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Profiling and Mitigation Practices of Inhabitants in Disaster-Prone Communities: Inputs for Climate-Resiliency Strategies

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ABSTRACT

Climate change poses a significant global threat that demands considerable attention. Effective addressing of this issue requires strong political intervention and decision-making by the government, which serves as the foundation for crafting policies that contribute to sustainable development. Additionally, community engagement and profiling play a crucial role in promoting climate change resilience efforts. The impacts of climate change, such as the heightened intensity and frequency of tropical cyclones, increase the vulnerability and exposure of individuals to climate-related hazards. Accordingly, this study aimed to investigate the mapping of residents residing in a specific disaster-prone hotspot and their practices for mitigating the effects of climate change in coastal barangays within Tacloban City. Through purposive random sampling and descriptive statistics, the findings revealed that some respondents lacked awareness about the effects of climate change. Although this does not provide a comprehensive assessment of their knowledge on the subject, it suggests a potential lack of understanding about climate change. To address this, it is recommended to implement a comprehensive information and education campaign using the local language and easily accessible media platforms. Furthermore, solutions should be devised to tackle issues related to water scarcity, transportation, and livelihood challenges, considering the substantial number of respondents who were relocating back to their original areas from the relocation site. On a positive note, a high level of climate change adaptation and mitigation practices was observed among the respondents, with many demonstrating awareness of environmental protection ordinances and participating in and emphasizing the importance of disaster drills.

Keywords: *Climate change, Mitigation, Resiliency, Adaptations, Practices*

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INTRODUCTION

The issue of climate change must be brought to public attention in order to aid in the adaptation and mitigation of its effects, according to Ochieng and Koske (2013). The contribution of greenhouse gas (GHG) emissions to climate change is primarily from developed countries while developing countries have a smaller impact. Despite variations in the effects of climate change around the world, research predicts a rise in mean temperature in the Philippines, with an estimated 6,300 fatalities and 4.1 million displaced individuals due to the impact of a super typhoon (United Nations Climate Change, 2022). Extreme weather conditions resulting from climate change, such as the increased frequency and intensity of tropical cyclones, exacerbate the vulnerability of people to climate-related hazards (Lasco *et al*., 2012). According to a report by the Worldwide Fund for Nature and the BPI Foundation, Tacloban City in the eastern Visayas region of the Philippines has a vulnerability rating of 6.74 out of 10, placing it in the direct path of any typhoons that make landfall (Ranada, 2014). The destructive impacts of climate change, including loss of life, property, and displacement, are staggering and require attention from all sectors of society.

Last August 24-25, 2018, a meeting was convened at the Leyte Park Hotel in Tacloban City to promote climate action plans and youth participation among Visayan youth leaders. The National Youth Commission initiated this meeting in partnership with the Climate Change Commission, DENR, and Plan International Philippines. The meeting aimed to emphasize the importance of youth involvement in raising awareness about climate change, its various causes and effects, and ways to address it (City Planning Development Office, 2019). Given the vulnerability of the Philippines to climate risks, the government has developed plans to mitigate the impact of climate change. In 2009, the Climate Change Act (Republic Act 9729) was passed, which mandated that climate change considerations be integrated into government policy and planning. This law served as the foundation for the creation of the Climate Change Commission, the National Framework Strategy on Climate Change (NFSCC) for 2010-2022, and the National Climate Change Action Plan (NCCAP) for 2011-2028. The NCCAP was also implemented at the local government level as the Local Climate Change Action Plan, to mainstream climate change as a priority for achieving a progressive and resilient nation.

The Philippines has a significant population residing in low-elevation coastal zones, ranking within the top ten globally. In the national database, 4,251 out of 41,992 coastal barangays are highly exposed to coastal river flooding, which represents 11.67% of the country's total population, equivalent to 10,210,740 individuals. Tacloban is among the affected areas,

and many households are at risk of sea-level rise and its associated hazards. It is essential to raise awareness among the coastal communities about the potential effects of climate change and help them adapt and mitigate its impacts to build a resilient coastal community.

Approximately 8% of global emissions result from energy use on farms and fertilizer production. Methane emissions from enteric fermentation in ruminants' digestive tracts are linked to their food consumption, but they also vary among individual animals. Therefore, it is necessary to monitor these emissions regularly (Ivanova *et al*., 2020).

It is in this light that conducting such a study is deemed appropriate and timely. We cannot dent the fact anymore of the realities of climate change. Hence becoming more engaged in these topics will allow us to prepare for our future actions.

With all the data mentioned, it is in this regard that there is a need of exploring the mitigation strategies for climate change among the residents of the coastal barangays in Tacloban City. In this light, the researcher sought to collate

1. the socio-demographic profiling of the respondents in terms of age, education, source of income and; years of residency in the barangay, and
2. the climate change mitigation of the residents in selected coastal barangays of Tacloban City

MATERIALS AND METHODS

Research design

This study focused on the ways how the residents mitigate climate change. The researcher used a descriptive approach as this study attempted to determine the adaptation and mitigation strategies of the residents living along the coastal barangays in Tacloban City. The use of descriptive research design is a good fit for a survey-type research questionnaire and useful in quantitatively generalizing ideas without concern for their causation, as this study needs. A descriptive survey was used in this study as it was deemed most appropriate in the identification and description of people's opinions about a phenomenon. This study was done before the COVID-19 pandemic hit the whole world, hence data-gathering procedure still followed the normal face-to-face interviews.

Research locale

This study was conducted in two coastal barangays of Tacloban City. There are 46 coastal barangays in Tacloban City and two of them were chosen as the study area since these two coastal barangays recorded a high vulnerability index as found in the study of Toda *et al*. (2015). These are Barangay 88 in San Jose, Airport, and Barangay 99 in Diit, both in Tacloban City. These barangays have a population of more than 5,000 individuals, reaching a total of more than 11,000 individuals.

Research respondents

There are estimated 71,657 residents living in the coastal barangays in Tacloban City based on the projected population given by Philippine Statistics Authority in the year 2018. This number is limited only to individuals aged 15 years old and above, which is the age range for this study's target respondents. The variability of the respondents' age will be of great significance to come up with a wider scope of responses. The researchers set the respondent's age to a minimum of 15 years old. Evenshaug and Hallen (2001) found out that children in late and early adolescence acquire abstract thinking, meaning they can think beyond the concrete situation. Holden (2007) also stated that many in this age group also start to show interest in different societal issues (Ojala, 2012). With the findings of the previous studies, the researchers established the 15 years old as a middle ground for which the respondents' age bracket must begin with.

Research instrument

This study used a researcher-made survey questionnaire which was completed with the help of the researcher's instructor. The researchers had requested an expert to help put the questionnaire in good form and substance. The questionnaire was examined by an environmental science professor and a research expert. Part I of the instrument covers the respondent's profile, and Part II and Part III cover the respondent's adaptation and mitigation strategies, respectively. Part IV is the observed barangay ordinances and activities in the barangay that deal with environmental conservation and climate change. The instrument was translated to Waray-waray with guidance from an expert.

Research procedure

The researchers made the survey questionnaire, patterned from the reviewed literature of the same area of interest, which is climate change mitigation. Then, the researcher consulted an expert, a science professor, to assess the content of the questionnaire. After having the survey questionnaire in good form, the researcher translated the questionnaire into the Waray-waray dialect so that it would be easy for the respondents to answer the survey. The translation was also guided by an expert in Waray- waray dialect to avoid improper wording. After approval of the translation, a letter of permission to the chairman of Barangay Candahug, a coastal barangay in Palo, Leyte, where the pilot survey was conducted, requesting permission to survey the residents in their jurisdiction. After the pilot survey was conducted, a letter of request was sent to conduct the actual survey to the chairmen of the study sites.

Statistical data analysis

The researchers used percentage and frequency counts. This is appropriate since this study is quantitative. The researcher assumed to have 20 individuals in each category (e.g. students, young professionals, housewives, fishermen, and the elderly). This would total a sample size of 100. However, getting a 100 percent response from a sampled unit is rare. So, an assumption of a nonresponse rate is necessary. According to Pazzaglia *et al*. (2016), one approach to limit the risk of bias from nonresponse is to select an 85 percent response rate. The final sample size would be 118. But during the actual survey, it was a challenge for the researcher to get the group, young professionals, and student respondents. Thus, the original survey design was not met and the researcher employed a purposive random sampling. The age bracket for each group was set by the researcher in a way that age will be distributed throughout. The researchers employed frequency and percentage counts to determine how many individuals have practiced a specific adaptation or mitigation strategy such as not burning plastics

and planting trees. Each adaptation and mitigation option was computed for its frequency count and percentages. However, some items in the questionnaire required a qualitative answer. Data gathered was presented using statistical figures such as graphs.

RESULTS AND DISCUSSION

Figure 1 shows how long the respondents have been living in the barangay, and how old are they at the time of the survey. The average age is 34 years old while the average year of residence is about 23 years.

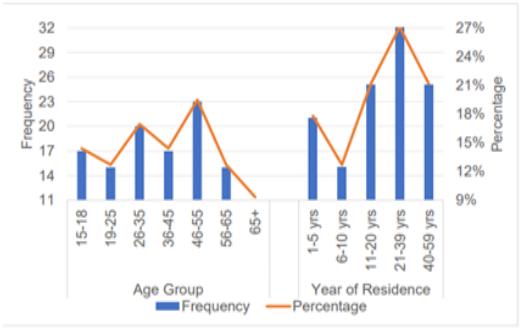

Figure 1. Age Group and Year of Residence of the Respondents

The data implies that most of the respondents were not originally from the barangay that they were currently residing in. Moreover, 18% of the respondents were living for 1-5 years in the barangay. This is an indication of new settlers in the barangay more than a year but less than five years after typhoon Yolanda. It can also be noted that there are inclusion of students amon the respondents since theyt paly an important role in the translation of climate-related and disaster-related policies in the community (Zeeshan *et al*., 2021).

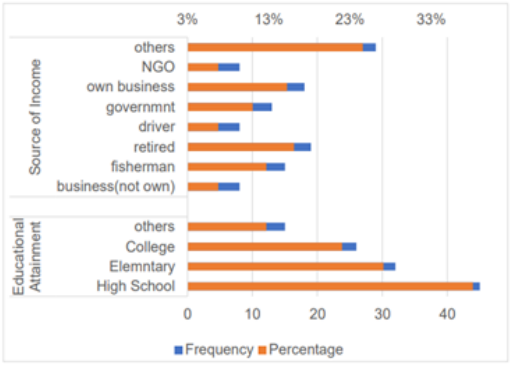

Figure 2. Education and Source of Income of the Respondents

Figure 2 shows the data on the respondents' source of income and educational attainment. Female respondents comprised seventy-five percent (75 %) of the sample. This was because females were the ones left at home attending to their children. It also shows that males were the ones who worked for their families. Often even when husbands or males were present, they shy themselves away and pass the task of entertaining to a female in the household. The majority of the respondents finished secondary education (38%). It also shows that most of the respondents did not have a stable job, and did not finish tertiary education. Housewives were the most in number, indicated as "others" in the figure.

Table 1. Media, Climate Change and Its Effects

	Frequency	Percentage
Respondents Who Have Heard About Climate Change	78	66%
Media from Where They Have Heard about Climate Change		
Television	78	66%
radio	38	32%
residents	24	20%
social media	16	14%
family	12	10%
Brgy. Officials/	6	5%
others	12	10%
Respondents Who Have Not Heard About Climate Change	40	34%
Respondents Who Knew the Effects of Climate Change	76	64%
Effects of Climate Change		
hot weather	62	53%
El Nino	58	49%
floods	56	47%
stronger typhoons	54	46%
La Nina	48	41%
liquefaction	40	34%
Sea-level rise	36	31%
storm surge	30	25%
tsunami	30	25%
others	10	8%
Respondents Who Did Not Know the Effects of Climate Change	42	36%

In **Table 1**, sixty-six percent of the respondents have already heard about climate change, while only 34 % have not heard about it. Most notably, they have heard about climate change through television (66%), radio (32%), and from the residents (20%), while only 5% reported that they have heard it from the barangay official. This implies that television and radio were the two most accessible media as a source of information regarding climate change while less has been heard of it from the barangay officials.

On the other hand, only 64 % of the respondents knew the effects of climate change. Among the top five responses were hot weather (53%), El Nino (49%), floods (47%), colder temperatures (46%) during the night, stronger typhoons (46%), and La Nina (41%). These top five responses are the obvious experience of the respondents and thus may have influenced their knowledge of climate change effects. These are common in the Philippines since on average about twenty typhoons visit the country each year, with heavy rains resulting in moderate to severe flooding in flood-prone areas.

Moreover, the most observable one was hot weather because it can be experienced almost every day in a particular season. In Tacloban City, the average temperature for May 2019 (the same as the time the survey was conducted) was 33 degrees Celsius (Accuweather, 2019). Seasonal variations should also be considered as this might affect the responses of the respondents. Should the survey be conducted during the rainy season, it could have produced a different response.

Table 2. Dwellings, Willingness to Move Away from the Coast, and Their Reasons

Frequency		Percentage
In a No Build Zone	68	58%
Not in a No Build Zone	50	42%
Willing to move away from the coast	92	78%
Reasons		
for safety	78	66%
so that evacuation will not be necessary	4	3%
availed of government housing	4	3%
if there is livelihood at the relocation area	6	5%
Not willing to move away from the coast	26	22%
Reasons		
livelihood is at the coast	20	8%
used to live here	2	2%
leave everything to God	2	2%
not in the No Build Zone	2	2%
we are already good	2	2%

In **Table 2**, almost half of the respondents have varied responses about whether they are in a No-Build Zone or not. According to Philippine Water Code, 40 meters away from the shore is considered a "No Build Zone". Looking at Google Maps (2020), the study areas are already more than 40 meters away from the shore. However, the hazard map of Tacloban City revealed that these areas could still be affected by a 2-4-meter-high storm surge. The percentage of the respondents who were in a No-Build Zone (58%) was outnumbered by the percentage of those respondents who were willing to move away from the coast (78%), where it is safe from storm surges. It should be noted that the main reason for their willingness to move away from the coast was their safety (against storm surge) (66%).

This decision was probably influenced by their experience when Super Typhoon Yolanda struck through Eastern Visayas. In contrast, the survey interview revealed that problems concerning water scarcity, transportation challenges, and livelihood availability in the relocation site were among some of the common issues confronting the respondents, thus leaving them to go back to their former houses even though most respondents (in San Jose area) already benefitted the free-housing program by the government.

Figure 3 shows that eating vegetables (86%) was the most practiced mitigation option among the respondents, followed by planting trees (81%), saving electricity (81%), limiting meat consumption (80%), limiting the use of plastics (78%), opting to public transport (71%), and waste segregation (71%). These were the top five mitigation options that were prominent among the respondents.

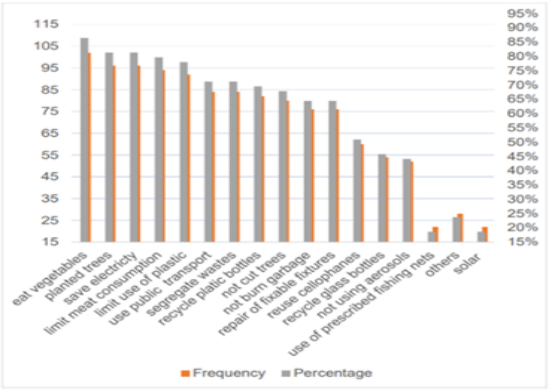

Figure 3. Mitigation practices

Questions on aerosols (44%) were only limited to insect repellents when the survey was conducted. It was quite alarming that over half of the respondents use insect repellent sprays for either mosquitoes or cockroaches. Similar to the present study. These mitigations were centered on themes about low-carbon product consumerism, energy conservation, waste management, and reforestation. The respondents have a high level of practice in mitigation options. The practice of climate change mitigation on an individual scale is relevant in reducing emissions of carbon. From the previous literature cited, opting for a green diet alone saves an amount of 1854 kg of CO2 equivalent (Bjelle *et al*., 2017). This amount multiplies when the majority of the respondents opt for a green diet.

On the contrary, the respondents failed to comment on the connection between their responses and climate change. Based on the survey interview, opting for a vegetable diet, saving electricity, and use of public transport were attributed to the desire of saving money. The respondents collected plastic bottles and sold them at a junkshop to generate income. Segregating wastes, not cutting trees, use of prescribed fishing nets, and planting trees (mangroves in this part) were consequences of the implemented ordinances. It can be deduced that many of the mitigation options were linked to other domains rather than climate change. Coelho, Russo, Oliveira, Monteiro, Lopes, and Borrego (2018) also made men tion of home sustainable actions are crafted anmd done in city levels.. These unheralded intentions were sourced from the respondents during the conduct of the study. These results coincides with what Roelich and Giesekam (2019) studied on wherein theie findings demonstrated the importance of considering alignment between perspectives, agency and potential actions when developing plans. These findings are relevant as well from Min *et al*., (2019) wherein they cited that cities play a key role in the low-carbon transition, with an increasing number of cities engaging in carbon mitigation actions, more so with natural ecosystem (Xi-Liu *et al*., 2018; Fawzy *et al*., 2020).

CONCLUSION

This study concerns the engagement of the residents in climate change adaptation and mitigation. The questions that this study

intends to answer were the demographic profiles of the respondents in terms of age, educational attainment, source of income, and years of residency in the barangay; the climate change adaptation of the respondents; and the climate change mitigation of the respondents. A 26-item survey was developed by the researcher to fulfill the research questions. Moreover, purposeful random sampling was employed due to time, labor, and resource difficulties encountered by the researcher.

A simple percentage and frequency count was utilized to come up with the representation of the data gathered. Individuals are the direct recipient of climate change effects and the government's relief operations and adaptation development as a result of these effects. Technically, adaptation development from the government upholds its mandate to safeguard the life of its citizens, but it is not always a complete package for all, sometimes it lacks something on the other side such as a loss of livelihood. Meanwhile, individual mitigation is also as significant as the energy, transport, and agriculture sector in lowering GHG emissions since they are the end-user of these sectors, they affect the supply-demand chain. The respondents moved back to their original dwellings despite there being free houses given by the government because there was no available sustainable livelihood at the relocation site. Water crisis and transportation mobility were also new challenges for them at the site. These motivated them to go back to their homes and ignore the government's warning about the hazard of storm surge for a time being while there is no typhoon. This is a major repercussion of a top-down approach to climate change. Results showed that there was a considerable number of respondents who did not know the effects of climate change.

While it could not suffice to conclude their level of knowledge of climate change, it could be an indicator of a poor understanding of climate change. This could be counteracted through a more all-inclusive information and education campaign about climate change through the use of local language and their most accessible media –television and radio. Providing solutions to water scarcity, transport, and livelihood challenges should also be made to address the large number of respondents who were moving back to their original places from the relocation site. On the other side of the story, there was a high level of practice of climate change adaptation and mitigation among the respondents; most of the respondents were aware of the existence of environmental protection ordinances; most of them had participated in and expressed the importance of the disaster drills. The local government could further strengthen these by giving incentives for positive environmental behavior and strictly imposing fines on those disobeying the ordinances. For future research suggestions, an increase in the number of respondents in a way that the result could represent the different social statuses could be significant, since the respondents of this study were mostly low-income families.

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CONFLICT OF INTEREST: The authors deem it necessary to seek and accept possible conflict of interest that may arise from the study, as they may have overlooked into such.

FINANCIAL SUPPORT: None

ETHICS STATEMENT: Informed consent will be obtained from all participants involved in the study, including stakeholders, local communities, and individuals participating in interviews, surveys, or any other data collection activities. Participants will have the right to withdraw from the study at any time without facing any negative consequences, as well as adhering to "do no harm" principle. All data collected will be treated with the utmost confidentiality. When presenting results, data will be aggregated and anonymized to prevent the identification of individual participants or communities. All research activities will be conducted with the highest level of integrity and objectivity.

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