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An Index to Determine Community Wellbeing Along Coastal Community in Leyte, Philippines

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Abstract

Coastal communities due to its geography are always susceptible to hazard. Typhoon Haiyan, the worst typhoon in the Philippines having the highest number of casualties recorded, added another burden to the coastal communities. But even with the impacts, people were still determined to stay in the area and recover as shown by their level of wellbeing. This is a continuing study after two years of the occurrence of the super typhoon. Currently, this study aimed to determine the indicators of community wellbeing and to assess the present level of Community Wellbeing Index (CWBi) in coastal communities. A face to face interview aided by a standardized questionnaire to 73 household heads determined by *G*Power analysis was conducted. Data were analyzed and community wellbeing index (CWBi) was determined. Results revealed that Haiyan affected communities had a strong level of CWB at 0.606. The sociocultural capital dimension, out of the 5 capitals, contributed the highest to this strong level of CWBi (0.202). Many of the households had the minimum educational qualification to get a job and several had the ideal age structure with less dependents. However, the natural capital represented by the ratio of forest cover had the lowest index value (0.021). Hence, ecosystem services provided by biodiversity such as productivity, protection from extreme climatic conditions, fresh air and water among others are nil. These ecosystem services could have helped raise wellbeing to a very strong level after a disaster

Keywords: Community capitals; Community wellbeing index (CWBi); Disaster; Super typhoon.

1. Introduction

The Philippines is characterized with long coastal areas. Considering the eastern board of Leyte facing the Pacific Ocean, it has a high probability of storm hazards. One of the most recent natural disasters that brought the highest number of casualties in the Philippines was typhoon Haiyan, locally named Yolanda. It hit the country on November 8,

2013 and made a landfall on the coasts of the Leyte Gulf and in many other coastal towns in the Philippines (Kim *et al*., 2015; Lagmay *et al*., 2015). According to a study by Kim *et al*. (2015), the strong winds generated the strong storm surge. Properties, agriculture, and public infrastructure were damaged and reached an estimated Php 89.6 billion (NDRRMC, 2013).

Typhoons frequently visit the Philippines approximately 20 times annually with seven to eight making landfalls (Lagmay *et al*., 2015; Yumul *et al*., 2011). However, typhoon Hayain was a rare typhoon, as categorized as a super typhoon, causing thousands of death (Nakamura *et al*., 2015) and other casualties and property damage. This typhoon also had an unusual route and intensity, compared with the previous typhoons that have entered or bordered on the Philippines' area of responsibility (Nakamura *et al*., 2015; Takagi *et al*., 2014).

Media reports, however, according to the World Health Organizations (WHO), focused too much on the "immediate ravages, injuries, deaths, and economic loss," failing to include essential "information about the long-term physical and mental health consequences of floods for the population." This kind of information would have been helpful as government and external organizations come up with evidence-based disaster emergency preparedness and response plans (Chiu, 2013).

As policymakers and national agencies plan and implement programs and projects to alleviate the severe aftermath of Haiyan, "understanding storm surge is crucial," especially considering the coastal facilities, evacuation, and coastline flooding (Lapidez, 2015). Because our local and national leaders have to wisely utilize the already depleted resources in order to balance out the present and future needs of those affected, understanding and prioritizing community wellbeing (CWB) is important. This kind of understanding will help leaders come up with policies that would allow for maximization of the use of limited resources. Overall, this would help both the local and national government to fulfill their role, which is to protect the public (Atkinson, 2014; Bagarinao, 2017; Buot and Cardenas, 2018)

The overall aim of this study was to determine the present level of CWB in one of the coastal communities affected by the super typhoon Haiyan. Specifically, the different dimensions with its indicators as well as their sub-indicators have been determined in order to create a baseline set of conditions serving as the standard measure of the effectiveness of interventions and other policies intended to improve CWB.

2. Materials and methods

2.1. Study Area

A two-stage random sampling was applied in this study. Palo, Leyte, declared heavily destroyed as shown by the number of deaths and the amount of infrastructure damaged, was chosen as the case study site through random sampling (Fig.1). Palo is considered as a historical town of Leyte.

At least three barangays from Palo, Leyte: Cogon, San Joaquin and Candahug, were included in the household survey. These barangays were included in the municipal information as the most heavily damaged barangays during typhoon Haiyan.

Table 1. The proportional distribution of the respondents in the 3 sites (Palo DRRM Office, 2015)

Barangay	Total Households	Actual Sample
Cogon	546	28
San Joaquin	490	28
Candahug	307	18
Total		74

2.2. Selection of Respondents

Respondents were chosen through a systematic random sampling. The number of respondents chosen was proportional to the total number of population in each barangay. The survey entailed a face-to-face interview aided by a standardized questionnaire. Most of the time, the heads of each household and, in some cases, the elderly person, who were left in the household were interviewed. *G*Power

analysis (Faul *et al*., 2007), a tool used to come up with the right number of sample (n) (Table 2). This is a flexible statistical power analysis. Using the program calculator, decisions can be made as to how large a sample size should be to arrive at a statistical judgement that is accurate and reliable.

2.3. Data Analysis

Data analysis followed the formula for CWBi (Buot *et al*. 2017) used in computing CWB of Leyte as follows:

$$CWBi = (B \bullet w_{d_1}) + (F \bullet w_{d_2}) + (Po \bullet w_{d_3}) + (SC \bullet w_{d_4}) + (N \bullet w_{d_5})$$

where B is the built capital; F, the financial capital; Po, political capital; SC, sociocultural capital and N, the natural capital; and W_{d1} to W_{d5} are weights of the five dimensions.

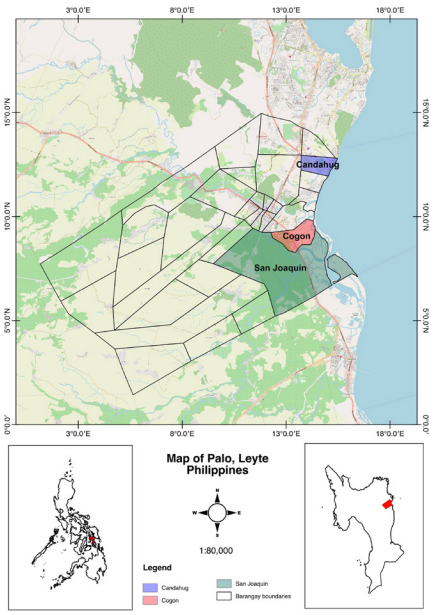

Figure 1. The highlighted area indicating the 3 study sites of Palo, Leyte (Betito, 2018).

Table 2. The computation of the number of sample (n).

t tests - Means: Difference from constant (one sample case)		
Analysis:	A priori: Compute required sample size	
Input:	Tail(s)	= One
	Effect size d	= 0.4
	α err prob	= 0.05
	Power (1-β err prob)	= 0.95
Output:	Noncentrality parameter δ	= 3.3466401
	Critical t	= 1.6672385
	Df	= 69
Total sample size		= 70
	Actual power	= 0.9524114

3. Results and Discussion

3.1. Selection and Validation of Indicators

If communities can effectively implement measures and mitigation strategies to strengthen their resilience against natural disasters, then they are in a much better position to withstand the aftermath of such disasters and thereby recover more quickly (Adger, 2006; Adger *et al*., 2004; Cutter *et al*., 2008; Cutter *et al*., 2010). Resilience as the proxy of community wellbeing then was hypothesized that the higher the level of community wellbeing, the shorter the route to recovery would be. In this regard, baseline indicators are necessary in order to monitor the changes in the community that are related to the occurrence of natural disasters (Lee *et al*., 2015). Vincent (2007) states that indicators and indices can never be fully established. They also evolve alongside the onset of unpredictable events happening even at the micro level. Thus, robust and durable indicators and indices are preferable to assure usefulness and accuracy. Because the indices established by several disaster researches vary widely, coming up with a standard metric that predicts and evaluates local communities' resilience to natural disasters is necessary.

Community Capitals Framework (Flora & Flora, 2013) identified 5 dimensions namely: built capital, financial capital, political capital, socio-cultural capital and the natural capital. A combination of the social and cultural capital was made in this study. Indicators were based on the 5 dimensions produced different values due to the different characteristics of the respondents (Tab. 3, 4).

3.2. Community Wellbeing Index (CWBi) of Leyte in the aftermath of super-typhoon Haiyan

CWBi of Leyte yielded a value of 0.605908 (Fig. 2). Although this already signified a strong level of CWB despite the constant threat of the intermittent occurrence of typhoons but this showed that the condition was not back to its original condition yet. Of the 5 dimensions, sociocultural capital had the highest value of 0.202 (Fig. 2). Household attributes, memberships in organizations/networking, a sense of community, and emotional connection were the indicators used to measure this dimension (Tabble 3). Of the 4 indicators in this sociocultural dimension, the household attributes had the highest indicator value followed by the membership on organization/networking (Table 3).

The sub-indicator of household attributes were educational attainment, family size, age structure, devotion to church and health status. Education level was necessary because education could strengthen people's resilience before and after disasters. It was observed that the more educated a person is, the more was prepared he or she for the impacts of disasters (Dufty, 2009). A high school education was seen as very useful for community preparation. Table 4 illustrates the highest education attainment of the respondents from 3 barangays. Although a small percentage only finished a university degree but a high school diploma was at least a good qualification to get a job.

The number of dependents and their ages greatly affect how a family recovers after a disaster. In terms of age distribution, the toddlers, the elementary pupils and the seniors need a lot of care (Fig. 3). The population, being young had several toddlers and young children. Fortunately, only a few were under the category of seniors, Cogon had 3, San Joaquin had 6 and 4 in Candahug. A population with plenty of very young and the senior group was described as "the extreme of age spectrum," which affect families' ability to transfer or move to other places (Cutter *et al*., 2000). Leyte showed less of the senior group. Even though it had toddlers, but it was balanced by the big population of the ages between 24-54 (Fig. 3) which showed that the extreme of age spectrum was not present in the site. This condition influenced the level of CWB in an area.

Another subindicator of sociocultural capital and also getting a second highest indicator value was membership to an organization (Tab. 3). As observed during the survey conducted, community members were very cooperative. The chairmen of every barangay were very supportive. The effort of the barangay health workers especially in Candahug, was very commendable. Their knowledge about everybody in

Table 3. Indicators and subindicators in the aftermath of supertyphoon Haiyan in Leyte.

Location	Dimension	Indicators	Sub-indicators values	Indicator weights	Indicator value
Leyte	a Built Capital	Road Infrastructure	0.810185	0.24166667	0.195795
		Quality Evacuation Center	0.709577	0.24166667	0.171481
		Communication Accessibility	0.50067	0.25833333	0.12934
		Water and Light Infrastructure	0.8965	0.25833333	0.231596
	b Financial Capital	Income stability	0.392503	0.30793651	0.120866
		Housing quality	0.805773	0.28253968	0.227663
		No. of assets	0.425872	0.14920635	0.063543
		House ownership	0.637	0.14920635	0.095044
		Credit support and insurance	0.13911	0.11111111	0.015457
	c Political Capital	Aid from government and NGOs	0.482802	0.15	0.07242
		Disaster preparation and management	0.690068	0.35	0.241524
		Provision of basic resources	0.402397	0.35	0.140839
		Availability of evacuation center	0.67262	0.15	0.100893
	d Socio-cultural Capital	Household Attributes	0.598683	0.40527473	0.242631
		Organization membership	0.624	0.24659341	0.153874
		Sense of Community	0.664072	0.15868132	0.105376
		Emotional Connection	0.664945	0.18945055	0.125974
	e Natural Capital	% of forest cover to total land area	0.345621	1	0.345621

Table 4. Sociodemographic profile of the respondents in Leyte in the aftermath of volcanic activity (n=74).

Factors	Categories	Leyte					
		Cogon (n=28)		San Joaquin(n=28)		Candahug (n=18)	
		f	%	f	%	f	%
Gender							
	Male	8	28.6	6	21.4	6	35.3
	Female	20	71.4	22	78.6	11	64.7

Table 4. Sociodemographic profile of the respondents in Leyte in the aftermath of volcanic activity (n=74) (contonue).

Factors	Categories	Leyte					
		Cogon (n=28)		San Joaquin(n=28)		Candahug (n=18)	
		f	%	f	%	f	%
Age							
	15- 24 yrs. old	0	0	0	0	0	0
	25- 54 yrs. old	14	51.9	19	67.9	11	64.7
	55-64 yrs. old	10	37	6	21.4	3	17.6
	65 yrs. old and above	3	11.1	3	10.7	3	17.6
Age (M±SD)		48.70±13.75		51.07±9.70		50.76±16.70	
Marital status							
	Single	4	14.8	2	7.1	0	0
	Married	17	63	16	57.1	13	76.5
	Widow/Widower	6	22.2	10	35.7	4	23.5
	Divorced/separated	0	0	0	0	0	0
Educational attainment							
	Elementary undergraduate	7	25.9	1	3.6	1	5.9
	Elementary graduate	2	7.4	6	21.4	2	11.8
	Highschool undergraduate	8	29.6	4	14.3	3	17.6
	Highschool graduate	4	14.8	4	14.3	6	35.3
	College undergraduate	2	7.4	6	21.4	4	23.5
	College graduate	4	14.8	6	21.4	1	5.9
	Vocational	0	0	1	3.6	0	0
Length of residency (interval)							
	0-10yrs	2	7.1	0	0	3	17.6
	11- 20 yrs	3	10.7	0	0	3	17.6
	21-30 yrs	9	32.1	4	14.3	1	5.9
	31 yrs and beyond	14	50	24	85.7	10	58.8
Length of residency (in years)		36.44±17.40		45.70±11.73		34.18±21.21	

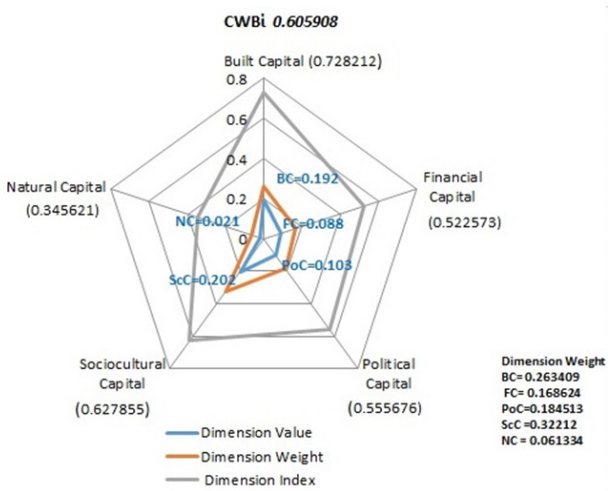

Figure 2. CWBi of Leyte in the aftermath of super-typhoon Haiyan

the barangay helped in the conduct of the survey. The welcoming attitude of the chairmen and the health workers were signs that indeed the barangays were used to having people outside of their barangays. They had been accustomed to joining meetings in international and national organizations especially funding agencies. This attitude had an influence over the feeling of trust in the community. Almost all of the Candahug respondents were member of organizations and some were even officers (Tab. 5). Cogon and San Joaquin had 29% and 32% actively joining the organizations, respectively. Almost a third of the population was actively engaging in network.

Sociocultural capital was enhanced by one's emotional attachment to a place or community. This was demonstrated by a person's duration of residence. The longer an individual resides in an area, the higher the level of his/her attachment to that area would be. As shown in the data, majority of the respondents had been staying in the area for more than 30 years (Tab. 4). As they stay longer in the locality, people get more involved in community issues, and therefore, a sense of connection is established. They become more concerned with the wellbeing of the community (Goodman *et al*., 1998; Norris *et al*., 2008; Perkins *et al*., 2002; Saban, 2015). Such was the case among Palo, Leyte residents.

The second dimension to get the second highest dimension value was Built Capital. This referred to the infrastructures of the community particularly, pertaining to road, communication accessibility, quality of evacuation centers, and other facilities created to deliver the basic services of light and water. In the case of Leyte, the value was 0.192 (Fig. 2). The preparedness of the built capital can be clearly seen through community responses and its recovery capacity. The quality of road in time of stressful event in order to bring disaster aid as soon as possible may as well affect the overall wellbeing. These indicators also provided an overall assessment of the amount of government or private property that may be particularly vulnerable to damage and economic losses (Cutter *et al*, 2010).

Leyte had experienced several strong typhoons thereby producing a more prepared local and provincial government. Palo, Leyte, being an urbanized municipality, had an organized road network. In addition, the municipality houses several provincial and national offices, and therefore, the town's communication infrastructure was also reliable. Light and water sources were also established, as these were needed by households and business establishments.

However, the availability of safe evacuation centers (EC) became a problem during typhoon Yolanda. People had wanted to evacuate to a safer place, but there was no sufficient information available whether their safety was better in EC. Most of the time, the consideration for personal safety and safety of their property

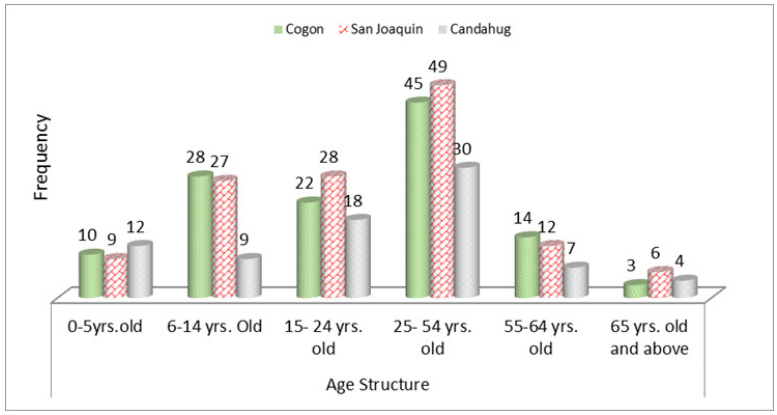

Figure 3. The frequency of age structure in three barangays in Leyte.

Table 5. Percentage distribution of membership to organization(s) in three barangays in Leyte.

	Cogon	San Joaquin	Candahug
Member to organization(s)	28.60%	32.10%	82.40%

were vital consideration. While Philippines had public schools, public gymnasiums and other public spaces as temporary shelters but these venues were not assessed regarding its quality to withstand strong typhoons. Bashawri . (2014) strongly supported the need to have quality ECs, as they would serve as the temporary dwelling of those affected by disasters. Presently, several international organizations extended help to the municipality of Palo in constructing their quality EC. Awareness was high among the LGU leaders regarding the need for reassessment of the EC for the safety of the people.

Another dimension that contributed to the improved CWBi was the political capital. The indicators included in this dimension were availability of aid from government and nongovernment sectors, the local government's plans and management strategies regarding disaster, and the provision of basic services in times of disasters and emergencies. It had a 0.103 dimension value, the third among the 5 dimensions.

The local government's plans and management strategies were measured through household's perceptions with regard to institutional preparedness and efficiency of disaster management (Fig. 4). And because communication was vital in surviving the impacts of supertyphoon, coming up with the right protocol regarding communication was expected from the local government (Fig. 5). It was clearly shown that more than 50% of the respondents agreed and strongly agreed that the plans about disaster management were known to all. A great majority accepted the fact that communication protocol was established but the problem perhaps was following it to the letter. What might have contributed to the people's lackadaisical attitude in following the warning to evacuate was the "this might not happen to me" syndrome (Sorensen & Sorensen, 2007). A feeling of complacency developed because of people's changing fluctuation of interests to follow orders (Kapuku, 2008; Kapuku *et al.*, 2013; Townshend *et al.*, 2015).

Early warning protocol and its strict implementation needed a reassessment with respect to effectivity (Jibiki *et al.*,2016; Kapucu *et al.*, 2013; Lapidez *et al.*, 2015). The fourth dimension was the financial capital. Indicators which included income stability, house quality and ownership, other assets for the household and credit & insurance support. It had a dimension value of 0.088. A lot of residents received aid from either the government or the private sector. Subsidies were given through the Department of Social Welfare and Development, and houses were built through the help of NGOs and big businesses. It was clearly shown in the

house age that most were built in 2013 (Fig. 6). Residents from the three barangays were either recipients of the housing projects or with their own resources, rebuilt their houses. One thing was clear that the majority of the houses were newly built in 2013.

The last dimension was the natural capital. It was the ratio of forest cover to total land area (Forest Management Bureau, 2014), generating a dimension value of 0.021 (Fig. 2).

The natural capital value signified a weak contribution on the attainment of the CWB. Forests were considered productive ecosystems, but with only 10% remaining forest cover in the Philippines, people's lives are also adversely affected. Indeed, it is crucial to understand the link between ecosystem services and human welfare (Boyd & Banzhaf, 2007; de Groot *et al.*, 2002). Forests provide food, shelter, and other resources, which are essential goods that satisfy human needs (Ancheta *et al.*, 2017; de Groot *et al.*, 2002). In this regard, research studies have been pointing out for so long that "the developing countries have high geographic exposure to hazards, high reliance on ecological system services and high sensitivity to environmental change" (Adger, 2006; Lin & Chan, 2013).

However, during natural disasters, natural resources are destroyed. It must be emphasized that when the forest is destroyed, life sustenance is also threatened. As Boyd & Banzhaf (2007) stated, ecosystem services are "the benefits of nature to households, communities, and economies." Hence, if only the natural capital were a little higher, CWBi would have been much better and problems would not have been that aggravated.

The storm surge in Leyte was unprecedented, as most people narrated. Some blamed it on climate change due to reduced forest cover obviously which
in turn resulted to disasters of stronger magnitudes (de Groot *et al.*, 2002). Ecosystem services would have served as climate regulators if they had not been greatly diminished due to declining forest covers (de Groot *et al.*, 2002, Limburg *et al.*, 2002).

4. Conclusion and Recommendation

Two years after Typhoon Haiyan, several new houses have been built on the same locations. These sites were those facing the Leyte Gulf, and therefore, if another supertyphoon similar to the strength of Haiyan comes, houses made of light materials will be wiped out again. The community members will find themselves in the same cycle they had been experiencing during supertyphoon Haiyan. Unfortunately, survivors may become too dependent on external aid, and thus, the vicious cycle will be sustained.

Using the CWBi as a guide, policymakers can now accurately determine the investments they need to make to prepare communities for natural disasters. Natural capital, as a component of CWB, having the lowest value reflects how society fails to conserve and protect the natural environment. It is high time we look at the value of the natural resources. More and more

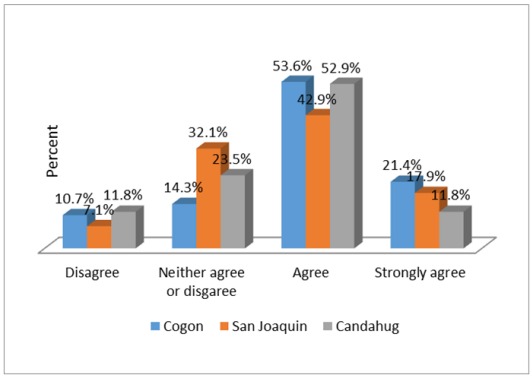

Figure 4. Level of agreement in Leyte regarding disaster management plans known to all.

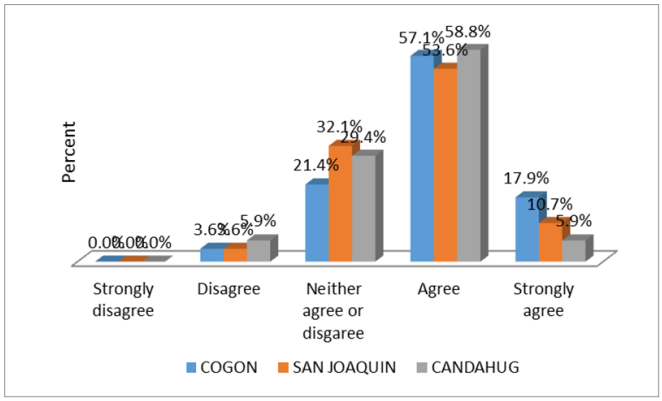

Figure 5. Level of agreement in Leyte regarding the establishment of communication protocol in case of disaster and its aftermath.

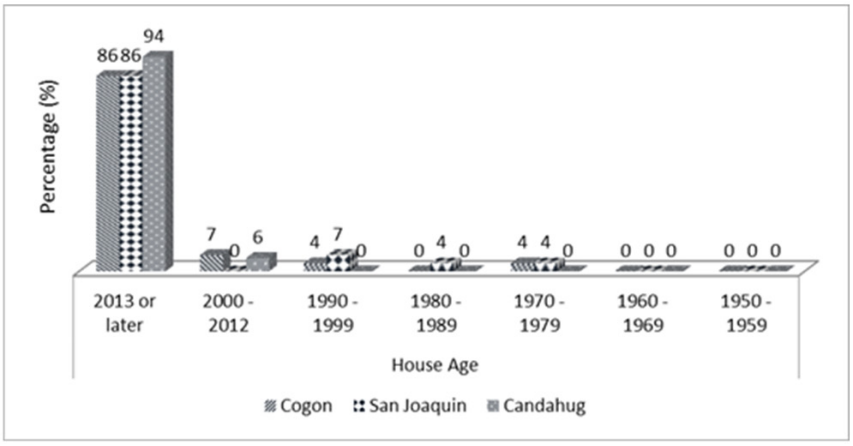

Figure 6. Percentage distribution based on house age in the three barangays.

application of the previous recommendations done by our ecologists and botanist coupled with the knowledge of the attitude of the people can be of help to the impact of the present scenario of natural disasters coming into our country. Instead of sourcing aid from international organizations, resources to sustain people's lives must ideally be supplied by the ecosystem services of the megadiverse Philippines. In addition, political capital must be used for the betterment of a community. Proper community land use plans can help lessen the impact of typhoons especially to vulnerable sectors. Land use planning must not be construed as the power that lies with the local political leaders. Decisions must be driven for community development. Grooming a community so that it becomes economically and socially stable and safe for everyone will translate into a high level of CWB.

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