

Exploring Indigenous Knowledge, Community Resilience and Belief Systems in Typhoon-prone Areas of Samar, Philippines

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Abstract: People who encountered and survived from disasters depend on their resiliency from their indigenous knowledge and adaptation to impacts of climate change. This study through inductive grounded theory explains the indigenous knowledge of farmers and fishers towards climate change resiliency. It was found out that many of these people derive their resiliency by clinging to their old belief systems, community refuge and strong faith of divine protection. Analyses of this knowledge established theory for climate change adaptation and mitigation..

Keywords: Indigenous knowledge, adaptation, impacts, grounded theory

1. Introduction

Climate change is already happening, and effects are compounded with the lackluster efforts and immovable attitude of some of the most vulnerable communities. Human activities are largely responsible for the effects of climate change through the use of fossil fuels that contributed much in increased concentration of greenhouse gasses which in turn alters the climate (Ye, et.al., 2013; Oreskes, 2004; Karl & Trenberth, 2003). Vulnerable communities are now feeling the effects such as more intense El Niño phenomenon, the rise of sea water level and sea surface temperature, more intense typhoons and more (Collins, et.al., 2010; Hoegh-Guldberg & Bruno, 2010; Van Aalst, 2006).

The recent climatic events and evidence proved that climate change is no longer a myth but a reality (Adger, et.al.,

2003). The most recent scientific assessments have confirmed that this warming of the climate system since the mid-20th century is most likely to be due to human activities (Maibach, Myers & Leiserowitz, 2014). Current warming has increasingly posed quite considerable challenges to man and the environment and will continue to do so in the future.

Coastal communities are particularly vulnerable to the impacts of hydro-meteorological hazards such as storms, droughts, landslides, and floods. Environmental degradation such as deforestation, desertification, biodiversity loss, soil erosion, and climate change, as well as social factors such as poverty and inequality, further compound their exposure to such hazards and make these communities extremely vulnerable to disasters. Disaster risk reduction efforts focused on putting the constituents to less exposure to the hazard

and capacitating them to make them less vulnerable and resilient to disaster. Communities are organized to function in a community resilient manner fostering active behavior and disaster management (Norris, et.al, 2008; Walsh, 2007). Another important factor that can increase the resilience of communities is their local and indigenous knowledge (LINK) because it addresses the interrelated human, social and cultural factors that increase risk and vulnerability (Hiwasaki, Luna, Syamsidik & Shaw, 2014).

Resiliency is "the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions" (UNISDR, 2009). LINK is intimately rooted in the belief systems and worldviews of a community. These play a major role in fortifying the inner strengths of individuals, social cohesion, increasing communities' awareness, and thus increasing community resilience (Hiwasaki, Luna, Syamsidik & Shaw, 2014).

When it comes to climate change vulnerability, Philippines is the third most vulnerable country in the world being an archipelago and facing at the forefront of typhoons in the Pacific. About 60-70% of the communities are coastal making them vulnerable to hydro-meteorological hazards and climate change impacts such as storm surge, flood, thunderstorms, and typhoons which average of 20 to 22 per year. The Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA), the country's climate watch arm, states that climate change is already happening and anthropogenic activities have a lot to do with it. PAGASA warns of more

extreme weather disturbances to come due to climate change.

Typhoon Haiyan, known locally as Yolanda hit the eastern part of the Philippines in November 2013. It affected over 14 million people across 46 provinces where Samar and Leyte provinces were the most affected areas. It may not be the strongest with 170-185 mph that hit the Philippines, but it is said to be the deadliest in history with about 6,201 deaths, and over 1,785 people reported missing (Disasters Emergency Committee, nd).

Samar Island, facing the Pacific, always the first to endure the devastation brought by typhoons. However, being a disaster-prone area, communities have learned to adapt to the changing climate through their indigenous knowledge and practices which made them resilient to disaster (Al Mamun & Al Pavel, 2014; Berrang-Ford, Ford & Paterson, 2011).

Indigenous peoples play an important role in establishing diversity and maintaining locally resilient social-ecological systems and must be included in the climatic discussions (Green & Raygorodetsky, 2010). Their indigenous knowledge has proven to withstand climatic variability and change through the years, but they are not given enough attention (Nyong, Adesina & Elasha, 2007). They share the burden of climatic effects and have been one of the most resilient concerning adaptation and mitigation (Kirmayer, et.al, 2011; Green & Raygorodetsky, 2010; Holling, 1986).

In this study, the researchers aim to assess the indigenous knowledge of the participants related to climate change. These are the felt effect of weather changes, daily observation of cloud formations, observation of the moon, sun and stars and

observation of the behavior of insects and animals which may have either scientific bearing and no scientific explanation (Hiwasaki, Luna, Syamsidik & Shaw, 2014). Since Resilient people drew their strength from external, spiritual strength and other collective unconscious of an individual (Richardson, 2002), the study avers the existence of this phenomenon among local people. Adaptability, on the other hand, is the capability of a person to adjust when a person can anticipate future occurrences of events, and he can accommodate these events (Quay, 2010).

2. Objectives

The study explored the resiliency of farmers and fishers through their deep inculcation of beliefs, practices, and ceremonies before, during and after the disaster occurred. The investigator utilized the inductive approach based on the knowledge of the participants in the field.

Specifically, it sought to:

2.1 Describe the participants:

- 2.1.1 perceptions and understandings of climatic changes and related natural phenomena;
- 2.1.2 survival, coping and mitigation strategies;
- 2.1.3 cultural belief systems; and
- 2.1.4 observations of animals, insects and celestial bodies and their interpretation of it.

2.2 Generate a theory of the participants' resiliency through inductive approach.

3. Methodology

Research Design: The design of the study is a qualitative grounded theory approach which is a discovery of theory

from data that are systematically obtained from social research (Glaser & Strauss, 1998). Specifically, Inductive approach by Trochim (2006) serves as the guide for the study.

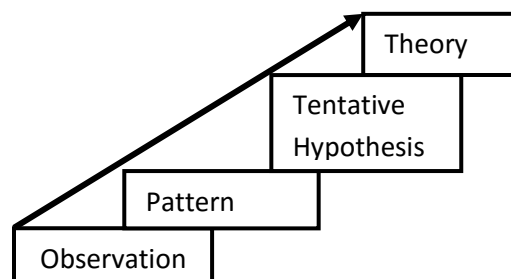


Figure 1. Research Process of Theory Generation

Research Environment: The study was conducted in the selected barangays (village) of Catbalogan City, the capital of the province of Samar, Philippines. Having a total of 952 barangays, Catbalogan City is a coastal city and home to about 103,000 Catbaloganons (local people) whose majority depend on farming and fishing as their main livelihood (2015 Population Census, PSA, 2016).

Participants and Informants: The researcher used purposive sampling in considering the participants of the study. These are the participants who qualified with the inclusion criteria as follows: a.) He/she should be farmer/fisher and known in the community; b.) must have a good reputation / standing in the community as a traditional farmer/fisher; c.) must have a good knowledge of fishing practices; and d.) is not a scientific or farming/ fishery technologist. Since Catbalogan is a coastal community, farmers and fishers were selected considering that they were exposed to coastal hazards and disasters and much local and indigenous knowledge (LINK) related to reducing disaster risk has been handed down over generations in these

coastal communities (Hiwasaki, Luna, Syamsidik & Shaw, 2014).

Twenty-one participants reached the saturation point through interviews and focus group discussion conducted. In all throughout the study, the conversation language used was Waray-Waray, the local dialect. The presentation of the participants in this paper is coded as P1 for participant 1, P2 for participant 2 and so on.

Initial interviews with village officials were conducted to guide the researchers in formulating the guide questions of the interview. Two instruments were utilized in the study, one for the demographic profile of the respondents and their scientific knowledge if they have on climate change and the second part is a structured interview guide in which indicators are patterned from Hiwasaki's (2014) LINK instrument to determine their indigenous knowledge. Simple frequency count and percentage analysis were employed to analyze the demographic data. Thematic analysis by Braun and Clarke (2006) and Colaizzi method (Polkinghorne, 1989) were employed to generate patterns and propositions.

Data Collection: The researcher conducted in-depth interviews and focus group discussion with the participants residing in an upland, island and coastal villages of Catbalogan City. All the participants were briefed about the study and written informed consents were solicited for their participation and for the use of audio/video recorders to record the interview more accurately. Based on their answers and feedback, the researcher revised and modified the guide questions.

Coding and Categorizing Data: All the transcribed interview data in the

Smartphone recorder were studied several times before the transcription to be more immersed and be able to capture the meanings the participants wanted to convey. This stage was done immediately after the initial interview with the participants through line-by-line readings. Maximum codes were constructed about concepts related to indigenous knowledge on climate change, where some concepts were similar to others while others were not. Themes were formulated through the progress of line-by-line codings and integration of sub-categories through constant comparison, modification, and analysis of concepts. Codings were patterned from Hsieh & Shannon's (2005) Three approaches to qualitative content analysis.

Theoretical Sampling, Constant Comparison. In this stage, the interview was guided based on developed concepts and sub-categories from the findings of preliminary gathered data on indigenous knowledge on climate change and the causes or derivation of such knowledge. Participant sampling was directed by emerging constructs and categories. Throughout the data gathering and analysis period, emerging categories or themes were constantly compared with each other, similar concepts were integrated, and contrasting categories were further explored to identify the solid concepts related to the study topic.

Memo Writing: To get the details and capture the big picture, the researchers write their memo. The memo is like a journal or diary of the researchers wherein every analysis of the initial interview and observations were written.

Theoretical Sensitivity: Initial observation and hypothesis were verified from existing literature. Moreover, generated theory was based on empirical

evidence gathered through interviews, focus group discussion and observations from the participants. Data were analyzed, coded and categorized into emerging themes.

Ethical Considerations: The participants were assured of the confidentiality of their responses and observance of anonymity. The researcher asked their consent to be a part of the study and to record the interview session. The researchers selected the study participants who met the inclusion criteria and who will participate to share their knowledge on climate change.

Theory Generation Process. The method of grounded theory approach is to read and re-read information derived from in-depth interviews or observation and identify common patterns or label variables (categories, concepts, and properties) and their interrelationships. It starts from the

transcription of data, key points are marked with series of codes, codes are reviewed, and patterns are formulated. Then, hypotheses are drawn to generate the theory (Glaser & Strauss, 1998).

4. Results and Discussion

4.1 Participants' Knowledge on Climate Change, Awareness, Resiliency and Adaptation Practices

The participants expressed their ideas about climate change and how they got their information about it. Among those ideas that emerged from the responses of the participants are: There is no distinction with the meaning of climate change with a change of weather. In the Waray-Waray dialect, the native tongue of Catbaloganons, the words climate and weather are translated with the same meaning, that is, it is called “*panahon*” which means both weather and

Table 1: Socio-demographic profile of the participants

Participant	Age (yrs)	Sex	Civil Status	Educational Attainment	Religion	Occupation	Address
1	76	F	Married	Elementary	Seventh Day	Fisher/Farmer	Coastal
2	55	F	Married	High school	Catholic	Farmer	Coastal
3	78	F	Married	Elementary	Seventh Day	Farmer	Coastal
4	60	F	Married	High school	Seventh Day	Farmer/Fisher	Coastal
5	48	F	Married	Elementary	Catholic	Fisher	Coastal
6	59	M	Married	Elementary	Catholic	Farmer/Fisher	Coastal
7	36	F	Married	Elementary	Catholic	Fisher	Coastal
8	51	M	Married	Elementary	Catholic	Farmer/Fisher	Coastal
9	29	M	Married	Elementary	Catholic	Fisher	Coastal
10	40	M	Widower	Elementary	Catholic	Farmer/Fisher	Coastal
11	29	M	Married	High school	Catholic	Fisher	Coastal
12	27	M	Married	Elementary	Born Again	Fisher/Farmer	Coastal
13	50	M	Married	Elementary	Catholic	Fisher/Farmer	Coastal
14	40	M	Married	Elementary	Catholic	Fisher	Island
15	43	M	Single	Elementary	Catholic	Fisher	Island
16	52	M	Married	Elementary	Catholic	Fisher	Island
17	45	M	Married	Elementary	Catholic	Fisher	Island
18	45	M	Married	Elementary	Catholic	Farmer/ Copra buyer	Upland
19	68	F	Widow	High School	Catholic	Farmer	Upland
20	70	M	Single	Elementary	Catholic	Farmer	Upland
21	69	F	Widow	Elementary	Catholic	Farmer	Upland

climate. 15 out of 21 participants have heard it from the mass media, and it is now being discussed in the family. Moreover, all of the participants have experienced disasters such as typhoons and earthquakes, and they can readily evacuate when there is a strong typhoon especially that they have known that strong typhoons such as Haiyan have killed many people.

Participant 2 states:

"Climate change is when it rains and shines at the same time. I have seen it also on TV."

"I just prepare for we do not know what will happen in the future. In some cases it happened, some did not. It depends because the weather suddenly changes. For example, now it is very sunny, but afterward, it suddenly darkens. Just like the rain (too), it suddenly pours. The cloud readily forms. They are very different and unpredictable."

Participant 4 explains:

"Yes, it means a different weather. It is rainy now, but next month it is sunny. The weather is not permanent every year."

"We just prepare food and materials such as rice, water, root crops, flashlight and radio too so we will hear the news about the weather."

"Unlike before it is very difficult now because like what Haiyan and other typhoons did, the damage is so devastating. We just have to prepare for a more bad weather will surely come."

4.2 Categorizing and Coding Themes

The following themes were derived from the transcription of interview data.

Theme 1: Climate Change Awareness. All participants expressed their thoughts on climate change. Some derived their ideas from the mass media and the conversation in the family. Even though majority opined that they have heard and claimed they knew about it, yet the definition is just literal. Most of their definition falls on weather and not on climate. They cannot make a distinction between climate and weather.

"Weather that is changing such as rainy and sunny days." (P2)

"A changing climate." (P3)

"It is sunny, yet it suddenly rains." (P5, P18, P19)

"A changing weather." (P9)

"It brought diseases." (P10)

"Increase in temperature of the Earth." (P14)

"A changing trail of climate." (P18)

Theme 2: Felt Effect of Climate Change. All of the participants have felt the effects of climate change by agreeing to the indicators mentioned to them by the interviewer. These indicators are too much rainfall, rising of temperature, drought, more intense tropical storm, rising sea level, more flooding, and landslides.

"Yes, it is very different now." (P1)

"It is very scary considering that too much rainfall causes landslides and flooding. I think it will be avoided if

we will follow the rule of God above." (P3)

"When it's hot you wish it would rain so that the plant in the farm will not be withered. It is different now because there are plenty of days of no rain at all." (P6)

"The hot is too much now. Before, you can bear working on the farm even until 10:00 AM in the morning but now even if it is only 9:00 AM, you wanted to go home because you cannot bear the sun heat. Climate change is real." (P7)

"There are changes that I can observe. Before the tide does not reach the level in our shore but not it reached up to the highest level in the shore during typhoon Yolanda (Haiyan)." (P8)

"Yes!, we have already experienced about a disaster that is during typhoon Rubi. We cannot believe that we survive. Our houses, boats, clothes, etc. disappeared just like a bubble." (P15)

"One example is our supply of dried coconut kernel; it's becoming limited. Unlike before, we usually get a bigger volume of it when weighed. We are getting a lesser harvest from the mountains now. Even the bananas that we harvest." (P18)

Theme 3: Local Government officials mitigation measures. Twenty out of twenty-one participants believed that their local officials are doing something for climate change mitigation, but they cannot mention any specific activity.

"Yes, I believe there are measures being conducted only that it does not reach our village." (P3)

"Yes, it was lectured to us during our assembly meeting in the 4Ps. We recycle garbage and plant vegetables because it was our obligation as beneficiaries of 4 Ps. Otherwise, you will be removed from the list." (P7)

"In our barangay, we don't have a seminar related to this. For me, as I remember, it is only about the processing of Bangus (milkfish) in which according to them we can somehow put a small business in this barangay." (P14)

"We have difficulty regarding finding our meals that time. Good thing that the relief goods came fast. We were very happy with the support of our mayor. Even though a lot of things were lost still, we find ways to continue our life" (P15)

Theme 4: Coral Bleaching Awareness. Although they were correct that most of the indicators mentioned were effects of climate change. However, one indicator which is coral bleaching turned out to be different. They are one in agreement that the destruction of coral reef is due to dynamite and other illegal fishing. They have no idea that it can be affected too due to rising of temperature and global warming.

"Yes, corals are destroyed when the weather is bad. When there is a storm, big waves destroy corals just like fish ponds." (P2)

"Yes, illegal fishing destroys the corals. That is why these activities are prohibited by the government."

But people have no choice for they want bigger catch. Fish catch is getting smaller now." (P3)

"Yes, there is. Dynamite fishing destroys the coral reefs." (P5)

"The trawl fishing activity. It screens the bottom of the sea destroying the corals." (P6)

Theme 5: Climate change is Inevitable. Participants believed that climate change is unavoidable due to lifestyles and changes in the way we live. The use of electronic gadgets, appliances that consume electricity, burning of garbage and other human activities that had changed may have an effect on the climate (weather). Since humans cannot go back to the old ways, hence climate change cannot be avoided.

"Climate change wants us to prepare because the people now are not afraid anymore. I am worried of strong typhoon for I still have small children and grandchildren." (P3)

"I know that climate change will happen because of the way we live now. We are very much dependent on electrical gadgets such as cellphones and computers which emit radiation to the environment especially the appliances that eat much electricity like the air-conditioning, TV and refrigerator. These add to warming of the earth." (P7)

"We know that the smoke from burning plastics can add to the warming of the earth but there is not much we can do about it. We made compost pits before but when it became full, we have no more to place our plastic."

Even I, myself, also burn our plastic garbage." (P14)

Theme 6: Knowledge from Others on Climate Change. Sources of information on climate change were derived from radio, TV, newspaper and conversation with the family. Some government agencies also conduct seminars related to climate change.

"Yes, I have heard of that from radio and TV." (P1,P2,P3,P5,P9)

"Yes, I've read it in the newspaper..." (P4)

"I have heard about during our seminar in 4Ps." (P7)

"Not only on the radio, I've heard it also from my children. It is being taught in school." (P10)

Theme 7: Observations of Celestial Bodies, Insects, Animals, Trees, etc. The observation of birds, insects, celestial bodies such as the sun, moon, and stars are widely observed by the participants. We took noticed of how fluent the participants in sharing stories associated with their observation. Most of them attributed it to their ancestors who have observed these phenomena, and they passed the story to them. Folkloric and quite absurd but they depend on from it and they are one in agreeing that *"there is no harm if you follow."*

This practice of deriving their prediction of weather patterns was handed from generation to generation. Most of the participants admitted that there was no guarantee of the occurrence of their prediction. They just manifested strong belief that it may happen through their experiences with these phenomena. In a

countryside, people should act in harmony with the community. Respectable elders in the community who have experienced these disasters are being listened to. When the elders say so everyone listens and follows.

Table 2 Knowledge because of Experience of the Celestial Bodies

Observation	Interpretation
1. Moon is seen in Full (FGD, P14,P15,P16,P17)	Good weather for the successive weeks.
2. The sun is not seen or shines lightly, the moon and stars are not seen, sky is dark (P1, P3, P19).	Bad Weather coming up.
3. Red Sunset like a bloody sky (P5,P7,P8)	No rain coming. Good weather at night.
4. The color of the moon is yellowish. (FGD)	Bad weather
5. The clouds shapes like an animal's etc. (FGD)	Good Weather
6. The night sky is totally black with the clouds they term it "Bakunawa" (eclipse). (FGD, P15)	Bad Weather coming
7. The moon has a rainbow circle around it (P2, P8, P10, P18)	Bad weather is coming.

There are studies that acknowledge indigenous knowledge to fill the needed information which is appropriate for climate adaptation strategies and weather management (Mahoo, et.al., 2015; Okonya & Kroschel, 2013; Green, Billy & Tapim, 2010; Nyong, Adesina & Elasha, 2007; Pepin, 1996). In observing weather condition, for instance, they just look at cloud formations, observe the stars, sun and wind patterns. This way of forecasting have been handed down from generation to generation, and local people have mastered these indigenous ways and mainstreamed it into their activities (Lee, Yen & Aikenhead, 2012; Risiro, Mashoko, Tshuma & Rurinda,

2012; Green & Raygorodetsky, 2010; Weatherhead, Gearheard & Barry, 2010).

Table 3 Knowledge because of Experience with the Insects and Animals

Observation	Interpretation
1. Kasili (eel) appears flying above the sea. (FGD,P8, P14 and P16)	Bad weather is coming.
2. When insects such as Ngiya-ngiya (crickets) are so noisy. (P4, P5)	Dry season is nearby.
3. Frogs croak loud. (P5)	Rainy season is coming.
4. When there are plenty of Raga daga (moth) at night (P10)	Rainy season is coming.
4. Birds are frantically flying such as Talabong (egret) and Balinsasayaw (swiftlet) (P12)	Bad weather is coming.
5. Ants are climbing the house (P18)	Flood will occur.
6. When the birds called "mana-ul" starts chirping (P19)	Bad weather may likely to occur.

The participants derived their interpretation from the recurring events that justified their prediction. Although there is bearing to a scientific explanation, for instance, the frantic behavior of birds who can sense abnormal weather condition and appearance of insects such as ants climbing houses, worms coming out from the soil and others would mean abnormality and could give local people a hindsight of the occurrence of the phenomenon. There is also scientific bearing in observing patterns of clouds, stars and the moon which can predict the weather (Rao, 2011; Sarafan; 2008).

Theme 8: Disasters Experienced. All of the participants have experienced disasters such as landslides, typhoons, and earthquakes in which the most recent disastrous events were typhoon Haiyan (Local name: Yolanda) in 2013 and Typhoon Hagupit (Local name: Ruby) in 2014. These

experiences made them aware of the effects of climate change. Whenever typhoon is coming, they know already what to do and to be prepared. Based on the responses of the participants, it can be averred that they have outlived the disaster through their experiences.

"I have experienced a lot of typhoons before, but it was Yolanda (Haiyan) that was the most severe typhoon because many people have died. Although unlike in Tacloban, I just prayed that the damage is not as devastating as in Leyte. I repaired so that I can avoid the disaster. That (Haiyan) was the strongest. That's all I can say." (P2)

"Yes, I have experienced typhoons such as Haiyan and Ruby, Ondoy and others which I forgot the names already. The typhoons before compared to now were not that strong because there are so many lives being taken now. Before only properties were destroyed, plants and houses like that... There are also frequent landslides, too much rainfall, and high tide now." (P4)

"For me, flooding is not new to us. But, we are shocked that water rises higher this time, which is not normal to us. What is normal for us is that water is only up to our waistline." (P18)

"Increase in rainfall and extreme heat which easily gets the flood." (P19)

Theme 9: Climate Change Adaptation and Mitigation. Adaptation measures conducted by the participants include house repair, making it strong by making it sturdy through

more braces, tying it to a tree or structure, putting a net in the roof. Others who are not sure and do not want to take risk would evacuate to a more sturdy building such as evacuation center or barangay hall. No one mentioned about any mitigation activities being done. Indeed they have adapted to the changing climate.

"We just hide to survive. We evacuated to our Church. We were members of 7th Day Adventist Church." (P5)

"During Typhoon Ruby, we tied our house to a strong tree or to a wooden stake on the ground to prevent it from shaking and to topple down due to big winds. We also tied the gutter and place weights on our roof." (P6)

"We evacuated during typhoon Haiyan to Barangay (village) hall. But it did not come as expected. Only my wife and children evacuated but I decided to stay to look for our house. You know they were disappointed because they were like sardines-packed in the hall while I was comfortable here in our house. I laughed at them when they returned home." (P6)

"We put a nest on our roof. We also tied it to a more sturdy structure." (P7,P19)

"We assemble stakes surrounding our house and tied it using a roof." (P8)

"We prepare water, food, and flashlight including radio during typhoons." (P9, P21)

"I gather all my children. We assembled every family member and stayed together." (P10)

"We go to our church here that would serve as our evacuation area. All of us here believed that in times that the water rises we know that the elevation of the site is very high so we're safe. Others go to Catbalogan City. We stocked a lot of can goods, noodles, and rice for our meals. We don't even leave our houses because we are afraid that all of our things might go away from us due to high tide. These are kitchen wares, clothes and even our boat which is very important for us as fishermen." (P14)

"We just go to the second floor every time it happens. Here in our place, I'm the one with plenty of lifebuoys. I prepare it to each of my children, so that even if I am away helping our neighbors, as barangay official, they are secured." (P18)

"They give us seeds to plant. They prohibit the use of 'slash and burn' system for clearing. They inform us through the seminar that 'kaingin' is not allowed." (P19)

Theme 10: Ceremonies and Rituals.

Dependence to the Divine Providence is evident among the participants. They have long accepted their fate that if their life will be taken from them, there is nothing they can do about it. They just rest their fate to God. However, they still ask for protection through prayers, procession and bible sharing.

"We went to our church after the typhoon and thanked the Lord that we were spared in the disaster." (P2)

"I just prayed to the Lord that He might provide us a strong and healthy body that can withstand this calamity. We do not own this life only God's.." (P3)

"We do a procession around our barangay. We pray the rosary." (P9)

"We conduct Bible sharing. We also join the procession in the church." (P11)

Resiliency is evident from the themes 1, 2, 6, 7 and 9 which are derived from the responses of the participants. Hence, the first hypothesis is derived from those themes.

Hypothesis 1: Farmers and fishers are resilient because they can predict and can sense bad weather before it happens and they can prepare in advance.

Proposition 1: A person can resist change when he/she can predict such change.

The second hypothesis refers to resiliency when you can outlive the disaster. This practice was believed to be effective for they have survived the effects of typhoons they have experienced. Hypothesis 2 is derived from Themes 1, 2, 5, 8 and 9.

Hypothesis 2: Resiliency is the ability to become stronger after you have encountered and survived these disasters.

Proposition 2: A person becomes stronger after he/she encountered a disaster and survived it.

Resiliency is the ability of a person to withstand the effects because he/she is confident that he/she can find a refuge or safety. Hypothesis 3 is derived from themes 5, 7, 8 and 9.

Hypothesis 3: A person is resilient when disaster strikes because he/she can find refuge in a nearby sturdy structure.

Proposition 3: A person is brave in facing disaster because he feels safe and can find a means to seek shelter and safety in the community.

Moreover, dependence on God's providence is clearly manifested among resilient people. Hence, hypothesis 4 is based on themes 5, 9 and 10.

Hypothesis 4: People are resilient because they have strong beliefs in the Divine Providence and they just rest everything to God.

Proposition 4: The Strong faith of the Divine Creator makes a person resilient.

From these themes and hypotheses derived, a theory was generated. It can be averred that it is not entirely new for these observations and explanations are common in the countryside that is not relying on scientific information (Kirmayer, et.al., 2011; Green, Billy & Tapim, 2010). Resilient people are always capable of bouncing back from tragedy and adjusting to adversity; thus, it supports the idea of Richardson (2002) that resiliency comes from external and spiritual strength and other collective unconscious of an individual. Moreover, when it comes to adaptability, it has bearing with the definition of Quay (2010) that adaptability is the capability of a person to adjust when a person can anticipate future occurrences of

events, and he can accommodate these events.

5. Conclusion and Recommendation

The hypotheses derived from the responses of the participants are the following:

- 5.1 Farmers and fishers are resilient because they can predict and can sense bad weather before it happens and they can prepare in advance.
- 5.2 Farmers and fishers have encountered disasters such as typhoons and earthquakes in the past, and they have survived these calamities.
- 5.3 Farmers and Fishers are assured that they can run and find refuge or shelter in a nearby sturdy structure.
- 5.4 Farmers and Fishers have the strong belief in divine providence that they will be protected through their rituals and prayers.

Hence, the theory generated out of the given hypotheses is presented in the schema (Figure 2) is to be known as the **Indigenous Knowledge on Climate Change Resiliency Theory**

This theory states that “*Resiliency is enhanced by a person's knowledge, his experience and an assurance of refuge and divine providence.*” These resilient people are capable of withstanding adverse effects of climate change when they have a good understanding of the patterns of nature, they have survived it, and they can cling on a divine source of strength.

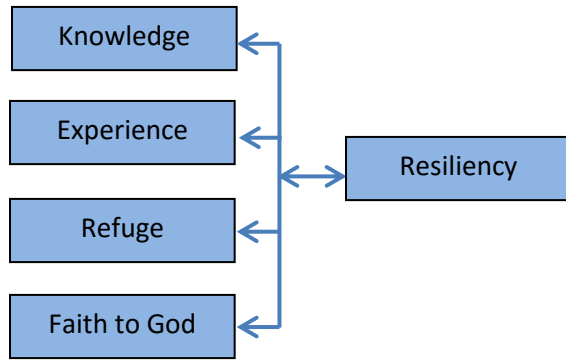


Figure 2. Conceptual Model of Climate Change Resiliency Theory

6. Bibliography

- Adger, W. N., Huq, S., Brown, K., Conway, D., & Hulme, M. (2003). Adaptation to climate change in the developing world. *Progress in development studies*, 3(3), 179-195.
- Al Mamun, M. A., & Al Pavel, M. A. (2014). Climate change adaptation strategies through indigenous knowledge system: Aspect on agro-crop production in the flood-prone areas of Bangladesh. *Asian Journal of Agriculture and Rural Development*, 4(1), 42-58.
- Berrang-Ford, L., Ford, J. D., & Paterson, J. (2011). Are we adapting to climate change?. *Global environmental change*, 21(1), 25-33
- Braun, V. & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3: 77-101.
- Collins, M., An, S. I., Cai, W., Ganachaud, A., Guilyardi, E., Jin, F. F., ... & Vecchi, G. (2010). The impact of global warming on the tropical Pacific Ocean and El Niño. *Nature Geoscience*, 3(6), 391-397.
- Glaser, B. G., & Strauss, A. L. (1998). Grounded theory. *Strategien qualitativer Forschung*. Bern: Huber.
- Green, D., & Raygorodetsky, G. (2010). Indigenous knowledge of a changing climate. *Climatic Change*, 100(2), 239-242.
- Green, D., Billy, J., & Tapim, A. (2010). Indigenous Australians' knowledge of weather and climate. *Climatic Change*, 100(2), 337-354. doi:10.1007/s10584-010-9803-z
- Hiwasaki, L., Luna, E., Syamsidik, Shaw, R. (2014). Local & indigenous knowledge for community resilience: Hydro-meteorological disaster risk reduction and climate change adaptation in coastal and small island communities. Jakarta, UNESCO, 60 pp.
- Hoegh-Guldberg, O., & Bruno, J. F. (2010). The impact of climate change on the world's marine ecosystems. *Science*, 328(5985), 1523-1528.
- Holling, C. S. (1986). The resilience of terrestrial ecosystems: local surprise and global change. *Sustainable development of the biosphere*, 292-317.
- Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative health research*, 15(9), 1277-1288.
- Karl, T. R., & Trenberth, K. E. (2003). Modern global climate change. *science*, 302(5651), 1719-1723.
- Kirmayer, L. J., Dandeneau, S., Marshall, E., Phillips, M. K., & Williamson, K. J. (2011). Rethinking resilience from indigenous

- perspectives. *The Canadian Journal of Psychiatry*, 56(2), 84-91.
- Lee, H., Yen, C. F., & Aikenhead, G. S. (2012). Indigenous elementary students' science instruction in Taiwan: Indigenous knowledge and western science. *Research in Science Education*, 42(6), 1183-1199.
- Mahoo H, Mbungu W, Yonah I, Recha J, Radeny M, Kimeli P, Kinyangi J. (2015). Integrating Indigenous Knowledge with Scientific Seasonal Forecasts for Climate Risk Management in Lushoto District in Tanzania. CCAFS Working Paper no. 103. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. Available online at: www.ccafs.cgiar.org
- Maibach, E., Myers, T., & Leiserowitz, A. (2014). Climate scientists need to set the record straight: There is a scientific consensus that human-caused climate change is happening. *Earth's Future*, 2(5), 295-298.
- Norris, F. H., Stevens, S. P., Pfefferbaum, B., Wyche, K. F., & Pfefferbaum, R. L. (2008). Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *American journal of community psychology*, 41(1-2), 127-150.
- Nyong, A., Adesina, F., & Elasha, B. O. (2007). The value of indigenous knowledge in climate change mitigation and adaptation strategies in the African Sahel. *Mitigation and Adaptation strategies for global Change*, 12(5), 787-797.
- Okonya, J. and Kroschel, J. (2013) Indigenous knowledge of seasonal weather forecasting: A case study in six regions of Uganda. *Agricultural Sciences*, 4, 641-648. doi: [10.4236/as.2013.412086](https://doi.org/10.4236/as.2013.412086).
- Oreskes, N. (2004). The scientific consensus on climate change. *Science*, 306(5702), 1686-1686.
- Pepin, N. (1996). Indigenous knowledge concerning weather: The example of Lesotho. *Weather*, 51(7), 242-248.
- Polkinghorne, D. E. (1989). Phenomenological research methods. In *Existential-phenomenological perspectives in psychology* (pp. 41-60). Springer US.
- PSA (2016). Highlights of the Philippine Population 2015 Census of Population. Retrieved June 5, 2016, from <https://psa.gov.ph/content/highlights-philippine-population-2015-census-population>
- Quay, R. (2010). Anticipatory governance: A tool for climate change adaptation. *Journal of the American Planning Association*, 76(4), 496-511.
- Rao, J. (2011). Reading the Weather Using the Sun, Moon, and Stars posted on April 26, 2011, in Live Science. Retrieved November 24, 2015, from <http://www.livescience.com/30374-weather-sun-moon-stars-prediction.html>
- Richardson, G. E. (2002). The metatheory of resilience and resiliency. *Journal of clinical psychology*, 58(3), 307-321.
- Risiro, J., Mashoko, D., Tshuma, T., & Rurinda, E. (2012). Weather forecasting and indigenous knowledge systems in Chimanimani District of Manicaland, Zimbabwe. *Journal of Emerging Trends in Educational Research and Policy Studies*, 3(4), 561.

Sarafan, R. (2008). Predicting weather with clouds. Retrieved November 28, 2016, from <http://www.instructables.com/id/Predicting-Weather-with-Clouds/?ALLSTEPS>

Trochim, William M. The Research Methods Knowledge Base, 2nd Edition. Internet WWW page, at URL:
<<http://www.socialresearchmethods.net/kb/>>
> (version current as of October 20, 2006).

UNISDR (United Nations International Strategy for Disaster Reduction) (2007). Hyogo Framework for Action 2005- 2015: Building the resilience of nations and communities to disasters. Geneva: UNISDR. UNISDR. 2009. Terminology on Disaster Risk Reduction. Geneva: UNISDR. Accessed 19 October 2015. <http://www.unisdr.org/we/inform/terminology>.

Van Aalst, M. K. (2006). The impacts of climate change on the risk of natural disasters. *Disasters*, 30(1), 5-18.

Walsh, F. (2007). Traumatic loss and major disasters: Strengthening family and community resilience. *Family process*, 46(2), 207-227.

Weatherhead, E., Gearheard, S., & Barry, R. G. (2010). Changes in weather persistence: Insight from Inuit knowledge. *Global Environmental Change*, 20(3), 523-528.

Ye, X., Zhang, Q., Liu, J., Li, X., & Xu, C. Y. (2013). Distinguishing the relative impacts of climate change and human activities on the variation of streamflow in the Poyang Lake catchment, China. *Journal of Hydrology*, 494, 83-95.