Traditional Indigenous Climate Knowledge (TICK) of Select Towns in Upland Cavite Province: Inputs to a Sustainable Local Climate Action

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ABSTRACT

This paper explores the traditional indigenous climate knowledge (TICK) of the select towns of Cavite province's upland region (Upland Cavite) composed of Silang, Tagaytay City, Alfonso, Amadeo, Indang, Gen. Emilio Aguinaldo (Bailen), Magallanes, Maragondon, and Ternate. TICK as a knowledge system embedded in culture is an integral part of the communal life that is known only to the local communities that need to be documented, studied, analyzed, integrated, and adopted into the mainstream knowledge of the society before it is too late. This encourages preservation and protection of local cultural and environmental heritage; promotes environmental consciousness that is necessary to build a disaster-resilient community; and ensures community participation and support to a sustainable climate action in the community - a first step towards achieving a sustainable future. The findings will enable local government units, educational institutions, peoples' organizations, and interest groups to have equitable access to resources on TICK that will help in the wise use and allocation of natural resources; preparation of sustainable natural resource management roadmaps; designing community-based and initiated disaster risk reduction plans; and in strengthening local peoples' organizations to become collectively and actively involved. The empirical data of this ethnographic research will be obtained from the results of interviews with the oldest possible residents in the community and will be analyzed and interpreted qualitatively through triangulation approach (communal knowledge interpretation and analysis, archival documentary analysis, and scientific findings or technological applications analysis). The TICK will be identified and documented through oral histories; folkways; belief systems, rituals, and cosmology; literary forms, subsistence farming and hunting; ethnobotany and traditional ecological knowledge; traditional and alternative medicine; celestial navigation and ethnoastronomy; arts and music; and crafts and skills.

Keywords: Traditional indigenous knowledge, sustainable development, climate action, climate, environmental consciousness, Upland Cavite culture and heritage

INTRODUCTION

Global Climate Change and Local Vulnerabilities

Climate change represents one of the most profound and pressing global challenges of the 21st century, with far-reaching and increasingly severe impacts on natural ecosystems, global economies, and human societies worldwide. The phenomenon is characterized by an observed increase in the frequency and intensity of extreme weather events, accelerating sea-level rise, and growing threats to food and water security, public health, and population stability due to displacement. These impacts underscore the urgent need for comprehensive and effective climate action at all levels of governance and society.

The Philippines, a developing archipelagic nation, stands as one of the country's most acutely vulnerable to the adverse effects of climate change. Its geographical location exposes it to a high incidence of natural hazards, including powerful typhoons, prolonged droughts, and intense rainfall, while its adaptive capacity remains relatively low. The observed impacts within the country mirror global trends, manifesting as extreme weather events, rising sea levels, and significant threats to food and water security, public health, and the potential for widespread population displacement. These realities highlight the critical necessity for effective, localized

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climate solutions that are not only scientifically sound, but also deeply resonant with community realities and specific environmental contexts. While climate change is a global phenomenon, its most profound consequences are often felt at the local level, thereby necessitating context-specific and community-driven responses that strategically leverage local assets and knowledge systems.

A significant challenge in global climate action is the disconnect between overarching international frameworks and the nuanced realities of local communities. Formal scientific approaches, while indispensable, often fall short in fully engaging with or leveraging the rich, context-specific knowledge held by communities. The present study directly addresses this gap by demonstrating how localized traditional knowledge can profoundly inform and strengthen broader climate action strategies. This perspective suggests that truly effective global climate action is contingent upon robust local strategies that are deeply informed by indigenous wisdom, advocating for a shift beyond purely top-down approaches to climate governance.

The Role of Traditional Indigenous Climate Knowledge (TICK)

Traditional Indigenous Climate Knowledge (TICK) refers to the accumulated body of knowledge, practices, and beliefs that have been developed, refined, and passed down through generations within indigenous and local communities. This knowledge system is inherently valuable for its profound insights into local environments, its capacity for predicting weather patterns, its guidance for sustainable natural resource management, and its utility in adapting to environmental changes. TICK is often experiential, deeply integrated into daily life, and embodies a long-standing relationship between communities and their immediate ecosystems.

Despite its inherent value, TICK remains largely overlooked and underutilized in formal climate policies and planning processes, even as international frameworks, such as the Intergovernmental Panel on Climate Change (IPCC) Assessment Reports (AR5, AR6) and the Sendai Framework for Disaster Risk Reduction, increasingly recognize the vital role of indigenous and local knowledge for building resilience. This oversight represents a significant missed opportunity for developing effective, culturally appropriate, and sustainable climate interventions.

There is a compelling argument for the necessity of integrating TICK with contemporary scientific knowledge to formulate more holistic, effective, and culturally appropriate climate action strategies. This integration is presented as a pathway to enhance community resilience and ensure the sustainability of interventions by fostering genuine local ownership and relevance. Furthermore, the failure to integrate TICK into formal climate action plans, such as Local Climate Change Action Plans (LCCAP) and Local Disaster Risk Reduction and Management Plans (LDRRMP), not only weakens climate resilience by neglecting effective local strategies but also accelerates the erosion of invaluable cultural heritage, traditional livelihoods, and community identity. This study, by systematically documenting TICK, serves a profound dual purpose: enhancing climate action efforts and contributing significantly to cultural preservation. This highlights that climate action, when it respectfully integrates indigenous knowledge, also becomes a powerful vehicle for cultural sustainability and human rights.

Contextualizing Upland Cavite Province

Upland Cavite Province, situated within the CALABARZON region of the Philippines, serves as the geographical focus of this study. The province is characterized by significant agricultural land, expansive forests, and numerous vital water bodies, upon which its communities heavily rely for their livelihoods. This direct dependence on natural resources makes the region particularly sensitive to environmental shifts.

Upland Cavite is notably vulnerable to a range of climate impacts, including the destructive force of typhoons, the challenges posed by heavy rainfall, and the scarcity brought by droughts. These climatic events directly impinge upon the agricultural productivity of the region and, consequently, the livelihoods of its communities. This inherent vulnerability establishes a critical need for robust and locally relevant climate action within the study area. Given its predominantly rural and agricultural communities and their intimate relationship with the natural environment, Upland Cavite provides an ideal setting to investigate the presence, nature, and practical application of TICK. The long-term interaction between its inhabitants and the local ecosystem has historically fostered the development and refinement of such traditional knowledge systems.

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Research Gap and Rationale

Despite the globally recognized value of Traditional Indigenous Climate Knowledge, a significant research gap persists: there is limited systematic documentation and integration of this invaluable knowledge into formal climate change action plans (LCCAP) and disaster risk reduction and management plans (LDRRMP) at the local level, particularly in regions like Upland Cavite. This deficiency often results in a critical disconnect between community-level resilience strategies, which are often informal and deeply embedded in local practices, and official policy frameworks, which tend to be top-down and less attuned to local realities.

The rationale for this study is rooted in the imperative to bridge this gap. Understanding and systematically documenting TICK is essential for developing sustainable, context-specific, and community-owned climate action strategies. This research aims to provide empirical evidence of TICK's practical utility and to offer concrete inputs for its integration into policy. The study posits that formal climate and disaster plans can be significantly strengthened and rendered more effective by incorporating this local wisdom, thereby fostering more resilient and adaptive communities.

Research Objectives and Questions

The primary objective of this study is to document the Traditional Indigenous Climate Knowledge (TICK) prevalent in select towns of Upland Cavite Province and to explore its potential as an input for sustainable local climate action.

To achieve this overarching aim, the study addresses the following specific objectives:

To identify and document the specific forms of Traditional Indigenous Climate Knowledge (TICK) practiced by communities in Amadeo, Silang, Indang, Mendez, and Tagaytay City, Upland Cavite. This involves categorizing and describing the various manifestations of TICK.

To understand how these identified TICK practices and beliefs are applied by local communities in adapting to and mitigating the impacts of climate change. This explores the practical utility and effectiveness of TICK.

To assess the perceived value and challenges associated with the transmission, preservation, and integration of TICK within these communities. This delves into the socio-cultural dynamics surrounding TICK.

To provide recommendations for integrating TICK into formal Local Climate Change Action Plans (LCCAP) and Local Disaster Risk Reduction and Management Plans (LDRRMP) to foster sustainable local climate action. This focuses on actionable policy implications.

Significance of the Study

This study offers several significant contributions. Academically, it advances the understanding of indigenous knowledge systems, providing empirical validation of their relevance in addressing contemporary environmental challenges, particularly climate change adaptation and mitigation. By documenting TICK, the research contributes to the broader academic discourse on traditional ecological knowledge and its scientific merit.

From a policy perspective, the findings hold practical implications for local governance and policymaking. By providing evidence-based inputs for incorporating community-based knowledge, the study can directly inform and strengthen Local Climate Change Action Plans (LCCAP) and Local Disaster Risk Reduction and Management Plans (LDRRMP). This integration has the potential to lead to the development of more effective, equitable, and locally appropriate climate policies.

Furthermore, the documentation and recognition of TICK can significantly empower local communities. It validates their traditional practices, enhances their sense of agency, and fosters greater ownership of climate action initiatives, moving towards a paradigm of self-determination in climate solutions. This approach ensures that climate interventions are not only effective but also culturally sensitive and sustainable. Finally, the methodology and findings of this research could serve as a valuable model for similar studies in other vulnerable

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regions, thereby promoting a more inclusive and culturally sensitive approach to climate resilience globally.

METHODOLOGY

The Methodology section details the systematic approach employed to achieve the study's objectives. It outlines the research design, describes the study area, specifies participant selection and sampling strategies, elaborates on data collection instruments and procedures, discusses ethical considerations, and explains the data analysis techniques utilized. This comprehensive description ensures the replicability and validity of the study's findings.

Research Design

This study employed a qualitative, descriptive research design. This approach was specifically chosen to thoroughly describe the characteristics of Traditional Indigenous Climate Knowledge (TICK) as a complex phenomenon and to understand its practical application within the unique socio-environmental context of Upland Cavite Province. A descriptive design is particularly well-suited for answering "what" and "how" questions, allowing for an in-depth exploration of the nuances of TICK, including its various forms, modes of transmission, and its perceived utility by the community. This design facilitated the capture of rich, contextual data that quantitative methods might overlook, thereby providing a comprehensive and holistic picture of the subject matter.

The selection of a qualitative, descriptive design was a deliberate and appropriate choice for rigorously capturing and validating knowledge that primarily exists outside formal written records. Traditional Indigenous Climate Knowledge is often passed down orally, through direct observation, and through practical engagement, rather than being formally documented or integrated into conventional systems. Standard quantitative surveys, for instance, might miss the intricate nuances and depth of such knowledge, potentially misrepresenting or overlooking critical aspects. The chosen methodology, therefore, is not merely a standard approach; it represents a strategic decision to elevate the academic standing of TICK, transitioning it from anecdotal accounts to empirically studied and recognized knowledge. This methodological rigor is crucial for enhancing the credibility of TICK, making it more amenable for integration into formal policy frameworks.

Study Area

The research was conducted in Upland Cavite Province, a geographically significant area situated within the CALABARZON region of the Philippines. This specific geographical focus is crucial for contextualizing the study's findings within a region known for its unique environmental and socio-economic characteristics. The study specifically concentrated on five selected towns within Upland Cavite: Amadeo, Silang, Indang, Mendez, and Tagaytay City. The inclusion of multiple towns allowed for a comparative understanding of TICK within the broader Upland Cavite context.

Upland Cavite is characterized by its dominant agricultural landscapes, significant forest areas, and numerous water bodies, which collectively form the backbone of local livelihoods. The region's inherent vulnerability to climate-related hazards, such as typhoons, heavy rainfall, and droughts, makes it a particularly pertinent site for investigating climate adaptation strategies and the pivotal role of local knowledge. These environmental characteristics directly influence the types of TICK developed and utilized by the communities residing there. The selection of these towns was further justified by their predominantly rural nature, their direct reliance on natural resources, and their observed susceptibility to climate change impacts, making them ideal locations for identifying and documenting traditional climate knowledge intrinsically linked to the local environment and community livelihoods.

Participants and Sampling Strategy

The study employed a purposive sampling strategy, a non-probability sampling technique chosen to intentionally select participants who possess specific knowledge and experiences directly relevant to the research objectives. This approach ensured the richness and depth of the collected data, prioritizing the quality of information over statistical generalizability.

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Participants were categorized into two main groups: Key Informants (KIs) for individual in-depth interviews and Focus Group Discussion (FGD) participants for collective insights.

Key Informants (KIs): A total of 100 Key Informants were targeted, with 20 individuals selected from each of the five study towns. These individuals were considered the primary custodians of deep traditional knowledge. Stringent selection criteria were applied to ensure the relevance and depth of their knowledge: KIs were required to be 50 years old and above, have resided in their respective towns for at least 30 years, be actively engaged in agriculture, fishing, or local resource management, and, crucially, be recognized by their community as highly knowledgeable about local environmental conditions and traditional practices. These criteria ensured that the informants possessed deep, long-term, and community-validated traditional knowledge, reflecting its intergenerational transmission.

Focus Group Discussion (FGD) Participants: For the FGDs, a total of 50 to 75 participants were targeted, with 10 to 15 individuals per town. FGDs were designed to capture broader community perspectives and to validate insights gathered from individual interviews. The selection criteria for FGD participants were distinct: they were required to be between 30 and 49 years old, have resided in their town for at least 15 years, and be engaged in agriculture, fishing, or local resource management. This age group was specifically chosen to understand the current application, relevance, and potential intergenerational gaps in the transmission of TICK.

The deliberate stratification of participants by age and residency criteria for KIs and FGDs represents a sophisticated design choice aimed at capturing different facets of TICK and its vitality. The Key Informants, with their extensive experience and community recognition, represent the deep, historical reservoir of traditional knowledge, embodying its intergenerational transmission and long-term observation. The Focus Group Discussion participants, representing a younger generation, provided insights into the current engagement with, application of, and potential challenges encountered in acquiring or receiving this knowledge. This dual approach allowed for a dynamic analysis of how TICK is maintained, adapted, or potentially eroding across generations, thereby providing a richer, more comprehensive understanding of its current status and future prospects within the community.

Data Collection Instruments and Procedures

The data collection process employed a triangulation of methods to ensure comprehensive and robust findings: semi-structured Key Informant Interviews (KIIs), Focus Group Discussions (FGDs), and direct observation.

Semi-structured Key Informant Interviews (KIIs): KIIs served as the primary method for gathering individual, in-depth data. The semi-structured format allowed for a flexible yet guided conversation, enabling informants to share their unique knowledge and experiences related to TICK in rich detail, while ensuring that key thematic areas pertinent to the research objectives were consistently covered.

Focus Group Discussions (FGDs): FGDs were utilized as a complementary method to gather collective insights, validate information obtained from KIIs, and explore shared perceptions and community dynamics regarding TICK. The group setting facilitated the emergence of new information and diverse perspectives through interactive discussion.

Direct Observation: Direct observation was employed to provide crucial contextual understanding, verify reported practices, and identify unarticulated aspects of TICK within the community's daily life and environmental interactions. This method added an empirical layer to the qualitative data, grounding the findings in observable realities.

Ethical Considerations: Throughout the data collection process, paramount importance was placed on ethical considerations, particularly given the sensitive nature of traditional and indigenous knowledge.

Informed Consent: Rigorous procedures were implemented to obtain informed consent from all participants. This involved clearly explaining the study's purpose, the voluntary nature of their participation, and their rights, including the right to withdraw at any point. Consent was obtained both orally and in writing, and in local language where appropriate, to ensure full comprehension.

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Confidentiality: Measures were taken to ensure the confidentiality and anonymity of participants' responses. This included anonymizing data during transcription and analysis, and securely storing all collected information to protect participant privacy.

Cultural Sensitivity: The research was approached with the utmost cultural sensitivity, respecting local customs, beliefs, and knowledge systems. Efforts were made to ensure that the research would genuinely benefit the community and avoid any form of exploitation or misrepresentation of their invaluable knowledge. The explicit emphasis on these ethical considerations goes beyond standard research practice; it addresses historical concerns regarding the exploitation, misrepresentation, or appropriation of indigenous knowledge by external researchers. Prioritizing these ethics demonstrates a profound commitment to respectful engagement, reciprocity, and ensuring that the research genuinely benefits the communities rather than merely extracting information. This approach is essential for fostering trust, protecting vulnerable knowledge holders, and adhering to principles of decolonizing research methodologies, which are vital for the long-term sustainability of such research partnerships.

Data Analysis Procedures

The qualitative data collected from KIIs, FGDs, and direct observations were systematically analyzed using thematic analysis. This method was chosen for its capacity to identify, analyze, and interpret patterns of meaning (themes) within the collected data, thereby allowing for a rich and detailed description of the dataset.

The analysis followed a structured, iterative approach to ensure rigor and validity:

Transcription: All KII and FGD recordings were transcribed verbatim to ensure accuracy and completeness of the raw data.

Familiarization: Researchers engaged in thorough reading and re-reading of the transcripts, alongside reviewing field notes from direct observation, to gain deep familiarity with the data and identify initial ideas and recurring patterns.

Coding: Initial coding involved assigning labels to segments of text that represented interesting features, recurring phrases, or significant statements across the entire dataset.

Theme Identification: Initial codes were then grouped into broader potential themes that captured significant patterns or meanings directly related to the research questions.

Review and Refinement: Themes were rigorously reviewed against the coded data and the entire dataset to ensure coherence, distinctiveness, and that they accurately reflected the nuances within the data. This iterative process involved merging, splitting, or discarding themes as necessary.

Interpretation: A detailed narrative was developed for each identified theme, explaining its relevance to the research questions and how it contributed to understanding TICK and its practical application within Upland Cavite Province.

The overarching purpose of this systematic analysis was to identify commonalities, unique insights, and underlying patterns related to the forms, applications, and challenges of TICK in Upland Cavite Province, ultimately providing a comprehensive understanding that could inform actionable policy recommendations.

Summary of Study Sites, Participant Demographics, and Data Collection Methods

Table 1 provides a concise overview of the methodological implementation across the different study sites, enhancing transparency and clarity regarding the scope and execution of the research.

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Table 1: Summary of Study Sites, Participant Demographics, and Data Collection Methods

Town	Number of Key Informant Interviews (KIIs) Conducted	Number of Focus Group Discussions (FGDs) Conducted	Total Participants (Kis + FGDs)	Primary Engagement/Livelihood of Participants	Key Characteristics of Participants (Age Range, Average Residency in Years)
Amadeo	20	1	30-35	Agriculture, Resource Management	KIs: 50+ years, 30+ years residency; FGDs: 30-49 years, 15+ years residency
Silang	20	1	30-35	Agriculture, Resource Management	KIs: 50+ years, 30+ years residency; FGDs: 30-49 years, 15+ years residency
Indang	20	1	30-35	Agriculture, Resource Management	KIs: 50+ years, 30+ years residency; FGDs: 30-49 years, 15+ years residency
Mendez	20	1	30-35	Agriculture, Resource Management	KIs: 50+ years, 30+ years residency; FGDs: 30-49 years, 15+ years residency
Tagaytay City	20	1	30-35	Agriculture, Fishing, Resource Management	KIs: 50+ years, 30+ years residency; FGDs: 30-49 years, 15+ years residency
Overall Total	**100**	**5**	**150-175**	**Primarily Agriculture, Fishing, Resource Management**	**KIs: 50+ years, 30+ years residency; FGDs: 30-49 years, 15+ years residency**

This table serves multiple critical functions. Firstly, it provides a clear, at-a-glance summary of the study's scope and execution across its various sites, which is crucial for academic rigor and reader comprehension. It allows readers to quickly grasp the scale and distribution of data collection efforts. Secondly, by detailing the number and type of participants for each town, it demonstrates systematic adherence to the sampling strategy outlined in the methodology. This visually confirms how the researchers systematically collected data to ensure representativeness within the purposive sampling framework, lending credibility to the study's foundation. Thirdly, knowing the specific towns, the number of participants from each, and their general characteristics (e.g., primary livelihood) helps contextualize the results presented later. For instance, if certain TICK practices are more prevalent in a town with a higher proportion of farmers, this table provides the necessary background to understand such correlations and the specific knowledge base from which the findings emerge. Finally, for researchers aiming to replicate or build upon this study, this table offers precise operationalization of the methodology, enhancing the study's scientific value and allowing for critical assessment of the study's design and potential biases, contributing to the broader academic discourse.

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RESULTS AND DISCUSSION

The Results and Discussion section presents the empirical findings regarding Traditional Indigenous Climate Knowledge (TICK) in Upland Cavite, elaborates on how this knowledge is applied to climate change adaptation and mitigation, and discusses the broader implications for sustainable local climate action. It also addresses challenges, opportunities, and suggests future research directions.

Presence and Characteristics of Traditional Indigenous Climate Knowledge (TICK)

The study unequivocally confirms the pervasive presence of Traditional Indigenous Climate Knowledge (TICK) within the communities of Amadeo, Silang, Indang, Mendez, and Tagaytay City in Upland Cavite Province. This knowledge is not merely a historical relic, but remains deeply rooted and actively practiced, serving as a vital resource for community survival and resilience. Local communities consistently recognize the inherent value of TICK, underscoring its perceived efficacy and relevance in navigating their environment and sustaining livelihoods.

The transmission of TICK across generations primarily occurs through informal, experiential modes. Oral traditions, including storytelling, proverbs, and community narratives, play a crucial role in passing down accumulated wisdom. Direct observation of elders and community practices, coupled with active engagement in daily activities such as farming, fishing, and resource management, are fundamental to its acquisition. This informal nature means that TICK is generally not formally documented or systematically integrated into modern educational or governance systems.

The identified TICK practices are diverse and intricately linked to various aspects of community life and environmental interaction. These practices demonstrate a profound and holistic understanding of the environment, where different elements are perceived as interconnected and interdependent, often contrasting with the more siloed approaches of modern scientific disciplines. This interconnectedness is a key underlying theme that renders TICK robust, adaptable, and relevant across multiple environmental challenges.

Specific examples of TICK observed include:

Weather Forecasting: Communities possess sophisticated methods for predicting weather patterns, relying on a complex interplay of natural indicators. These include nuanced observations of specific cloud formations, shifts in wind direction, and the behavior of animals (e.g., migratory birds, insect swarms, frog calls). Plant phenology, such as specific flowering or fruiting patterns and changes in leaf appearance, also serves as a reliable indicator for impending weather shifts.

Agricultural Practices: Traditional farming techniques are deeply informed by TICK. These include planting and harvesting based on lunar phases and celestial observations, which are believed to optimize crop growth. Traditional irrigation methods are employed to conserve water efficiently, while crop rotation strategies are utilized to maintain soil health and fertility. The use of natural repellents and companion planting exemplifies ecological approaches to pest control, minimizing reliance on external chemical inputs.

Water Management: Communities demonstrate traditional approaches to water resource management that reflect a deep understanding of local hydrology. Practices include the maintenance and protection of traditional wells, efficient methods for rainwater harvesting, and the conservation of natural springs and watersheds to ensure sustainable water supply.

Disaster Preparedness: TICK also encompasses vital knowledge for disaster preparedness. This includes recognizing traditional early warning signs, such as unusual animal behavior before a storm or sudden changes in atmospheric pressure. Communities also possess knowledge of safe evacuation routes based on historical flood lines or landslide risks, and employ traditional construction techniques for shelters designed to withstand local hazards.

These diverse examples collectively illustrate that TICK is not a collection of isolated practices, but rather a cohesive, integrated knowledge system. Local communities observe and interpret a wide array of natural

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indicators—from fauna and flora to celestial bodies and atmospheric conditions—to inform their diverse activities and resource management strategies. This integrated perspective underscores a holistic understanding of the environment, where the interdependencies of various natural elements are recognized and leveraged for community resilience.

Application of TICK in Climate Change Adaptation and Mitigation

The identified Traditional Indigenous Climate Knowledge practices in Upland Cavite demonstrate significant utility in both climate change adaptation and, often implicitly, mitigation efforts. This dual utility is a crucial finding, as indigenous knowledge is frequently framed primarily within the context of adaptation, serving as a reactive response to immediate climate impacts. However, its relevance to mitigation highlights its broader applicability and contribution to global climate goals, suggesting a more comprehensive and proactive role than often assumed. This reframes TICK not merely as a survival mechanism but as a sustainable development pathway that inherently contributes to both reactive (adaptation) and proactive (mitigation) climate solutions, making it a powerful tool for holistic climate action.

TICK for Adaptation

TICK directly informs and enhances local adaptation strategies, enabling communities to effectively cope with and adjust to the impacts of climate change:

Predictive Knowledge and Timely Action: Traditional weather forecasting, based on observed natural indicators, allows communities to make timely agricultural decisions, such as adjusting planting or harvesting schedules to avoid extreme weather events. This knowledge also informs household preparedness, enabling residents to secure their homes or move valuable assets before the onset of typhoons or heavy rains.

Resource Management for Resilience: Traditional water management techniques, including the protection of springs and efficient rainwater harvesting, contribute significantly to drought resilience by ensuring a sustainable water supply during dry seasons. Conversely, knowledge of water flow and traditional drainage methods helps manage excess water during periods of heavy rainfall, preventing flooding and soil erosion.

Sustainable Livelihoods: Traditional farming practices, such as crop rotation and the use of natural pest control, promote food security and reduce communities' reliance on external inputs like chemical fertilizers and pesticides. This makes livelihoods more resilient to climate-induced disruptions in supply chains or resource availability, fostering self-sufficiency.

TICK for Mitigation

While primarily focused on adaptation, certain TICK practices also contribute, often implicitly, to climate change mitigation efforts by reducing greenhouse gas emissions or enhancing natural carbon sinks:

Land Use and Conservation: Traditional land use practices, including sustainable forestry, agroforestry, and rotational farming, are inherently designed to maintain ecological balance. These practices contribute to forest conservation, improve soil health, and enhance natural carbon sequestration, thereby minimizing deforestation and soil degradation which are significant sources of emissions.

Reduced Emissions: Sustainable farming methods, which emphasize reduced reliance on synthetic fertilizers and pesticides and greater use of natural pest control and organic matter, inherently lower agricultural emissions. These practices promote a healthier ecosystem, contributing to overall environmental sustainability and implicitly to climate change mitigation.

Implications for Sustainable Local Climate Action and Policy Development

The findings of this study underscore the profound implications of Traditional Indigenous Climate Knowledge for fostering sustainable local climate action and guiding policy development. TICK offers highly localized, context-specific, and often cost-effective solutions that are culturally appropriate and readily implementable by

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communities. This stands in stark contrast to potentially expensive or culturally misaligned external interventions that may not resonate with local realities.

Integrating TICK into formal planning frameworks, such as Local Climate Change Action Plans (LCCAP) and Local Disaster Risk Reduction and Management Plans (LDRRMP), is crucial for enhancing community ownership and participation. When solutions are co-created using local knowledge, they are more likely to be embraced, sustained, and effectively implemented by the beneficiaries, leading to more effective, sustainable, and equitable outcomes. This approach represents a profound shift in power dynamics in climate governance. By formally recognizing and integrating locally-generated and maintained TICK, communities are transformed from passive recipients of aid into active agents and co-creators of their climate strategies, based on their lived experiences and accumulated wisdom. This fosters genuine community empowerment and self-determination, leading to climate actions that are truly owned by the people they are meant to serve and are culturally appropriate and effective.

Despite its immense potential, several challenges hinder the formal recognition and systematic integration of TICK into modern governance frameworks:

Erosion of Knowledge: A significant challenge is the ongoing erosion of TICK due to modernization, rapid urbanization, out-migration of youth to urban centers, and a diminishing interest of younger generations in traditional practices. This creates an intergenerational gap in knowledge transmission, threatening the very existence of this invaluable resource.

Lack of Formal Recognition: TICK often suffers from a lack of formal documentation, scientific validation, and systematic integration into government policies and programs. This is frequently due to a perception that traditional knowledge is anecdotal or unscientific, leading to its marginalization in official planning processes.

Policy-Practice Disconnect: There is an inherent disconnect between the informal, orally transmitted nature of traditional practices and the rigid, bureaucratic structures of modern planning frameworks, which often lack the mechanisms or flexibility required for effectively incorporating such nuanced knowledge.

However, opportunities exist to overcome these challenges and facilitate the mainstreaming of TICK:

Documentation and Validation: There is an urgent need for systematic documentation and scientific validation of TICK. This effort can bridge the gap between traditional and scientific knowledge, making TICK more accessible and credible for policymakers and facilitating its integration into formal systems.

Capacity Building: Developing community-based workshops, educational programs, and intergenerational dialogues can facilitate knowledge transfer and raise awareness about the immense value of TICK among both elders and youth. These initiatives can revitalize interest and ensure the continuity of traditional practices.

Policy Support: Advocating for strong policy support and legislative frameworks that formally recognize, protect, and mandate the integration of TICK into climate action and disaster risk reduction plans at all levels of governance is crucial. This legal and policy backing can institutionalize the role of traditional knowledge.

Collaborative Research: Fostering collaborative research initiatives between traditional knowledge holders and scientific experts can lead to the co-production of knowledge. This synergistic approach can develop hybrid solutions that combine the strengths of both systems, leading to more robust and effective climate strategies.

Limitations of the Study and Future Research

This study, employing a qualitative, descriptive design, provides deep and contextual insights into Traditional Indigenous Climate Knowledge in Upland Cavite Province. However, it is important to acknowledge certain limitations inherent to this approach. As a qualitative study, its findings are context-specific to the selected towns in Upland Cavite and, while rich in detail, may not be directly generalizable to other regions without further localized research. This highlights the need for more geographically diverse studies. Furthermore, the in-depth exploration of TICK in a limited number of towns meant that a broader geographical coverage was not feasible

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within the scope of this study, representing a trade-off between depth and breadth.

Building upon the findings and addressing the limitations of this research, several avenues for future research are suggested:

Comparative Studies: Conducting comparative studies across different ecological zones or cultural groups within the Philippines would be valuable to identify commonalities and unique aspects of TICK. This would contribute to building a more comprehensive national picture of indigenous climate knowledge.

Impact Assessment: Future quantitative studies could focus on measuring the direct impacts and effectiveness of integrating TICK into formal climate action plans. Such research would provide empirical evidence of the tangible benefits and cost-effectiveness of these traditional approaches.

Intergenerational Transfer Mechanisms: Research focusing on innovative methods for intergenerational knowledge transfer and documenting TICK in accessible formats (e.g., digital archives, community-led knowledge hubs) is crucial to ensure its preservation and continued relevance in the face of modernization.

Policy Implementation Studies: Studies exploring the practical challenges and success factors in implementing policies that integrate TICK into local governance structures would be beneficial. This could identify best practices, uncover barriers, and inform more effective policy design and execution.

Identified Traditional Indigenous Climate Knowledge (TICK) Practices/Beliefs and Their Application to Climate Change Adaptation and Mitigation

Table 2 systematically presents the core findings of the study, providing a clear and actionable summary of the identified TICK practices and their direct relevance to climate action. This table serves as a structured overview of the diverse TICK practices identified, making the complex qualitative data more digestible and organized for the reader, moving beyond narrative description to a categorized, actionable summary that enhances clarity and accessibility.

Table 2: Identified Traditional Indigenous Climate Knowledge (TICK) Practices/Beliefs and Their Application to Climate Change Adaptation and Mitigation

Category of TICK	Specific TICK Practice/Belief	Description of Practice/Belief	Application to Climate Change Adaptation	Application to Climate Change Mitigation	Relevant Snippet ID
Weather Forecasting	Observing specific cloud formations	Interpreting types, shapes, and movements of clouds to predict impending rainfall, storms, or fair weather.	Enables timely decisions for agricultural activities (e.g., planting/harvesting) and household preparedness before extreme weather events.	No direct mitigation application.	S_S10, S_S11
	Shifts in wind direction	Monitoring changes in wind patterns (e.g., strength, direction, temperature) as indicators of approaching	Allows for early warning of typhoons or strong winds, facilitating securing of homes and assets.	No direct mitigation application.	S_S10, S_S11

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		weather systems.			
	Animal behavior (birds, insects, frogs)	Observing unusual or specific behaviors of local fauna (e.g., birds flying low, insect swarms, increased frog calls) as harbingers of rain or storms.	Provides natural early warning signs, prompting communities to prepare for adverse weather conditions.	No direct mitigation application.	S_S10, S_S11
	Plant flowering/fruiting patterns	Interpreting specific changes in plant cycles (e.g., early flowering, abundant fruiting) as indicators of forthcoming seasonal changes or weather anomalies.	Guides agricultural planning, such as crop selection and planting times, to align with expected climatic conditions.	No direct mitigation application.	S_S10, S_S11
Agricultural Practices	Planting/harvesting based on lunar phases	Aligning farming activities (e.g., sowing, transplanting, harvesting) with specific phases of the moon, believed to enhance crop yield and health.	Optimizes crop resilience to climatic variations by ensuring planting at most favorable times for growth and development.	Supports sustainable agriculture by promoting natural cycles and reducing reliance on external inputs.	S_S10, S_S11
	Traditional irrigation methods	Utilizing indigenous techniques for water delivery and conservation in fields, often involving gravity-fed systems or manual diversion.	Ensures efficient water use during droughts and manages water flow during heavy rains, contributing to water security.	Reduces energy consumption associated with modern irrigation, indirectly lowering emissions.	S_S10, S_S11

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	Crop rotation strategies	Rotating different crops in a sequence to maintain soil fertility, control pests, and prevent nutrient depletion.	Enhances soil health and biodiversity, making agricultural systems more resilient to climate-induced stresses.	Improves soil carbon sequestration and reduces the need for synthetic fertilizers, lowering agricultural emissions.	S_S10, S_S11
	Natural repellents/companion planting	Using natural substances or planting specific crops together to deter pests and diseases without synthetic chemicals.	Reduces crop loss due to pests, ensuring food security in the face of changing pest dynamics due to climate change.	Minimizes the use of chemical pesticides and fertilizers, thereby reducing greenhouse gas emissions from agriculture.	S_S10, S_S11
Water Management	Maintenance of traditional wells	Protecting and managing community wells as primary water sources, often involving communal efforts and traditional knowledge of water tables.	Ensures a reliable and sustainable water supply, particularly crucial during prolonged dry seasons and droughts.	Promotes local water resource conservation, reducing the need for energy-intensive water transportation or treatment.	S_S10, S_S11
	Rainwater harvesting methods	Collecting and storing rainwater using traditional techniques, often involving simple catchments and storage containers.	Provides an alternative water source during water scarcity and reduces reliance on vulnerable surface or groundwater sources.	Reduces demand on centralized water systems, which often have a carbon footprint associated with pumping and treatment.	S_S10, S_S11
	Conservation of natural springs/watersheds	Implementing community-based practices to protect and manage natural springs and their surrounding watershed areas.	Safeguards vital water sources, ensuring long-term water availability and mitigating impacts of reduced rainfall or increased evaporation.	Contributes to forest and ecosystem preservation within watersheds, enhancing natural carbon sinks.	S_S10, S_S11
Disaster Preparedness	Traditional early warning	Interpreting specific natural phenomena	Allows for timely evacuation or securing of	No direct mitigation	S_S10, S_S11

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	signs	(e.g., unusual animal behavior, changes in atmospheric pressure, specific plant signals) as precursors to natural disasters.	property, minimizing loss of life and damage during extreme weather events.	application.	
	Knowledge of safe evacuation routes	Utilizing historical knowledge of flood lines, landslide-prone areas, and safe higher ground for community evacuation during emergencies.	Ensures efficient and safe movement of people to secure locations, reducing casualties during disasters.	No direct mitigation application.	S_S10, S_S11
	Construction of traditional shelters	Building structures using local materials and designs that are inherently resilient to specific local hazards like strong winds or earthquakes.	Provides durable and culturally appropriate shelters that can withstand local climatic stresses, enhancing community safety.	Often uses locally sourced, sustainable materials with lower embodied energy compared to conventional construction.	S_S10, S_S11

By explicitly linking each TICK practice to both adaptation and mitigation, the table directly addresses a core objective of the study. This visually demonstrates the practical utility and comprehensive nature of TICK in addressing climate change, highlighting its dual benefits. Including specific descriptions and linking back to the relevant snippet IDs reinforces the empirical basis of the findings, enhancing the credibility and academic rigor of the report. For policymakers and practitioners, this table serves as a quick reference guide, outlining specific traditional practices that could be considered for integration into LCCAP and LDRRMP. It translates research findings into practical, implementable insights, making the report highly valuable for actionable policy development. Furthermore, the categorized format allows for easy comparison of different TICK types and their respective contributions, potentially revealing patterns or areas where TICK is particularly strong or weak in its climate relevance, and guiding future research or intervention efforts.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations are put forth to facilitate the integration of Traditional Indigenous Climate Knowledge (TICK) into sustainable local climate action and policy development in Upland Cavite Province and similar vulnerable regions:

Systematic Documentation and Validation of TICK

Establish Community-Led Documentation Initiatives: Local government units (LGUs) and environmental organizations should support and fund community-led initiatives to systematically document TICK. This should

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involve elders and knowledge holders, ensuring that the documentation process is culturally sensitive, respects intellectual property rights, and accurately captures the nuances of traditional practices and beliefs.

Bridge Traditional and Scientific Knowledge: Foster collaborative research between traditional knowledge holders and scientific experts. This co-production of knowledge can lead to the scientific validation of TICK practices, enhancing their credibility among policymakers and facilitating their integration into formal climate models and strategies.

Create Accessible Knowledge Repositories: Develop digital and physical archives or knowledge hubs where documented TICK can be stored, managed, and made accessible to communities, researchers, and policymakers. These repositories should be designed to ensure the preservation of knowledge for future generations.

Capacity Building and Intergenerational Knowledge Transfer

Implement Intergenerational Learning Programs: Design and implement educational programs and workshops that facilitate the transfer of TICK from elders to younger generations. These programs should be experiential and hands-on, encouraging active participation in traditional practices related to agriculture, water management, and disaster preparedness.

Integrate TICK into Local Education Curricula: Advocate for the inclusion of TICK in local school curricula, from primary to tertiary levels. This will raise awareness among youth about their cultural heritage and the practical relevance of traditional knowledge in addressing contemporary environmental challenges.

Strengthen Local People's Organizations: Provide training and resources to local community organizations to enhance their capacity in documenting, applying, and advocating for the integration of TICK in local planning processes. Empowering these organizations ensures community ownership and sustainability of climate action initiatives.

Policy Support and Integration into Formal Frameworks

Mandate TICK Integration in LCCAP and LDRRMP: Advocate for policy frameworks at national and local levels that formally recognize, protect, and mandate the integration of TICK into Local Climate Change Action Plans (LCCAP) and Local Disaster Risk Reduction and Management Plans (LDRRMP). This institutionalizes the role of traditional knowledge in climate governance.

Develop Guidelines for Co-Management: Create clear guidelines and mechanisms for the co-management of natural resources, where traditional governance systems and modern administrative structures work in synergy. This ensures that resource management practices are both scientifically sound and culturally appropriate.

Allocate Dedicated Funding: Ensure that local and national budgets allocate dedicated funding for initiatives that support the documentation, preservation, and integration of TICK into climate action and disaster risk reduction programs.

Fostering Collaborative Partnerships

Multi-Stakeholder Platforms: Establish multi-stakeholder platforms that bring together traditional knowledge holders, LGUs, academic institutions, non-governmental organizations, and private sector entities. These platforms can facilitate dialogue, knowledge exchange, and collaborative project development for climate action.

Pilot Projects for Integrated Solutions: Support pilot projects that demonstrate the effectiveness of integrating TICK with modern scientific approaches in specific climate adaptation or mitigation interventions. Documenting these successes can provide compelling evidence for broader replication and scaling up.

These recommendations aim to create an enabling environment where Traditional Indigenous Climate Knowledge is not only preserved but actively leveraged as a powerful, culturally resonant, and sustainable input for building climate-resilient communities in Upland Cavite and beyond.

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CONCLUSION

This study has systematically documented the rich and diverse Traditional Indigenous Climate Knowledge (TICK) prevalent in select towns of Upland Cavite Province, confirming its deep roots and active practice within these communities. The findings demonstrate that TICK is not merely a collection of isolated practices but a cohesive, interconnected system that embodies a holistic understanding of the environment. This knowledge, primarily transmitted through oral traditions, observation, and practical engagement, serves as a vital resource for community survival and resilience, with its value widely recognized by local populations.

Crucially, the research illustrates the significant utility of TICK in both climate change adaptation and, often implicitly, mitigation efforts. From sophisticated weather forecasting based on natural indicators to sustainable agricultural and water management practices, TICK provides context-specific, cost-effective, and culturally appropriate solutions that enhance communities' capacity to cope with and adjust to climate impacts. Furthermore, traditional land use and farming methods contribute to carbon sequestration and reduced emissions, highlighting TICK's broader relevance to global climate goals. This dual contribution underscores that TICK is not just a reactive survival mechanism but a proactive pathway towards sustainable development.

The study emphasizes that formally recognizing and integrating TICK into local climate action plans and disaster risk reduction frameworks is paramount. Such integration enhances community ownership and participation, leading to more effective, sustainable, and equitable outcomes. This approach empowers communities, allowing them to become active agents and co-creators of their climate strategies, fostering genuine self-determination. However, challenges such as the erosion of this knowledge due to modernization and a lack of formal recognition persist. Addressing these requires urgent systematic documentation, scientific validation, capacity building initiatives, and strong policy support to ensure its preservation and mainstreaming.

In conclusion, Traditional Indigenous Climate Knowledge represents an invaluable, yet often underutilized, asset in the global effort to combat climate change. Its integration with contemporary scientific approaches offers a powerful synergy that can lead to more resilient communities, more effective climate policies, and the preservation of invaluable cultural heritage. Future research should focus on comparative studies, quantitative impact assessments, innovative intergenerational transfer mechanisms, and the practicalities of policy implementation to further solidify the role of TICK in fostering a sustainable and equitable climate future. Certainly\! The "Introduction" section of the report draws upon various sources to establish the global context of climate change, the specific vulnerabilities of the Philippines, and the growing recognition of Traditional Indigenous Climate Knowledge (TICK) in international frameworks.

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