternatively, experimental or longitudinal studies could have been considered; however, these would require extended timeframes and controlled environments, which were impractical given the urgency of climate change impacts in the region.

3.2. Research site

The research site is in the province of Nueva Ecija. Given that flooding is a significant and immediate problem faced by the province due to climate change, the study focused on the top ten flood-prone and affected cities and municipalities, including their top three flood-affected barangays. The list of these areas was obtained from the Provincial Disaster Risk Reduction Management Council (PDRRMC) and supported by the study of Peria (2014). The selected barangays include Brgy. MS. Garcia, San Juan Accfa, and Aduas Sur in Cabanatuan City; Brgy. Bantug, Camatchile, and Pinamalisan in Gabaldon; Brgy. Sta. Lucia Young, Macarse, and Sto. Rosario Young in Zaragoza; Brgy. Abar First, Sto. Nino First, and Tondod in San Jose City; Brgy. Sta. Rita, San Vicente, and San Fernando Sur in Cabiao; Brgy. Panabingan, Cama Juan, and Sta. Barbara in San Antonio; Brgy. San Jose, San Antonio, and Nagmisahan in Cuyapo; Brgy. San Carlos, La Purisima, and Bucot in Aliaga; Brgy. Sta. Maria, Vallarosa, and San Juan in Licab; and Brgy. San Alejandro, Barangay Dos, and Sta. Clara in Quezon.

3.3. Respondents

The study's respondents were household heads in the top three flood-affected barangays within the top ten flood-prone cities and municipalities, as identified by PDRRMC. These individuals were selected for their decision-making roles within families. Purposive sampling was applied to identify the barangays, while proportional quota sampling determined the number of respondents from each barangay to ensure population representation. While purposive sampling was appropriate for targeting specific affected areas, alternative approaches like stratified random sampling could have been applied to provide a more generalized sample across the entire province.

3.4. Research instrument

The data collection instrument was a structured questionnaire divided into three sections: respondent profile, household profile, and climate change perception. The perception section covered awareness, perceived vulnerabilities, adaptation strategies, and barriers to response. This instrument was chosen for its ability to capture detailed, quantifiable data. Validation was conducted through expert review by the research adviser and panel members, ensuring content validity. A test-retest method established reliability (Cronbach's alpha = 0.911). Other instruments, such as focus group discussions or digital surveys, were considered but not utilized due to logistical constraints and the preference for a more direct and individualized method of gathering information.

3.5. Data collection

Data was collected after securing permissions from relevant agencies and obtaining informed consent from the respondents. Questionnaires were supplemented by informal interviews and observations to clarify and cross-validate responses. Alternatives, such as structured interviews or longitudinal observational studies, were considered but ultimately rejected due to time and resource constraints.

3.6. Data analysis

Data analysis involved descriptive statistics (frequency, percentage, and weighted mean) to summarize respondents' profiles, attitudes, and adaptive strategies. Non-parametric correlation (Spearman correlation) was used to determine relationships between variables such as respondents' knowledge, perceived vulnerabilities, and responses. The Wilcoxon-Mann-Whitney test, a non-parametric equivalent of the t-test, identified significant differences in perceptions between rural and urban respondents. Other methods, such as chi-square tests or logistic regression, could have been applied to examine categorical relationships but were not chosen due to the ordinal nature of much of the data.

4. RESEARCH RESULTS

4.1. Respondent and household profile

The majority of the respondents are aged between 41 years old and 50 years old, predominantly male, married, and high school graduates. Agriculture is the primary source of income for most households,

with a monthly income of less than PHP 5,000. Most respondents have lived in their current residence for an average of 10–20 years, typically residing in nuclear families of fewer than four members, and with fewer than four working members. The majority live in semi-concrete houses situated in low-lying areas, exposing them to significant challenges, particularly in flood-prone regions. This housing situation reflects vulnerability to natural disasters, with studies like Puaschunder (2017) emphasizing the need for sustainable development and housing improvements to ensure community safety. The housing profile calls attention to the importance of addressing environmental risks and sustainable development, as highlighted in the work of Yeung et al. (2018), which stresses the need for education in climate resilience and housing-related challenges.

4.2. Climate change perception

Respondents primarily define climate change as a "change in our atmosphere" with most knowledge obtained from television. The respondents believe that global temperatures and rainfall are rising, with the increasing frequency and intensity of typhoons identified as the most common and concerning climate change effect. Awareness of climate change concepts is moderate, with Cabanatuan residents exhibiting the highest awareness, while Gabaldon and Licab residents show lower levels. Most respondents are aware of the risks posed by climate change to health and well-being, particularly injuries and deaths due to flooding and storms. A generally positive attitude towards climate change is prevalent, with respondents showing preparedness through household emergency plans. Cabanatuan respondents demonstrate the highest concern, while Licab respondents are more cautious. Adaptation strategies such as building flood defenses and maintaining sanitary practices are commonly practiced, with Zaragoza residents leading in adaptation efforts. Mitigation practices, like conserving energy and turning off unused appliances, are also common, particularly among Zaragoza residents. The main barriers to implementing climate change responses are financial constraints and reliance on government intervention.

4.3. Comparison of climate change perception between respondents of rural and urban areas

There is no significant difference in basic climate change awareness between rural and urban respondents. However, significant differences are found in perceptions of vulnerability to climate change, attitudes towards its impacts, and the frequency of adaptation and mitigation practices. Rural respondents perceive greater risks to health and access to services, exhibit higher concern, and demonstrate more frequent adaptation and mitigation responses. This suggests that rural communities, due to their greater reliance on natural resources and limited access to services, feel more vulnerable and thus engage in more proactive climate responses.

4.4. Relationship of socio-demographic profile variables to climate change perception

4.4.1. Relationship between socio-demographic profiles and perceptions of climate change

The analysis reveals significant correlations between socio-demographic factors and climate change perception. Gender is significantly linked to impact risks on health and well-being ($r = 0.623$), overall risk perception ($r = 0.727$), and mitigation responses ($r = 0.207$). Civil status is significantly correlated with understanding the causes ($r = 0.010$) and effects ($r = 0.026$) of climate change. Educational attainment strongly influences climate change perceptions, with the highest correlation found in basic concepts ($r = 0.483$). Income sources also significantly affect perceived risks to goods and services ($r = 0.525$), overall impact risks ($r = 0.986$), attitudes toward climate change ($r = 0.900$), and the frequency of both adaptation ($r = 0.526$) and mitigation ($r = 0.580$) practices. Additionally, personal monthly income correlates significantly with perceptions and practices related to climate change adaptation ($r = 0.003$) and mitigation ($r = 0.012$).

4.4.2. Relationship of household profile variables to climate change perception

Household profile variables also exhibit significant correlations with climate change perceptions. Long-term residence is strongly associated with awareness of climate change, except in areas like access to goods and services and mitigation practices. The number of household members correlates with understanding basic climate change concepts ($r = 0.034$), health risks ($r = 0.180$), adaptation ($r = 0.000$), and mitigation efforts ($r = 0.034$). However, the number of working members has little influence on climate-related perceptions. Family monthly income shows a strong relationship with perceptions and practices, while the type of house is significantly related to all components except adaptation strategies. Interestingly, the type of residence does not correlate significantly with climate change perceptions.

4.5. Relationship between climate change impact risks, attitude, and adaptation and mitigation responses

The analysis highlights that perceived risks related to health, well-being, and access to goods and services are significantly associated with adaptation ($p < 0.001$) and mitigation responses ($p < 0.001$). Attitudes toward climate change also correlate significantly with the frequency of adaptation ($p < 0.001$) and mitigation practices ($p < 0.001$). Respondents with higher perceived risks and more positive attitudes tend to engage more frequently in proactive climate adaptation and mitigation strategies.

4.6. Project LEARN: Literacy enhancement action for restoration of nature

Project LEARN is a proposed literacy-based climate change adaptation and mitigation program aimed at reducing individuals' vulnerability to climate change impacts by enhancing their knowledge of climate science and their ability to integrate that knowledge into everyday actions. The project focuses on both basic scientific understanding and procedural knowledge, providing practical information on how to translate environmental concerns into concrete actions. Emphasizing that climate change action begins with education and that adaptation starts with disaster risk reduction (DRR), project LEARN aims to foster comprehensive climate literacy.

The findings from this study highlighted specific gaps in climate literacy, particularly among households facing frequent flooding risks. Data gathered from questionnaires, interviews, and observations revealed moderate climate change awareness levels and identified socio-demographic factors, such as education and income, as significant influencers of adaptive and mitigative responses. These insights directly informed the development of project LEARN, a climate literacy program tailored to address the observed knowledge gaps and to empower communities with practical skills to enhance resilience and adaptive capacity.

The project proposes a partnership between a local government unit (LGU) and a tertiary educational institution as part of their extension project. The LGU will handle the dissemination of information to the target audience and provide the necessary administrative support and management. Meanwhile, the educational institution will supply resource persons and educational materials. The program includes a three-month-long seminar workshop divided into seven units, each addressing different aspects of climate change.

The first unit, "Climate literacy: The essential principles of climate science", covers topics such as the sun as the primary energy source, the complexity of climate, the interaction between life and climate, climate variability, and the impact of human activity on climate. This unit aims to build a foundational understanding of climate science using resources like "Climate literacy: The essential principles of climate science" and Al Gore's *The Inconvenient Truth* (Gore, 2006).

The second unit, "Introduction to climate change", delves into the basic concepts, causes, and effects of climate change, focusing on its impact on the Philippines, including key sectors such as health, agriculture, fisheries, water, and environmental management. This unit uses materials from the Red Cross/Red Crescent climate guide and the climate change resource book.

The third unit, "Climate change scenarios", familiarizes participants with global and Philippine climate change scenarios and their consequences, such as changes in temperature, rainfall variation, and sea level rise. This unit utilizes resources like "Climate change in the Philippines" from the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) to illustrate potential future climate scenarios.

The fourth unit, "Key terminologies of climate change", aims to develop a common understanding of important terms related to climate change, such as impacts, vulnerability, adaptation, mitigation, risk, hazards, shock, variability, trend, exposure, sensitivity, and adaptive capacity. This unit ensures that all participants have a shared vocabulary to discuss climate change issues effectively.

The fifth unit, "Understanding community vulnerability and capacity to respond to climate change", helps participants identify the climate change and disaster threats facing their community, vulnerable geographic locations, economic sectors, and populations. It also explores existing community capacities to handle climate impacts and articulates a vision for community resilience. This unit uses the "Compendium of climate change vulnerability and impact assessment tools".

The sixth unit, "Developing a community climate change response", focuses on adaptation strategies, explaining the concept and types of adaptation, providing examples, and describing the elements of a community climate change response plan. Participants will identify priority actions and a process for implementing them. Resources such as "Climate change adaptation: Best practices in the Philippines" support this unit.

The final unit, "Mitigation as a response to climate change", covers mitigation strategies, explaining the concept and types of mitigation, and providing examples. This unit aims to equip participants with practical strategies to reduce climate change impacts using resources like "Climate change mitigation initiatives of the Philippines".

Project LEARN seeks to empower communities through education, enhancing their resilience to climate change by providing the knowledge and practical strategies needed for effective adaptation and mitigation. The collaboration between the LGU and the educational institution ensures that the program is well-supported and effectively implemented, fostering a more climate-resilient community.

5. DISCUSSION

5.1. Household vulnerability and environmental risks

The findings indicate that a significant proportion of respondents reside in semi-concrete houses in low-lying areas, increasing their vulnerability to climate-related disasters, particularly flooding. This aligns with the literature emphasizing the importance of housing conditions in disaster risk management; for instance, Löschner et al. (2017) highlight that the spatial arrangement of settlements in flood-prone areas exacerbates climate change risks due to improper land use, leading to increased exposure to flooding events. Similarly, Junger et al. (2022) note that land use pressures in these regions represent a systemic challenge in managing urban development in vulnerable zones. Furthermore, Ramiaramanana and Teller (2021) support the link between housing vulnerability and disaster risk, asserting that urbanization in flood-prone areas often results in precarious living conditions compounded by inadequate infrastructure, thus underscoring the need for improving housing resilience to enhance community safety through sustainable development practices. Education also emerges as a pivotal factor in mitigating these risks, as Gong

et al. (2021) assert that educational initiatives significantly enhance community awareness and preparedness for environmental challenges. This is echoed by Li et al. (2023), who argue that incorporating DRR into educational curricula effectively reduces vulnerability by equipping individuals with the knowledge and skills to respond to disasters. Moreover, the role of gender in environmental education is highlighted by Daraz et al. (2023), who note that women often demonstrate greater concern for environmental issues, suggesting that targeted educational programs could empower women and enhance community resilience. Socio-demographic factors influencing risk perception and preparedness are crucial, as Shen et al. (2020) found that individuals with lower educational attainment and income levels often exhibit heightened risk perceptions, leading to inadequate protective measures against disasters. Enhancing educational opportunities and risk awareness among vulnerable populations is essential for fostering a culture of preparedness and resilience. In conclusion, addressing the interplay between housing vulnerability, education, and disaster preparedness through sustainable development and educational initiatives — particularly among marginalized groups — can significantly improve community resilience and reduce susceptibility to environmental risks.

5.2. Moderate climate change awareness and preparedness attitudes

Respondents displayed moderate awareness of climate change, particularly in relation to its causes and effects, with differences in knowledge levels across various regions. Cabanatuan respondents showed the highest awareness, while Gabaldon and Licab showed the lowest. Despite the moderate awareness, respondents exhibited a proactive attitude towards preparedness, such as developing household emergency plans. This positive stance, especially among Cabanatuan respondents, indicates an underlying readiness to address climate risks, though the findings suggest a need to bridge the gaps in climate change knowledge to further improve their response capabilities.

5.3. Rural and urban differences in climate change perception

There is a significant difference between rural and urban respondents in terms of their perception of vulnerability, attitudes towards climate change, and the frequency of adaptation and mitigation practices. Rural respondents perceive themselves to be at greater risk, especially regarding health and access to goods and services during extreme weather events. This heightened sense of vulnerability drives more proactive adaptation and mitigation efforts compared to their urban counterparts. These differences underline the need for targeted climate action strategies that specifically address the distinct vulnerabilities of rural communities, ensuring that they receive adequate support and resources to effectively respond to climate challenges.

5.4. Socio-demographic influences on climate change perception

The significant relationship between socio-demographic factors and climate change perception suggests that gender, civil status, educational attainment, and income sources play a critical role in shaping how individuals perceive and respond to climate change risks. For instance, gender-specific concerns about health risks indicate that communication strategies should consider these differences to effectively reach diverse groups. Similarly, the strong influence of educational attainment highlights the need for climate change education initiatives that foster a comprehensive understanding across different demographics. The link between income and adaptation or mitigation practices suggests that economic stability enables individuals to take more proactive steps in addressing climate risks, indicating that financial resources are a crucial factor in climate action.

5.5. Household dynamics and climate change perception

Household variables such as the number of members and long-term residency significantly impact climate change perceptions and actions. Larger households tend to have a better grasp of climate change concepts and engage in more frequent adaptation and mitigation efforts. This may stem from collective family experiences and shared discussions about environmental challenges. The significance of family income in shaping perceptions and responses further emphasizes the economic dimension of climate adaptation. The type of house is also a critical factor, influencing how households perceive climate risks, while the physical type of residence appears less relevant compared to social and economic factors. These insights suggest that household dynamics, stability, and economic resources are vital in shaping climate responses.

5.6. Impact risks and attitude as drivers of adaptation and mitigation

The strong correlation between perceived climate change impact risks and proactive adaptation and mitigation practices indicates that individuals who feel more vulnerable to climate risks are more likely to engage in behaviors that reduce their exposure. A heightened awareness of personal risks, particularly related to health and access to essential goods, drives more frequent adaptation strategies such as building flood defenses and adopting energy-saving practices. Furthermore, the positive correlation between attitudes toward climate change and the frequency of adaptation and mitigation efforts underscores the importance of fostering informed and optimistic attitudes toward environmental action. This finding suggests that educational programs focusing on building awareness of climate risks and the benefits of proactive adaptation can lead to more widespread engagement in climate mitigation efforts.

5.7. Project LEARN: Empowering communities through climate literacy

Project LEARN aims to enhance climate literacy and empower communities to take proactive measures against climate change. The program's partnership between an LGU and a tertiary institution ensures that communities receive both academic expertise and administrative support. By focusing on education as the foundation for climate action, project LEARN covers essential climate science, localized impacts on the Philippines, and practical strategies for adaptation and mitigation. The program's structure, with units ranging from foundational climate knowledge to community-specific response plans, provides participants with the tools necessary to both understand climate change and implement effective actions. Furthermore, project LEARN has the potential to be implemented as a community extension project by the university, enabling it to maximize its outreach and impact. Through this model, the university can play a pivotal role in fostering community resilience, applying its academic resources to address real-world climate challenges while strengthening its engagement with local communities.

6. CONCLUSION

The study concludes that respondents, predominantly middle-aged, married, and with low levels of education and income, frequently face typhoons, storms, and floods in their low-lying residential areas. They possess a basic understanding of climate change concepts and demonstrate moderate awareness, perceiving its impacts as posing a medium risk to their everyday lives, although not life-threatening. The frequency of practicing adaptation and mitigation strategies is notably higher among rural respondents compared to those in urban areas. These practices correlate positively with factors such as education, income, years of residence, and household size. Furthermore, perceived climate change impact risks and attitudes serve as significant predictors of the frequency of adaptation and mitigation responses; those who perceive a higher threat are more likely to implement these practices. Additionally, a significant proportion of respondents live in semi-concrete houses in low-lying areas, which increases their vulnerability to climate-related disasters, particularly flooding. This aligns with literature emphasizing the importance of housing conditions in disaster risk management (Löschner et al., 2017; Junger et al., 2022; Ramiaramanana & Teller, 2021). Education is pivotal

in mitigating risks, as highlighted by Gong et al. (2021) and Li et al. (2023), emphasizing the need for incorporating DRR into educational curricula. The role of gender in environmental education, as noted by Daraz et al. (2023), suggests that targeted educational programs could empower women and enhance community resilience. However, limitations in the research include a focus on specific demographics, which may not capture the full spectrum of climate change impacts across different communities. Future research should explore the effectiveness of tailored educational programs and the role of socio-demographic factors in shaping climate change perceptions and actions. While this study is centered on Nueva Ecija, the results offer insights that are applicable to other flood-prone agricultural areas. The findings, particularly regarding moderate climate change awareness, the role of socio-demographic factors, and differing perceptions of risk between rural and urban settings, can be relevant to similar communities globally. These results underscore a broader need for adaptive strategies that account for socio-economic and environmental vulnerabilities, supporting future research aimed at validating these findings in other climate-vulnerable regions and agricultural areas.

Based on these findings, it is recommended to implement project LEARN as a climate literacy program for households, aiming to enhance their resilience to climate change impacts. Climate change education and awareness campaigns should be tailored to address the specific vulnerabilities of middle-aged, low-income communities in flood-prone areas, emphasizing the escalating risks associated with extreme weather events. Comprehensive climate literacy programs should move beyond basic knowledge, providing a deeper understanding of climate science, its causes, and potential impacts. Strengthening awareness and action programs in urban areas is essential, given their lower perceptions of risk and implementation of strategies compared to rural counterparts. Priority should be given to communities with lower education levels, income, and shorter residency periods, recognizing their heightened vulnerability and potential for increased action with appropriate knowledge and resources. Communication strategies should focus on the escalating and potentially life-threatening risks of climate change to motivate increased adaptation and mitigation actions. Ultimately, project LEARN should be expanded and tailored to meet the needs of diverse communities, ensuring accessibility and engagement for long-term impact.

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