ROOTED RESILIENCE: INDIGENOUS KNOWLEDGE AND CLIMATE ACTION IN THE PHILIPPINE HIGHLANDS

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Abstract

Indigenous communities in the Philippine highlands maintain ecological knowledge systems rooted in cultural heritage and spiritual ties to the land. This study examines how an upland indigenous community in Barangay Carmen, Misamis Occidental, perceives climate change and engages in adaptive ecological behaviors. Using a descriptive-correlational quantitative design, data were collected from 115 respondents through structured interviews, employing the Climate Change Risk Perception Scale (CCRPS) and General Ecological Behavior Scale (GEB-50). Findings indicate a moderate perception of climate change risks (M = 3.29), particularly in terms of severity and personal vulnerability, and a high frequency of sustainable practices (M = 3.98), notably in biodiversity protection, sustainable consumption, and waste management. Lower engagement was observed in energy conservation and climate advocacy. A significant positive correlation ($r \approx 0.30$, $p = 0.005$) was found between risk perception and ecological behavior, with education emerging as a key factor. Despite limited formal climate education, the community's environmental actions reflect deep-rooted traditional knowledge. These findings underscore the critical role of Indigenous ecological wisdom in enhancing climate resilience at the community level and align with the Climate Change Act (RA 9729), Indigenous Peoples' Rights Act (RA 8371), and the National Climate Change Action Plan, contributing to Sustainable Development Goal 13. It recommends integration of Indigenous perspectives into policy, education, and local climate action, highlighting the practical implications of this research for shaping effective climate policies and educational strategies.

Keywords: *Indigenous knowledge, climate resilience, ecological behavior, Philippine highlands, traditional adaptation, SDG 13*

Introduction

Climate change poses significant global threats, with impacts felt most acutely by vulnerable communities such as indigenous peoples. The Philippines ranked among the countries most at risk from extreme weather events, has prioritized climate change adaptation in its national agenda. In line with the Philippine government's climate policies (e.g., the Climate Change Act of 2009 and the National Climate Change Action Plan 2011–2028) and the global Sustainable Development Goal 13 on Climate Action, there is a growing emphasis on community-based adaptation and the integration of indigenous knowledge.

An upland indigenous cultural community in Barangay Carmen, Misamis Occidental, presents a pertinent case: They possess a rich tradition of environmental stewardship rooted in their spiritual beliefs and customary practices. However, increasingly severe climate disruptions threaten their traditional way of life and the ecological balance they have maintained. Despite these challenges, the community's resilience and determination to adapt to the changing climate is inspiring. Understanding how members of this community perceive climate change—and how these perceptions influence their practices—is crucial for developing culturally appropriate adaptation strategies.

This study focuses on an indigenous cultural group in Barangay Carmen, Misamis Occidental. This community, deeply connected to its land and its resources, relies heavily on farming and forest resources, making it highly sensitive to climate variability. Their indigenous practices (e.g., ritual offerings for good harvest and communal forest management) reflect a profound connection to the environment. By examining the relationship between the community's perspectives on climate change and their ecological practices, the research aims to bridge indigenous knowledge with modern sustainability efforts. Such an approach addresses gaps in literature where indigenous-specific climate perspectives are often overlooked.

The conceptual foundation of this research is the interplay between perceptions and behavior. Guided by the Theory of Planned Behavior (Ajzen, 1991), we propose that attitudes and beliefs about climate risks influence intentions and actions related to environmental conservation. In indigenous contexts, these attitudes are informed by both traditional ecological knowledge and exposure to modern climate information.

Empirical studies in the Philippines underscore these dynamics. For example, a study of Aeta communities in Central Luzon showed that climate risk perceptions were deeply intertwined with spiritual beliefs and traditional practices (Cruz & Perez, 2020). Similarly, work with the Ifugao people of the Cordillera highlands revealed that traditional agricultural practices contribute to ecological sustainability, even as communities become aware of changing climate patterns (Dizon & Rivera, 2020). For the community in Barangay Carmen, whose cultural identity and livelihoods are closely tied to their land, the urgency of integrating their wisdom with climate science is apparent. Doing so could significantly enhance resilience.

This study aligns national research priorities on climate resilience and contributes to Sustainable Development Goal 13 by informing community-based climate action grounded in traditional knowledge.

Materials and Methods

Research Design and Setting

This study utilized a descriptive-correlational quantitative design to examine the relationship between climate change risk perceptions and sustainable practices. The research was conducted in Barangay Carmen, Jimenez, Misamis Occidental, a rural upland community in Northern Mindanao, Philippines. The area is home to a recognized indigenous cultural group that relies on traditional farming, forest resources, and subsistence activities. Its geographic location and distinct socio-cultural structure make it an ideal setting for exploring community-based ecological knowledge and climate vulnerability.

Instrumentation

The survey instrument consisted of three parts: (1) the demographic profile, (2) the Climate Change Risk Perception Scale (CCRPS), and (3) the General Ecological Behavior Scale (GEB-50). The CCRPS was adapted from Leiserowitz (2006) to assess the perceived likelihood, severity, personal vulnerability, and response efficacy related to climate change. The GEB-50, initially developed by Kaiser (2020), was used to measure the frequency of environmentally responsible behaviors across seven domains: energy, water, waste, transportation, consumption, biodiversity, and social action.

To ensure linguistic and cultural validity, all items were translated into Bisaya, the local vernacular, and back-translated into English. Items were pilot-tested and reviewed by subject experts and local community facilitators. Internal consistency was confirmed with Cronbach's alpha values of 0.85 (CCRPS) and 0.89 (GEB-50), indicating high reliability.

Data Collection and Ethical Considerations

The survey was conducted through structured face-to-face interviews to accommodate literacy constraints. A total of 115 community members participated, representing a substantial portion of the adult population in the study area. Participants were selected using purposive sampling to ensure inclusivity across age, gender, and household roles. However, due to the use of purposive sampling and logistical constraints in reaching remote households, findings may not be generalizable to all Indigenous communities. In addition, reliance on self-report data may introduce social desirability bias, as participants may have provided responses they believed were socially acceptable. These limitations should be taken into account when interpreting the study's findings.

Ethical protocols were rigorously followed, as mandated by the Indigenous Peoples Rights Act (IPRA) of 1997 (RA 8371) and global research ethics standards.

Key ethical safeguards included:

- Prior community engagement: Consultations were conducted with the Barangay Indigenous Peoples Mandatory Representative (IPMR), elders, and leaders to secure cultural consent.
- Institutional ethics approval: The study protocol was reviewed and approved by the University Research Ethics Committee.
- Free, Prior, and Informed Consent (FPIC): Participants were informed of the study objectives, data confidentiality, and their voluntary right to participate or withdraw. Consent was obtained verbally and in writing using local dialect.
- Cultural sensitivity and confidentiality: Researchers respected community customs and ensured anonymity by not disclosing specific names, tribes, or rituals. No video or photo documentation was conducted without consent.
- Data safeguarding: All responses were anonymized and securely stored in accordance with institutional data protection policies.

The research team collaborated with local interpreters and community facilitators to avoid misinterpretation and ensure mutual respect throughout the data-gathering process.

Data Analysis

All data were encoded and analyzed using Microsoft Excel. The following analytical procedures were conducted:

- Descriptive statistics (mean, frequency, percentage) were computed to summarize demographic profiles, perception scores, and practice frequencies.
- Inferential analysis was carried out using Excel's data analysis toolpak:
    - Independent samples t-tests (or non-parametric Mann-Whitney U test approximations) were applied to compare groups by gender and other binary variables.
    - ANOVA and Kruskal-Wallis equivalents were used for variables with more than two groups (e.g., educational level).
    - Pearson's r correlation was used to assess the relationship between climate change risk perception and the frequency of ecological practices.
- Charts and visual summaries were generated to supplement the interpretation and presentation of data.

This Excel-based approach ensured accessibility and allowed for transparent tracking of computations, aligning with institutional resource availability.

Results

Demographic Profile

Participants were primarily female (65%) and aged 55 and above. Educational attainment varied widely, with most respondents having only completed primary or secondary education. Notably, higher educational attainment correlated positively with higher climate change perception and practice scores ($p < 0.05$), while gender differences also showed statistically significant effects on perception levels.

Climate Change Risk Perceptions

The climate change risk perception of the indigenous cultural community was moderate across all dimensions. Table 1 summarizes the mean scores for each aspect of risk perception.

Table 1. Climate Change Risk Perception Scores Among the Indigenous Community (N = 115)

Perception Dimension	Mean Score	Qualitative Rating
Likelihood of impacts	3.12	Sometimes
Severity of impacts	3.39	Sometimes
Personal vulnerability	3.38	Sometimes
Response efficacy	3.27	Sometimes
Overall Perception	**3.29**	**Sometimes**

Note: Mean scores were rated on a 5-point Likert scale where 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often, 5 = Always.

Table 1 presents the community's perceived understanding of climate change threats and their ability to respond. All dimensions of perceived likelihood, severity, vulnerability, and efficacy were rated around the "sometimes" level, with mean scores ranging from 3.12 to 3.39.

The perceived severity of impacts (M = 3.39) and personal vulnerability (M = 3.38) received the highest ratings, indicating that while the community acknowledges the dangers and feels somewhat personally at risk, there is less clarity on how frequently these risks might manifest (reflected in the lower mean of 3.12 for likelihood). The response efficacy (M = 3.27) belief in one's or the community's ability to reduce climate impacts was also moderate, suggesting opportunities for empowerment-based interventions.

These results affirm earlier studies (Cruz & Perez, 2020; Dizon & Rivera, 2020), which noted that Indigenous communities often perceive climate threats through experience and oral knowledge rather than formal science, potentially limiting their sense

of control over outcomes.

Sustainable Practices

In contrast to their moderate risk perception, respondents reported frequent engagement in sustainable ecological behaviors. Table 2 provides a breakdown of practice domains.

Table 2. Frequency of Climate-Related Practices by Domain (N = 115)

Practice Domain	Mean Score	Qualitative Rating
Energy conservation	3.40	Sometimes
Water conservation	4.13	Often
Waste management	4.18	Often
Sustainable transportation	3.67	Often
Sustainable consumption	4.37	Always
Nature and biodiversity actions	4.37	Always
Social/political environmental actions	3.73	Often
Overall Practices	**3.98**	**Often**

Note: Practice frequency was rated on a 5-point scale from 1 = Never to 5 = Always.

Table 2 reveals that members of the indigenous cultural community frequently engage in sustainable practices, particularly those tied to traditional ecological knowledge and subsistence living. The highest scores were observed in:

- Sustainable consumption (M = 4.37): such as reusing materials, buying only necessities, and preserving food.
- Nature and biodiversity actions (M = 4.37): including planting trees, protecting rivers, and respecting sacred ecological spaces.

These practices align closely with traditional values of reciprocity, conservation, and community stewardship. Consistent with Alimboyong and Magalona (2019), the behaviors observed are not reactive to modern climate discourse but are rooted in ancestral norms that emphasize harmony with the environment.

Interestingly, energy conservation scored the lowest (M = 3.40), possibly due to limited control over energy sources or lack of access to efficient technologies such as solar panels or LED lighting. Social and political engagement—like participating in cleanups, seminars, or environmental campaigns—was moderate (M = 3.73), pointing to an area where institutional support could amplify grassroots initiatives.

These high practice scores, despite only moderate perception levels (as shown in Table 1), suggest that behavior is driven by cultural norms more than climate awareness itself, providing a strong foundation for culturally sensitive climate programs.

The quantitative findings from both tables underscore a key conclusion: Indigenous practices are often environmentally sustainable by default, and climate literacy can enhance, rather than replace, these traditional systems. The perception–practice correlation ($r \approx 0.30$, $p = 0.005$) supports the notion that enhancing climate awareness through targeted education can further promote adaptive behaviors.

Discussion

The findings reveal a key paradox: Despite only moderate awareness of climate change concepts, the community exhibits high levels of sustainable practice. This suggests that traditional ecological behaviors are already deeply embedded and can serve as a foundation for climate adaptation.

The moderate perception of efficacy—people's confidence in addressing climate change—is notable. This reflects a need for education and community-based empowerment. When people believe they can act meaningfully, they are more likely to support adaptation strategies (van Valkengoed & Steg, 2019).

Furthermore, energy conservation scored the lowest among behaviors. Structural or economic limitations, such as lack of access to efficient technologies or knowledge of low-carbon practices, may constrain this domain. On the other hand, social and political environmental engagement ($M = 3.73$) suggests the potential for mobilizing advocacy and organizing environmental programs at the grassroots level.

Education remains a critical factor: more educated individuals had higher scores in both perceptions and practices, implying that formal and informal environmental education initiatives could bridge knowledge gaps and empower action.

In summary, the community presents a valuable opportunity for policy and program interventions that build on existing sustainable habits while enhancing understanding of climate dynamics. Programs co-developed with the community—respecting their knowledge, customs, and leadership structures—could significantly enhance climate resilience.

Conclusions

This study provides empirical evidence that an upland indigenous cultural community in Barangay Carmen, Misamis Occidental, exhibits a strong foundation of sustainable environmental behaviors, even in the absence of high formal awareness about climate change. The findings affirm that:

1. The perception of climate change risk among community members is moderate, particularly in the domains of perceived severity and personal vulnerability. However, perceptions of likelihood and efficacy were relatively lower, indicating a need to strengthen understanding and confidence in climate responses.

2. The community consistently engages in high-frequency sustainable practices, especially in areas aligned with traditional knowledge systems such as water conservation, sustainable consumption, and biodiversity protection. These practices suggest that cultural values and ancestral norms continue to guide ecological stewardship.
3. A significant positive relationship exists between perceptions of climate change and ecological practices. This correlation supports the notion that improving climate literacy—even incrementally—could further enhance the community's already environmentally conscious behaviors.
4. Education level is a key factor influencing both perception and practice, suggesting that targeted educational interventions may yield substantial benefits. Additionally, gender differences in perception indicate the importance of inclusive, gender-responsive climate programming.

The study highlights the crucial role of indigenous knowledge systems as both a repository of sustainable practices and a foundation for adaptive climate change strategies. As the Philippines advances the implementation of the National Climate Change Action Plan (NCCAP 2011–2028) and fulfills its obligations under the Climate Change Act of 2009, it is essential to recognize, document, and support traditional ecological knowledge. Integrating climate science with indigenous wisdom—through culturally responsive education, community-based adaptation, and participatory governance—can significantly enhance the nation's climate resilience and contribute meaningfully to achieving Sustainable Development Goal 13.

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Disclosure: Use of AI Tools

This study utilized digital tools to support the writing and editing process. Specifically, OpenAI's ChatGPT was utilized to enhance clarity and conciseness in drafting and refining the manuscript. QuillBot was employed for paraphrasing and grammar suggestions, while Grammarly was used for final grammar and style checks. The authors maintained complete control over the content, ensuring the accuracy, integrity, and originality of the work.

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