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Sociocultural Factors Influencing Adaptation Capacity of Indigenous People in Barotac Viejo, West Central Philippines

Eva T. Aldon, Armando C. Forbes, Ninfa S. Ang

Social Science Department, College of Arts and Sciences, St. Paul University, Iloilo City, Philippines
Email: etaldon2002@yahoo.com

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Abstract

The adverse effects of climate change are now being experienced by the people without any apparent solution despite joint efforts of the world's climate experts. Developing countries are reportedly to be hit the hardest. This means lives and livelihoods of billions of people are at stake. Indigenous people are vulnerable of this imminent danger. Determining the adaptation capacity and strategies of these indigenous people can help reduce the extent of damages that may likely occur. A study is conducted in Sitio Nagpana, Barotac Viejo, West Central Philippines to determine the level of adaptation capacity of the indigenous community and the socio-cultural factors that influence it. One hundred thirty-six households are surveyed using a self-made questionnaire as the primary tool to collect the information needed. The result show average adaptation capacity of the community. Socio-demographic factors like religion and gender show significant relationship with adaptation capacity. The rest does not show significance at all.

Keywords

Indigenous People, Climate Change, Adaptation Capacity, Social Factors

1. Introduction

The serious and irreversible damage of climate change is projected to happen within this century [1]-[3]. Nation states all over the world have already expressed their concerns about the problem the people on earth are facing due to this phenomenon. Scientists actively study together to make future projections of the climate by understanding its past and present patterns. There are also physical evidences predicting that the worst scenario may

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happen sooner than expected [3]-[5]. Additionally, research studies about climate change showed that developing countries were expected to be hit the hardest. This was also announced by physicist Josefina Comiso of the National Aeronautics and Space Administration (NASA) at the conference of the Philippine Atmospheric Geophysical Astronomical Services Administration (PAG-ASA) in 2008 that the Philippines was among the developing countries which were the most vulnerable to the effects of climate change. There will be higher temperatures, irregular rain patterns, rising sea levels, and more frequent weather-related disasters. One of the more serious negative effects of climate change will be on the water supply which is the most basic resource necessary for survival of mankind. At stake are the lives and livelihoods of billions of people. Nature is now taking its toll against people's lives and properties and its wrath is now experienced by people themselves. All indications show that the threats of climate change are real and thus, can really be catastrophic. There is apparently no immediate solution underway despite joint efforts by experts; hence the people should take part in at least in their own ways to minimize its adverse effects.

As such, there is an increasing recognition regarding the imminent danger the people are facing due to this global problem. While mitigation measures are being promoted to reduce the impacts of this phenomenon, the people to some extent need to come up with their own adaptation measures to complement these mitigating actions. Adaptation capacity and strategies of the people and the community can help reduce the extent of damages that may occur. Hence, both individuals and societies would require new socio cultural practices in order to adapt to whatever environmental changes in the future.

Indigenous people, although considered as the most vulnerable people to climate change, are rarely considered in academic or public discourse about the subject [5]-[7].

They live close to either coastal areas or mountains where they highly depend on for their livelihoods and well-being. Their environments that are directly affected by climate change are increasingly threatened by extreme weather events, and other environmental changes. Moreover, some current attempts to tackle climate change may also have disastrous effects on indigenous groups and communities.

In the Philippines, the government has established a number of protected areas for indigenous people. Among them are the Aeta in Nagpana in Barotac Viejo, west central Philippines. They are the descendants of the original inhabitants of the country who have managed to resist centuries of Spanish and American colonization and have retained their customs and traditions. The Aetas are among the major groupings and the most popular indigenous people in the country. They are short, black complexioned with kinky black hair [8]. There are other Aeta who inhabit various parts of Luzon and Visayas.

Understanding social and cultural norms is important because cultural habits and customs may affect attitude towards adaptation capacity. Community activities form part in the adaptation processes by building adaptive capacity in the face of climate-related disruptions of cultural norms. Adaptation includes a wide range of adjustments by entities such as households, firms and other institutions in response to the effects of climate variability [1] [9]-[11]. This study will explore the adaptation capacity of indigenous people to climate change and the factors that influence it. The study aimed to determine the sociocultural factors influencing adaptation capacity of Nagpana Aeta to calamities brought about by climate change. Among the specific objectives were the following: 1) to determine the socio demographic profile of Nagpana Aeta; 2) to measure the level of adaptation capacity of Nagpana community against climate change; and 3) to determine how social factors influenced adaptation capacity of *Nagpana Aeta* against climate change.

2. Methodology and Data Collection

2.1. The Study Site

The NagpanaAti community is geographically located at SitioNagpana, Barangay Lipata, Barotac Viejo, Iloilo province. It is an hour and a half bus ride from the Jaro terminal in Iloilo City to Barotac Viejo. From the town proper, one needs to get a tribike to go to Nagpana where one could encounter rough and steep roads.

Nagpana's climate is relatively dry from December to April and wet for the rest of the year considering the cool climate in December to February and warm from April to June. The residents, however, claimed that the two seasons were not as pronounced as before. Although not very well informed of climate change, the Aeta observed the unusual and drastic change of the climate and the extremely hot weather which they said was resulting to loss of their investments in their crops.

2.2. The Research Design

This study is descriptive-correlational using a one-shot survey. All household heads were targeted as respondents, hence no sampling was necessary. Only 136 household heads were interviewed face-to-face from a total of 142 households. The data were collected using a self-made semi structured and structured instrument to generate information. A basic measurement tool was used to describe information on 1) socioeconomic and demographic data, and 2) natural resources and activities. A structured interview schedule was used to measure adaptation capacity to climate change. Likert scale was used to determine the level of adaptation capacity, where each of the 10-item measure statements were assigned values for every response made. Responses for most likely, likely, maybe likely or unlikely, likely and very unlikely were assigned values of 5, 4, 3, 2 and 1, respectively. The scores were interpreted as follows: for 1 - 16 would mean poor, 17 - 33 was average while 34 - 50 meant good adaptation capacity.

Several focus group discussions (FGD) were also conducted to verify the information collected from the survey. The researchers stayed on weekends in the community and school breaks in order to socially integrate with the *Aetas* and keenly gather first hand information on the socioeconomic condition and their activities *i.e*. community norms, beliefs, traditions related to their livelihoods. A resident was also trained to conduct ethnographic collection of information as regards their socio-cultural adaptation capacities. The pre-tested survey instrument was translated to *Inati*, the local dialect of *Nagpana*.

Percentage was used to describe the socio-demographic characteristics of the respondents while the level of adaptation capacity was categorized into good, average and poor. Significance of relationship between variables was tested using chi square at 5% confidence level.

3. Results

3.1. Nagpana Socio Demographic Characteristics

Sitio Nagpana has a total population of 721 with 142 households and 165 families. The average household number was 4 members per family with some households having two families. The socio demographic profile of the respondents is presented in **Table 1**. The data reveal that more than two-thirds (69.9 percent) of the respondents were males and most (39.7 percent) of them were relatively young. Almost three-fourths (73.5 percent) of the respondents were married. Nearly all or nine (91.9 percent) in ten of the residents in *Nagpana* were Protestants. Only 8% were Roman Catholics. This wide gap in terms of religious affiliations of the residents can be explained by the historical fact that it was a Protestant Pastor who became the first tribal chieftain, thus the influence of the said Pastor could not be ignored. Farming is the primary occupation of a very high majority (89.0 percent) of the respondents with the rest on other livelihoods like trading. Most of the women were into handicraft making due to the abundance of *nito* as raw materials.

It is interesting to note that there were five (3.7 percent) respondents who were employed in various government and private agencies outside Nagpana community. As regards to educational attainment, half (50.0 percent) of the respondents received 1 - 5 years of education. Nearly half went to high school while almost twelve percent were in college level.

The distance and difficulty encountered by Nagpana children in going to High School every day notwithstanding financial constraint were the reasons given for the low rate of educational mobility. Going to College therefore is far out for most of them to even think about. This is something that the Local Government needs to look into. While the Nagpana children want to get at least a High School diploma, they claimed that they did not have the resources to pay for the fare in going to High School which is just one ride from their homes. It is traversing rugged roads that they found to be a major constraint. Moreover, the flood that is too dangerous for them during typhoon season can be enough reason to skip high school because there is no bridge that connects their place to the nearest barangay or municipality. They also did not have money to buy materials for projects, among others.

To some extent, there were children who had to rely on other people's help to get to High School and College. Some said they needed to work for other families who would pay for their tuition in exchange for their services. Still others would prefer to stay home after finishing elementary to help their parents in the household and also to eke out for a living. The norms in Nagpana only show that they are not really keen in setting other goals like going out of their community and enjoy life outside world can offer. They seemed to be more contented to stay

Table 1. Socio-demographic profile.

	f	%
Gender		
Male	95	69.9
Female	41	30.1
Age		
Young (15 - 35)	54	39.7
Middle (36 - 50)	40	29.4
Old (51 and above)	42	30.9
	Mean Age = 42.7059 Median Age = 39.00	
Civil Status		
Single	5	3.7
Married	100	73.5
Separated	15	11.0
Widowed	16	11.8
Religion		
Roman Catholic	11	8.1
Protestant	125	91.9
Primary Occupation		
Farming	121	89.0
Trading	4	2.9
Employment	5	3.7
Others	6	4.4
Years of Education		
None	6	4.4
One - Five Years	68	50.0
Six to Ten Years	46	33.8
Eleven Years and Above	16	11.8
	Mean = 5.38 Median = 4.0	

in their community not for anything else but to preserve their ethnicity as being an Aeta.

3.2. Nagpana's Adaptation Capacity to Climate Change

Table 2 shows the adaptation capacity of the respondents to climate change. Respondents' adaptation capacity was measured in a ten-item questions and their views on this were asked. More than three-fourths of the respondents agreed with the following statements:

"There is opportunity for me to shift to other jobs" (81.6 percent) and "There is government support in terms of early warning systems in case of impending disasters" (79.4 percent). Over two-thirds (68.4 percent) also agreed with the statement "I get assistance from the government in times of disasters (*i.e.* NDCC or National

Table 2. Distribution of respondents according to adaptation capacity to climate change.

	Most Likely		Likely		Maybe Likely or Unlikely		Unlikely		Very unlikely	
	f	%	f	%	f	%	f	%	f	%
1. There is opportunity for me to shift to other jobs.	2	1.5	111	81.6	13	9.6	10	7.4	0	0
2. I have the means to strengthen the structure of my house to protect against strong winds.	1	0.7	45	33.1	27	19.9	62	45.6	1	0.7
3. There is government support in terms of early warning systems in case of impending disasters.	22	16.2	108	79.4	2	1.5	3	2.2	1	0.7
4. I get assistance from the government in times of disasters (*i.e.* NDCC).	40	29.4	93	68.4	2	1.5	1	0.7	0	0
5. I have the means to relocate my family to safer grounds to protect them from disasters.	1	0.7	70	51.5	14	10.3	51	37.5	0	0
6. Either I can deepen my well or find other sources to ensure supply of water in times of drought.	49	36.0	42	30.9	2	1.5	43	31.6	0	0
7. I can protect my family from air-borne disease carriers.	1	0.7	41	30.1	8	5.9	86	63.2	0	0
8. I have my survival kit ready in case of disaster.	0	0	2	1.5	4	2.9	100	73.5	30	22.1
9. I know what to do in times of disasters.	1	0.7	50	36.8	24	17.6	60	44.1	1	0.7
10. I can diversify to other sources of livelihood.	24	17.6	53	39.0	9	6.6	9	6.6	50	36.8

Disaster Coordinating Council) and majority (51.5 percent) expressed the same sentiment on the statement "I have means to relocate my family to safer grounds to protect them from disasters." More than a third agreed that "I can diversify to other sources of livelihood" (39.0 percent) and "I know what to do in times of disasters" (36.8 percent).

Nearly three-fourths (73.5 percent) disagreed with the statement "I have survival kit ready in case of disaster" and almost two-thirds (63.2 percent) said the same on the statement "I can protect my family from air-borne disease carriers." Almost half (45.6 percent) also disagreed with the statement "I have means to strengthen the structure of my house to protect against strong winds." Over a third (37.5 percent) also disagreed with the statement "I have the means to relocate my family to safer grounds to protect them from disasters."

Over a third (36.0 percent) strongly agreed with the statement "Either I can deepen my well or find other sources to ensure supply of water in times of drought." More than a fourth (29.4 percent) also strongly agreed with the statement "I get assistance from the government in times of disasters".

More than a third (36.8 percent) strongly disagreed with the statement "I can diversify to other sources of livelihood" and over a fifth (22.1 percent) expressed the same sentiment on the statement "I have my survival kit ready in case of disaster." Almost a fifth did not agree/disagree with the statement "I have means to strengthen the structure of my house to protect against strong winds" (19.9 percent) and "I know what to do in times of disasters" (17.6 percent).

3.3. Level of Adaptation Capacity to Climate Change

On the whole, more than three-fourths (77.2 percent) of the respondents had average level of adaptation capacity to climate change. More than a fifth (22.8 percent) had good level of adaptation capacity and none had poor lev-

el of adaptation capacity (Table 3).

4. Relationships between Socio Demographic Profile and Level of Adaptation Capacity

The study determined the relationships between the socio demographic characteristics of the respondents, namely gender, age, civil status, religion, primary occupation and years of education and level of adaptation capacity.

4.1. Gender and Level of Adaptation Capacity

Presented in Table 4 is the distribution of respondents according to gender and level of adaptation capacity. Data reveal a higher proportion (87.8 percent) of females had "average" adaptation capacity to climate change than males (72.6 percent). However, more males (27.4 percent) had "good" level of adaptation capacity to climate change than females (12.2 percent). No male of female had "poor" adaptation capacity.

When gender was related to level of adaptation capacity, it resulted to a Chi-square of 3.74 with a p-value of 0.040. The relationship between them is statistically significant at 5 percent level. This implies that the gender of the respondents is related to their level of adaptation. Being male or female had something to do with the level of adaptation capacity of the respondents climate change.

4.2. Age and Level of Adaptation Capacity

Distribution of respondents according to age and level of adaptation capacity is presented in Table 5. Almost the same proportion of respondents who were young (80.0 percent) and old (83.3 percent) had "average" level of adaptation capacity while almost two-thirds (60.6 percent) of the middle aged were in this level of adaptation capacity.

More than third (36.3 percent) of the middle aged had "high" level of adaptation capacity while only a fifth (20.0 percent) of the young and less than this figure of the old (16.7 percent) were in this level of adaptation capacity. No respondents in any age bracket had "poor" level of adaptation capacity.

Relating age and level of adaptation capacity yielded a Chi-square of 1.450, with a p-value of 0.484 at 5 percent level. This indicates no significant relationship between them. Age of the respondents had no bearing on their level of adaptation capacity to climate change.

Table 3. Distribution of the respondents according to level of adaptation capacity to climate change.

Level of Adaptation	f	%
Poor	0	0.0
Average	105	77.2
Good	31	22.8
Total	136	100.0

Table 4. Distribution of respondents according to gender and level of adaptation capacity.

Level of Adaptation	Gender					
	Male		Female		Total	
	f	%	f	%	f	%
Poor	0	0.0	0	0.0	0	0.0
Average	69	72.6	36	87.8	105	77.2
Good	26	27.4	5	12.2	31	22.8
Total	95	100.0	41	100.0	136	100.0

Chi-square = 3.74, p-value = 0.040, Significant at 5% level.

Table 5. Distribution of the respondents according to age and level of adaptation capacity.

Level of Adaptation Capacity	Age							
	Young		Middle		Old		Total	
	f	%	f	%	f	%	f	%
Low	0	0.0	0	0.0	0	0.0	0	0.0
Average	41	80.0	29	60.6	35	83.3	105	77.2
High	13	20.0	11	36.3	7	16.7	31	22.8
Total	54	100.0	40	100.0	42	100.0	136	100.0

Chi-Square = 1.450, p-value = 0.484, Not significant at 5 % level.

4.3. Civil Status and Level of Adaptation Capacity

Shown in **Table 6** is the distribution of respondents according to civil status and level of adaptation capacity to climate change. Results show that a high majority of the respondents across all categories of civil status had "average" level of adaptation capacity—single (80.0 percent), married (77.0 percent), separated (73.3 percent) and widowed (81.3 percent).

More than a fourth (26.7 percent) of the separated had "good" level of adaptation capacity. Over a fifth (23.0 percent) of the married and a fifth (20.0 percent) of the singles had "good" level of adaptation capacity while nearly a fifth (18.7 percent) of the widowed was in this level of adaptation capacity. No respondent in any category of civil status had "poor" level of adaptation capacity to climate change.

A Chi-square of 0.301 with a p-value of 0.960 resulted when civil status and level of adaptation capacity was cross-tabulated. At 5 percent level, the relationship between them is not significant. This means that the civil status of the respondents had no effect on their level of adaptation capacity to climate change.

4.4. Religion and Level of Adaptation Capacity

Table 7 presents the distribution of respondents according to religion and level of adaptation capacity. Results of the study show that more than three-fourths (80.0 percent) of the Protestants had "average" level of adaptation capacity while less than half (45.5 percent) of the Catholics were in this level of adaptation capacity.

Majority (55.5 percent) of the Catholics had "good" level of adaptation capacity to climate change while only a fifth (20.0 percent) of the Protestants belonged to this level of adaptation. No Catholic or Protestant had "poor" adaptation capacity to climate change.

4.5. Primary Occupation and Level of Adaptation Capacity

Cross-tabulating religion and level of adaptation to climate change resulted to a Chi-square of 6.856 with a p-value of 0.009 at 5 percent level. This means there is significant relationship between religion of the respondents and their level of adaptation capacity to climate change. Being Catholic or Protestant is related to the level of adaptation capacity of the respondents to climate change. Most of the people are protestant indicating cohesiveness. This supports the theory that socio-demographic factors are important in affecting the ability of individuals to function normally in their daily life.

Presented in **Table 8** is the distribution of respondents according to primary occupation and level of adaptation capacity. All those whose primary occupation is others had "average" level of adaption capacity while only half of those who were in trading were in this level. A high majority of those whose primary occupation is farming (77.0 percent) and employment (80.0 percent) had average level of adaptation.

Half of those engaged in trading (50.0 percent) and almost a fourth (23.0 percent) of those in farming and a fifth (20.0 percent) of those employed had "good" level of adaptation capacity to climate change. No respondent from other occupation was in this level of adaptation capacity. No respondent from any primary occupation had "poor" level of adaptation capacity.

When primary occupation was related with level of adaptation capacity to climate change, it produced a Chi-square of 3.484, with a p-value of 0.323. At 5 percent level, the relationship between them is not significant.

Table 6. Distribution of respondents according to civil status and adaptation capacity.

Level of Adaptation Capacity	Civil Status									
	Single		Married		Separated		Widowed		Total	
	f	%	f	%	f	%	f	%	f	%
Poor	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Average	4	80.0	77	77.0	11	73.3	13	81.3	105	77.2
Good	1	20.0	23	23.0	4	26.7	3	18.7	31	22.8
Total	5	100.0	100	100.0	15	100.0	16	100.0	136	100.0

Chi-Square = 0.301, p-value = 0.960, Not significant at 5% level.

Table 7. Distribution of respondents according to religion and adaptation capacity.

Level of Adaptation Capacity	Religion					
	Catholic		Protestant		Total	
	f	%	f	%	f	%
Poor	0	0.0	0	0.0	0	0.0
Average	5	45.5	100	80.0	105	77.2
Good	6	35.5	25	20.0	31	22.8
Total	11	100.0	125	100.0	136	100.0

Chi-square = 6.856, p-value = 0.009, Significant at 5% level.

Table 8. Distribution of respondents according to primary occupation and level of adaptation capacity.

Level of Adaptation Capacity	Primary Occupation									
	Farming		Trading		Employment		Others		Total	
	f	%	f	%	f	%	f	%	f	%
Poor	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Average	93	77.0	2	50.0	4	80.0	6	100.0	105	77.2
Good	28	23.0	2	50.0	1	20.0	0	0.0	31	22.8
Total	121	100.0	4	100.0	5	100.0	6	100.0	136	100.0

Chi-square = 3.484, p-value = 0.323, Not significant at 5% level.

This indicates that the primary occupation of the respondents has no effect on their level of adaptation to climate change.

4.6. Years of Education and Level of Adaptation Capacity

Presented in **Table 9** is the distribution of respondents according to years of education and level of adaptation capacity to climate change. The data reveal that all respondents with no education had "average" level of adaptation to climate change and more than three-fourths of those with 1 - 5 years (75.0 percent), 6 - 10 years (76.0 percent) and 11 years and above (81.2 percent) were in this level of adaptation capacity. Relating years of education and level of adaptation to climate change resulted to a Chi-square of 2.141, with a p-value of 0.544. The relationship between them is not significant at 5% confidence level. A fourth (25.0 percent) of those with 1 - 5 years of education, more than a fifth (24.0 percent) of those with 6 - 10 years of education and less than a fifth 918.8 percent) had "good" level of adaptation. No respondent with no education had "good" level of adaptation.

Table 9. Distribution of respondents according to years of education and level of adaptation capacity.

Level of Adaptation Capacity	Years of Education									
	None		1 - 5 Years		6 - 10 Years		11 Years and Above		Total	
	f	%	f	%	f	%	f	%	f	%
Poor	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Average	6	100.0	51	75.0	35	76.0	13	81.2	105	77.2
Good	0	0.0	17	25.0	11	24.0	3	18.8	31	22.8
Total	6	100.0	68	100.0	46	100.0	16	100.0	136	100.0

Chi-square = 2.141, p-value = 0.544, Not significant at 5% level.

There is no respondent in any category of years of education that had a "poor" level of adaptation to climate change. This means that the number of years of education of the respondents had no bearing on their level of adaptation to climate change.

There is a need for an approach that would place social and economic well-being of Nagpana at the forefront of the analysis that will focus on social and institutional constraints that limit their capacity to respond. Adaptation, adaptive capacity and vulnerability may be interrelated in the context of climate change [4] hence, a clear understanding of these different concepts will certainly have some implications to drawing out institutional framework tailor made for Nagpana community [2] [12]. Kelly and Adger highlighted patterns of vulnerability at the household level in response to climate stress [6]. The researchers would have wanted to stay a bit more with the Aeta to also give them better understanding of the real danger they are facing but were also constrained with time since research is just one of their many functions. The Aetas based on their responses appear confident that they can handle any threat because they claimed to have gone through a lot of it in the past. However, they apparently lack proper education about how serious or dangerous climate change can bring to their lives and livelihoods. They also need to understand what mitigating measures they need to take. This behavior was observed by the researchers and was also indicated during the focus group discussion with them. Information, education campaign may be necessary to be conducted because only by education can be a key to enhanced adaptation capacity as posited by Lutz *et al*. [13].

5. Conclusions and Recommendations

The result indicates that socio-demographic factors like sex, age religion, etc. should be taken seriously into consideration, when planning interventions for development or prevention of calamity as in this community. It is true even in a small-size rural community as this one, where social ties still remain strong among its members. In the case of *Nagpana* community, sex and religion showed significance to adaptation capacity. Although other social factors did not show any statistical significance at all to adaptation capacity, these factors are still important to be considered in any development projects that will affect the social life of the *Aetas*.

Education is a major concern and needs to be addressed among the indigenous people. Although statistically there have been improvements to indigenous education, indigenous people still have the lowest statistics in terms of attendance, retention, continuing their education. Although initiatives (financial assistance) have been implemented, there is still a great deal that can be done to increase the importance of education amongst the indigenous community. Unfortunately, negative views towards the current system of education have led to high unemployment amongst the indigenous population. Although many indigenous people have moved to towns and cities in search of work there are many who are still living in remote areas, where there are few positions vacant. The government has funded indigenous employment programs but there is still more to achieve. Skills need to be taught, social attitudes need to be altered and more community effort needs to be made so that unemployment does not become a condition that is continually passed through the generations.

One of the major challenges the indigenous community is still facing today is the negative social attitude. There is still a feeling of alienation on the part of *Nagpana* people against their counterpart in the lowland. There is a need to exert efforts on how to improve understanding of people working together regardless of affiliation in order to face the current vulnerabilities and adaptation strategies against the adverse effect of climate

change. Education still plays an important role in improving lives of the people, financially, or otherwise. Lutz (2014) says that human capital built through education is the key to development. It is a crucial determinant of individual empowerment even to adaptive capacity to climate change.

The local government where *Nagpana* community belongs needs to feel the urgency to address not only adaptation capacity but mitigation strategies as well. The following should be given utmost concern if only to improve both mitigation strategies and adaptation capacity of *Nagpana* community. The first is to raise their awareness of the impacts of climate change and plan out responses to minimize its effects. Second is to support diversification of livelihoods to reduce their dependency on farming and shift to livelihoods that are less dependent on climate variability. And lastly, there is a need to establish institutional mechanisms and community involvement to enhance the capacity of the community to support present adaptive livelihood options. In this case, a better understanding of the population dynamics of the community is needed in order to be aware of how the people can become resilient in the face of these changes. Only with this knowledge can policymakers take on this gravest of challenges.

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