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Vernacular House Architecture and Climate Change Adaptation: Lessons from the Indigenous Peoples of Cagayan, Philippines

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Abstract: Structures such as vernacular dwellings were not only shaped by culture and tradition but also reveal how people dealt with climate. Using a descriptive-qualitative research design, this study analysed the vernacular houses of *the Ibanag, Itawit*, and *Malaweg* in the province of Cagayan in the Philippines to derive a practical template for designing sustainable and climate-conscious houses and buildings. Using focus group discussions (FGD) and observations cross referencing it to concretised architectural and cultural sources revealed that the vernacular houses, particularly that of the *Ibanag* and *Itawit,* possess similar characteristics to the typical Filipino *bahaykubo*, however, distinguished with a separate kitchen bridged by a "*balag*" or "*binattag*". It is elevated from the ground to keep the floor dry and to protect their belongings when the Cagayan River swells. The walling and windows of awning or sliding type made of bamboo practically makes the house penetrable providing natural ventilation and lighting. The "*gannung*" or "*tallung*"*(silong* in Tagalog) allows air to flow from below through the bamboo permeable floors. There is absence of ceilings or room divisions in the house that allows free circulation of air during the hot seasons. Moreover, materials like cogon, bamboo, *uway* (rattan), and local woods which are endemic in the locality were used in its construction. Ultimately, close community ties and the *bayanihan* spirit in the community are vital mechanisms for climate change adaptation. With the environmental challenges indigenous communities are facing today, the vernacular houses' architectural design features can inspire the houses and buildings of today.

Keywords: Vernacular house; Climate change adaptation; Indigenous people; Cagayan.

Introduction

The Philippines, along with several other nations, are among the most vulnerable to climate-related disasters. Over the years, the country and its people have endured the devastation of natural disasters that are intensifying continuously. Due to the continued severity of these effects, the Philippine government has taken disaster risk seriously. In fact, the legislative branch is campaigning for the Department of Disaster Resilience (Medel et al., 2020), a new department tasked with managing and coordinating the development, implementation,

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monitoring, and assessment of disaster and climate change resilience plans and programs. This measure is undertaken largely to mitigate the loss of substantial resources and to lessen population exposure and risk.

Cagayan, located in the northern portion of Luzon, has shown its tenacity in the face of natural calamities. However, this does not make the Cagayan people complacent as they continue to enhance their adaptability to climate change. Over the years, the indigenous inhabitants of Cagayan have adapted to this severe environment by, among other means, constructing vernacular dwellings suited to a rapidly shifting climate. However, the resilience of the people of Cagayan extends beyond their disaster-resistant architecture; this attribute was innate to the population.

Super typhoon Lawin slammed the province in 2016, marking the first time in the country's history that a storm warning no. 5 was issued. Numerous private homes, businesses, and government structures, including schools, were obliterated by the ferocity of the wind, which caused extensive damage (van der Meide & Pagaran, 2017). NDRRMC estimated a total of 33,183 displaced families and an approximation of 1.5 billion pesos in damages in the affected areas (Gloria, 2021). Cagayan province suffered extensive damage to its agriculture and infrastructure as a result of Typhoon Ompong's second unbelievable power (Gatto et al., 2021). An 'adaptive' approach to the conception and habitation of built environments can serve as the conceptual foundation for the building design of the future in light of the rapidity and momentum of the global climate changes that humans are currently experiencing. The Ibanag, Itawes, and Malaweg have learned to duplicate nature's highly successful adaptive metabolic systems by combining old knowledge with present and future technologies.

Globally, indigenous peoples are characterised as being extremely sensitive to the harmful effects of climate change, but they are also recognised to have specialised climate adaptation knowledge. Most scholars define the vulnerability of indigenous peoples in terms of a combination of biophysical and contextual factors, such as their exposure to climatic hazards and the direct effects of climate change (Green et al., 2010), their reliance on climate-sensitive, resource-based livelihoods, and their limited financial, technological, and political resources (Williams and Hardison, 2013).

While significant research has been conducted on the effects of climate change and the vulnerabilities of biophysical systems and various economic sectors in the Pacific Islands (Taylor et al., 2016), less attention has been paid to how indigenous communities experience climate change, identify appropriate adaptation options, and mobilize their capacity to deal with impacts, including traditional knowledge. It is necessary to conduct research on place-based understandings of climate change, local impacts and vulnerabilities, and adaptive ability to enable effective adaptation (McCubbin et al., 2015) and to inform efforts to incorporate traditional knowledge (Mantyka-Pringle, 2017). In addition, the interplay between climate change and broader socioeconomic and cultural changes, such as globalisation, demographic shifts, and development pressures, as well as the effects on indigenous communities' adaptive capacity and traditional knowledge, must be thoroughly considered (O'Connell-Milne & Hepburn, 2015).

The built environment used to be more closely shaped by the unique characteristics of each landscape. Construction methods frequently used local resources since they were intended to interact with their surroundings. For instance, climate change has made floods more apparent, the most prevalent natural hazard in the world, more severe and frequent (Næss et al., 2005). South and Southeast Asia are the regions where flooding occurs most frequently. These regions' vernacular buildings show a range of strategies for coping with the ongoing threat of floods. Elevating the building is one of these response measures. Buildings are erected in Vietnam's Mekong Delta on the highest ground or on river embankments, and where necessary, landfill is used to raise sites (Le et al., 2007). Many homes have a platform built in the main living area that is watertight and covered with ceramic tile or another water-resistant material (Snow & Prasad, 2011). Some houses also contain a loft for related use. The most prevalent method of flood adaptation in central Thailand's flood-prone areas is the elevation of houses on stilts (Nilubon et al., 2016).

Additionally, the emphasis on catching breezes and enhancing air circulation inside the home is another method that is common in vernacular design. Glass windows have replaced the jalis and wind towers in modern homes, increasing the brightness but at the expense of increased heat gain (Batool, 2014). Modern designs can benefit greatly from keeping the advantages of wide windows found in most traditional homes while incorporating them with the usual emphasis on avoiding heat gain. A low-energy whirlybird on the roof or an exhaust ventilator below gable roofs, for instance, can help exhaust warm air from higher levels of the house while enabling cold air to enter through windows below

(Sipek et al., 2012). Similar benefits can be obtained while maintaining the improved natural lighting of contemporary homes by installing longer eaves and awnings (Cumming, 2017).

In this study, the researchers wanted to analyse viewpoints on adaptive ability and the role traditional knowledge plays in the development of this capacity among indigenous people in Cagayan, Philippines. It focusses on how these communities see and seek to use traditional knowledge in the context of climate change. It is essential to gain such insights into indigenous views and goals in order to effectively target research and practice in order to increase adaptive capacity. These insights are also essential for the development of a national framework to protect traditional knowledge and provide standards for its collecting, storage, and application in climate change adaptation and catastrophe risk reduction.

Methodology

Study Site

This study was conducted in the towns of Abulug, Enrile, and Rizal where the chosen IPs are principally located. The Malaweg are found in Rizal, the Itawes are from Enrile, and the Ibanag are from Abulug. All these towns are located in the province of Cagayan as shown in Figure 1. Cagayan is a vast expanse of plains and valleys, bordered by mountains and crisscrossed by rivers and creeks, the largest of which is the Cagayan River. Of its total land area, more than a quarter is flat to nearly level land. This consists of alluvial plains, river deltas, low wetlands, mangroves, and beaches. Steep and very steep land which constitute around 10.44% and 24.73%, respectively, of the total land area, are found along the Cordilleras, the northern mountains of the Sierra Madre range.

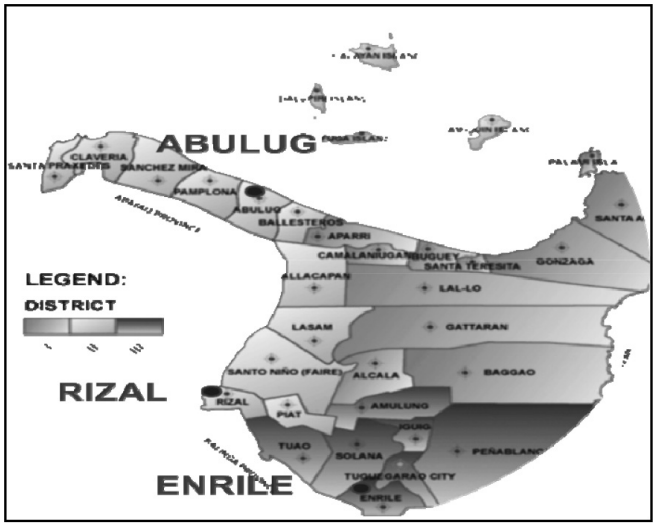

Figure 1: Map of the Province of Cagayan (Source: Google Images).

According to the National Economic and Development Authority's (NEDA) and National Disaster Coordinating Council's (NDCC) analysis from 2010, Cagayan is one of the most economically vulnerable areas in the Philippines in terms of its capacity to withstand natural disasters brought on by climate change (Sundo, 2019). Additionally, due to its geographic location and the impact of sea level rise, Tuguegarao City, which is in Cagayan, is similarly a flood-prone zone area to Iloilo City and Metro Manila, according to the Philippine Atmospheric and Geophysical and Astronomical Services Administration (PAGASA) and Department of Public Works and Highways (DPWH) in 2010 (Dulin & Lalican, 2015). The city's typical temperature ranges from 30 to 32°C, making it the warmest city in the Philippines. The city's record high temperature was 42.2°C on April 29, 1912 (Nnadiri & Lopez, 2021).

In relation to the indigenous groups, the Ibanag, one of the oldest inhabitants of Cagayan Valley, are found principally in Tuguegarao, Solana, Aparri, Peñablanca, Lal-lo, Camalaniugan, Abulug, Buguey and Amulung in Cagayan. Before the Ilocano diaspora in downstream Cagayan, the Ibanag mainly inhabited the area. One of the towns where the Ibanag can still be found is Abulug. The Itawes are commonly found in the northern part of the Philippines, particularly in Cagayan Valley. Ethnologists distinguish Itawes with its own dialect and characteristics, a form of shelter, clothing, art, social structure, and other attributes. In a census record cited by Rocero (1982), it was noted that among the "Itawes area", Enrile has the largest percentage of Itawes living in the municipality compared to other ethnic groups. Furthermore, the last of the three ethnic groups considered in this study is the Malaueg. "The Malauegs" belong to a the ethnolinguistic group found mainly in Rizal, Cagayan.

Data Collection and Analysis

This project is part of a wider project to examine the vernacular house construction methods, beliefs, and practices of the indigenous people of Cagayan. The study employed a variety of approaches, including semi-structured interviews, focus groups, and archival research. Interviews and focus groups relied on narrative inquiry for villagers to relate their stories and experiences. Key informant interviews were conducted with cultural studies experts, including community chiefs

and individuals with a practical understanding of house construction methods and practices. Table 1 summarises the demographics of the interview participants. Focus groups explored the beliefs and practices of the IPs. There were eight to twelve participants in each focus group. Interviews and focus groups were conducted in the local language and in Tagalog, which is spoken by most respondents. Interviews and focus groups were recorded and transcribed non-verbatim.

Table 1: Demographics of the study participants

	Focus Group Discussion		
	Abulug	*Enrile*	*Rizal*
Total Sample	8	12	9
Sex:			
Male	3	7	5
Female	5	5	4
Age Group:			
50 - 55 yr	3	2	2
55 -60 yr	3	4	2
60+ yr	2	6	5
Education:			
Primary	1	5	6
Secondary	2	4	3
Tertiary	5	3	-
Main Income:			
Farming	3	3	5
Salaried Work	-	5	3
Small Business	-	2	1
Retired/None	5	2	-

Results and Discussion

The vernacular house is an architecture that is inherent and characterised by the use of local materials and knowledge endemic to the place. Usually, without the supervision of professional architects, they are typically simple and practical. It adheres to basic green architectural principles of energy-efficient materials and resources in close proximity to the site. These structures capitalise on the native knowledge of how houses can be effectively designed as well as how to take advantage of local materials and resources. Vernacular houses evolve over time reflecting the characteristics of the local environment, climate, culture, natural materials, technology and the experience of centuries of community building. While the vernacular houses show a simplistic construction system with minimal expressions of the society, the building typologies represent the prevailing social and cultural systems of the three ethnolinguistic groups studied in this project. The climate-responsive practices of the vernacular houses are presented in the following sections in three general themes: structural framework, resource use and management practices, and cultural attitudes and values.

Structural Framework

In general, the design of the houses is well-tailored to the geographical setting. The Ibanag, Itawes and Malaueg vernacular houses are elevated from the ground. Figure 2 shows a photograph of an Itawes vernacular house located at Enrile, Cagayan. The elevation of the house is noticeable which is a design feature of stilt houses. The participants of the study reasoned that this design feature keeps the floor dry during rainy seasons and protects their belongings when the river swells. In Southeast Asia and the Philippines, stilt houses are very common. Aside from providing flood protection, there is strong evidence that the vernacular stilt-house was developed from the rice-growing culture in the warm, humid tropical region. It is thought to have originated from granary architectural typology and later evolved into houses. Rice, products, and valuables are stored in the attic beneath the roof while living space is located in the middle. It is a direct response to natural forces, inventive use of resources, and demonstration of beliefs in supernatural powers through ornaments placed on the roof (Widodo, 2012).

Figure 2: An Itawes vernacular house located in Enrile, Cagayan.

Furthermore, the bamboo floors and bamboo walls (Figure 3, right picture) give easy access to ambient air providing natural ventilation. The cogon roofing material and bamboo mat ceilings are excellent solar and sound insulators, creating a conducive place to rest,

Figure 3: Researchers' impression of the Itawes House (left) and actual elevated flooring made of bamboo (right).

sleep and do some recreational activities. Underneath the elevated floor is another multi-functional space to keep their animals, farm tools and to be their food-processing area. The vertical distance from ground to the floor is usually between 2 m and 5 m because these people are proximate to the river where perennial flooding is expected. Meanwhile, the walls of the houses virtually makes the house a penetrable basket. Windows of the awning type have a nipa or palm window lid that can either slide from side to side or be pushed out by a pole that serves also as support when not in use. There are usually no ceilings or room divisions. However, if required, room partitions are quite low and do not reach the underside of the roof or the ceiling, if there is any, to allow for the free circulation of air within the house.

The structural framework of the vernacular houses is no longer reflected in modern homes to a great extent. In fact, based on the field visits, most of the houses have adapted western architectural styles. A concrete floor, brick or concrete block wall, and an iron sheet or tiled roof are typical features of modern homes nowadays (Barretto-Tesoro, 2015). Without significant consideration for the tropical climate, foreign Western-style architecture models were embraced in the 20th century (Brody, 2001) forcing the need for air conditioning for enclosed buildings, which were primarily made of concrete and had glass windows. Because new buildings' flat roofs without eaves were not constructed to withstand the monsoon during the rainy season, their façade rapidly became speckled with watermarks. The preference for foreign architectural styles is still popular despite these disadvantages. However, because of relatively high energy prices and an increase in environmental consciousness, many of today's designers and engineers are re-examining the design elements of Filipino vernacular houses such as

Figure 4: A modified version of the Itawes vernacular house but still maintaining the bridge or *balag* between the main house and the kitchen.

that of the Bahay Kubo and its method of addressing climatic difficulties in a straightforward but effective manner (Lanaria, 2021; Rashid & Ara, 2015; Lacanilao, 2010; Rivera-Lutap, 2010).

It is interesting to note that every bit of space in the house has maximum utilization. The researchers' artistic impression of the Itawes House based on the narratives of the participants is shown in Figure 3 (left picture). For both Ibanag and Itawes houses, the bridge would be the preferred area for family bonding and recreation, especially during the full moon. In this spot are large jars of water used to wash their muddy feet or hands before entering the buildings. It also serves as extinguisher in case of a house fire. The main reason why the main building is located quite far from the kitchen building is to prevent the main building from further conflagration in case the kitchen is accidentally set on fire. In the event that the kitchen fire can no longer be contained, the next thing to do is to dismantle the bridge, which can be done quickly, to control the fire to spread towards the main building. An actual balag

(bridge) can be seen in Figure 4. The house shown is the only remaining house with such structure as far as the community survey of the researchers are concerned.

Resource Use and Management Practices

The majority of ethnic houses in the Philippines follow a common pattern of resource use. For instance, people in the lowlands use bamboo, nipa, and cogon to stay cool, while people in the highlands use solid, tightly-fitting planks to help retain heat. The typical ethnic home is a multipurpose one-room building that is airy, light, and comfortable while still being sturdy and structurally sound (Clariza, 2010).

Bamboo

First, the Malaueg vernacular house is entirely made of *bulu* rafts or what can be equated as the mother of Forlales' Cubo (Santiago & Rosenbloom, 2022). Meanwhile, most parts of the Ibanag and Itawes houses are composed of *boho* and *bayog* as well. The Ibanag house makes use of bayug poles to reinforce the center of the flooring and for their house's girt and rafters. The "binattak" or sometimes called "batalan" is a bridge connecting the main house to the cooking area, and is made of bamboo rafts. The stairs were also made of bamboo poles. Bamboo railings were optional for the Ibanags then. At times, the Ibanag house includes railings made of bamboo as well. The counterpart of the "binattak"/"batalan" in the Itawes house which they call the "balag" is made of bamboo rafts, too. The flooring, windows, and walls of the Itawes house are made of woven *boho* slats while *bayug* poles are used for its girt and window runners.

With the recent recognition of Forlales' Cubo, there's no denying that the use of bamboo in house construction is indeed and will always be one for the books. Aside from its abundance and environmental benefits, the Malaueg, Ibanag, and Itawes houses have benefitted for so long from the durability, flexibility, and aesthetics that bamboo offers. Because all construction materials are generally lightweight and flexible, Itawes vernacular house is resilient to earthquakes. On the other hand, it has less resiliency to destructive typhoons that are prevalent in the northern part of the country. Albeit this weakness, repairs and rehabilitation could be done in less than a week.

Nipa and Cogon

The nipa palm (*Nypa fruticans*) also known as mangrove palm is a trunkless plant that grows in soft mud and slow-moving tidal and river water. One of the vastest nipa areas in the country is found in the estuaries of three rivers—the mighty Cagayan from its western bank the Abulug, and Pamplona in the northwestern end of Cagayan Province. From the vast nipa vegetation, the Ibanag of Abulug, who are known for their weaving prowess, found a living out of making nipa shingles which they also commonly used for the roofing of their houses. To date, the Ibanag of Abulug still uses nipa shingles for their houses because of their cost-effectivity, availability, good thermal insulation, lightweight, and wind resistance. The durability of nipa shingles can also be increased if properly harvested, treated, stored and double-layered.

In Itawes houses, Cogon Grass is the counterpart of Nipa Palm. Cogon Grass (*Imperata cylindrica*) is a variety of tall grass that is native to Asia and grows in tropical lands such as the Philippines. With its seed's ability to be dispersed through the air, Cogon can propagate almost anywhere which is why it is widely available in the entire country. Cogon is also mainly used for the roofing of the Itawes house. Just like the Nipa Palm, Cogon offers heat absorption and wind resistance. However, unlike the nipa palm, no weaving is done with the preparation of the cogon roofing. Rather, it is put up through thatching where cogon is clipped in between the girts or tied to the girt of the roof.

As many consider, cogon as infestive as it takes away most of the nutrients from crops because of its widespread propagation, the Itawes were able to hit two birds with one stone when they found a good housing material in it. Today, Cogon is still extensively used for roofing in cottage industries and Ivatan houses in Batanes.

Rattan

While other people made use of pegged wood construction or wood glue to hold housing materials together before nails or screws came into existence, the Itawes, Ibanag, and Malaueg used Rattan or what is locally known as "Uway" to bind materials in a procedure called lashing or knotting as can be seen in Figure 5. Out of their scarcity of housing materials, these indigenous groups were able to come up with a good quality adhesive from the Rattan's palm. An abundance of Rattan supply can be found in the Philippines which is one of the countries that comes second to Indonesia, the world's top supplier (Sugiyanto, n.d.). This plant can usually be located and harvested from the hills, mountainous regions, and tropical forests, the kind of topography that the three towns have.

Uway is commonly used as a material for crafting furniture but because of its light, durable, and elastic features, the natives of Cagayan thought that it is perfect

Figure 5: Rattan used as a knotting material.

for tying up things. With its abundance in the area, the three groups used it as knotting paraphernalia for almost everything, even as an adhesive for housing. The most common method of processing the rattan stem or wood is through sun drying. For years, it has been one of the main sources of income for the locals in the most remote areas in the Philippines.

Cultural Attitudes and Values

Close community ties among the indigenous communities of the Ibanag, Itawes, and Malaueg create support systems which are vital mechanisms for resilience. This can take many guises, including reciprocal exchanges, paying it forward and trading of valuables among people, "bayanihan". An interesting feature of the vernacular houses is their ability to be relocated since it is made of indigenous light materials. This changing of locations was done for agricultural purposes or to avoid flooding or landslides. A handful of physically fit town residents were able to raise the houses and carry them while carrying bamboo poles. This relocation is referred to as "Bayanihan," which is Filipino for "being in a bayan." It alludes to the idea of working together as a community to accomplish a specific purpose (Guillermo, 1964).

Bayanihan embodies mutual assistance and self-help among equals or togetherness in a common effort. This form of help is experienced in many ways. These include activities such as weddings, christening, burials, farm-related activities, emergencies and house construction as well as house relocation. The three groups of Indigenous communities have their own distinct way to observe bayanihan. One of the endeavours in a community that manifests togetherness or communal work is house construction. The Ibanags term it *"pagaruffunan"* while the Itawes call it *"tannawa"* and Malauegs regard it as *"illu"*.

As soon as the couple finally decided to construct their own house, the Ibanags, Itawes and Malauegs personally invite the community people to help in the activity/work. However, for the Ibanags and Itawes, aside from the personal invitation, they use

"ammariaw", an instrument that produces sound to convene people. The sound varies and it depicts the type of activity being called for.

Bayanihan for the construction of the house commences in the gathering and preparation of materials. These materials can be readily accessed in the locality normally in the mountains, along the rivers and nearby places. This value (bayanihan spirit) is not only evident during the preparation of materials but also extends from the laying of the cornerstone of the house until it is completed.

In the process of house construction, the people who volunteered to help, identify a leader among themselves and the division of tasks is based on their skill, though, the usual procedures or steps in building the house are still followed. In some instances, where the house is already constructed, the community people are requested to help relocate the said house to the newly identified place. Relocation is done by lifting the entire house after being securely tied with mature and strong bamboos horizontally attached beneath the flooring of the house with extensions for the people to be able to lift ready for transfer. For the Itawes, the walls of the house are temporarily detached to lessen their weight. Usually, these houses are carried by at least 20 men. The stronger men are positioned nearer the center of the weight of the house while the weaker ones stay farther because the shorter the extended lifting arm, the stronger the lifting force is required. Conversely, the longer the extended lifting arm, the weaker the lifting force is required.

In the process of transferring the house, this group of men stops occasionally to take a rest and secure the whole structure. This is also the time for them to drink water and request substitution for those who are already exhausted. This happens repeatedly until the house is relocated to the new site.

Conclusions and Recommendations

The perspectives from the indigenous communities in Cagayan illustrate the multifaceted nature of traditional knowledge and its varied role in building adaptive capacity for climate change. In particular, these perspectives underline that traditional knowledge represents situated and dynamic ways of knowing. Specifically, the vernacular houses of the indigenous peoples in Cagayan can provide a basis for developing new resilient buildings. Homes can serve as a useful model for creating sustainable, climate-conscious, energy-efficient houses and buildings. This is evident from the characteristics of the houses being built from locally available, affordable materials including cogon leaves, nipa, and bamboo. Additionally, these materials are organic and renewable. The structural framework of the vernacular houses can also be integrated into modern houses. The big windows let in natural light and ventilation. The stilt houses create functional space and allow ventilation from the bamboo porous floors. It is also important to note that the cultural values of the indigenous people in Cagayan feature climate adaptive practices as well. The *bayanihan* spirit allows the community to work in cooperation to achieve a particular goal. Therefore, it is important to appreciate these observable traditional systems for their ability to further scientific knowledge of the dynamics and responses of the local environment. They are fundamental in determining ideas of autonomy, agency, and the possibility for group action and innovation.

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