

## **Knowledge, Attitudes, Practices, and Action on Climate Change and Environmental Awareness of the Twenty-two Villages along the River Banks in Cagayan de Oro City, Philippines**

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### **ABSTRACT**

This study determined the knowledge, attitudes, practices (KAP), and action of the settlers of the twenty-two villages along the River Banks in Cagayan de Oro City, Mindanao, Philippines on climate change and environmental awareness. This study used the quantitative approach with field observation and questionnaires method for data collection. Results of this study indicated that the settlers' knowledge, attitudes, practices, and action on climate change was on a moderate level, with attitudes as dominant, followed by knowledge, practices, and action. The study concludes that the settlers' knowledge, attitudes, practices, and action need intervention to improve their awareness.

**Keywords:** KAP, Action, climate change, settlers, river banks

## INTRODUCTION

The primary motivation behind this Knowledge, Awareness, and Practices (KAP) Survey is to address climate change awareness and education. In addressing gaps in sustainable climate change adaptation, mitigation, and disaster risk programming are needed.

Climate change continues to represent as one of the greatest threats to the global environment, society and the economy (Japan-Caribbean Climate Change Project, 2016). Climate change is one of the most threatening global environmental changes of the century (Costello, et al., 2009). Also, climate change has become a primary concern of many scholars, particularly the climatologists and the environmentalists, in the natural sciences (Azizi, 2002; Paoletti et al, 2007; Roshan et al, 2009).

The effects of human activities are evident in observable changes to the functioning of ecosystems, the earth's oceans, atmosphere, freshwater systems, and land surfaces. These environmental changes include freshwater shortages, climate change, biodiversity loss, and exhaustion of fisheries (McMichael, 2003 and 2004). Many industrial and infrastructural developments, human population growth and urbanization, plastic usage, electronic wastes, vehicular emissions, depletion of biodiversity, contamination of pollutants in the water bodies, soil and atmospheric pollution have devastated the natural environment, causing severe ill health effects on human beings. Many developed countries are slowly finding several alternative and innovative technologies to minimize the effects of pollution and optimal utilization of the natural sources (Anbalagan and Shanthi, 2015).

Education is a key component of the global response to climate change (United Nations Framework Convention on Climate Change, 2019). Climate change education helps young people address the impact of global warming and encourages changes in their attitudes and behavior and helps them adapt to the climate change-related trends (Heidari & Heidari, 2015). The role of education in addressing the challenges of climate change is increasingly recognized; the education sector remains underutilized as a strategic resource to mitigate and adapt to climate change.

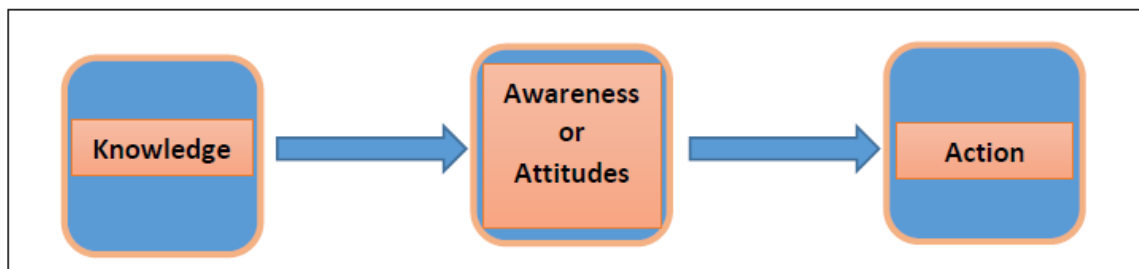
The city of Cagayan de Oro is one of the largest cities in the Philippines. It is located on a flat plain at the northern coast of Mindanao, the large southern island of the country, and is the capital city of the province of Misamis Oriental. The city has an area of 412 square kilometers 26, about one-third of which is used for agriculture, and six major rivers flow through the city and into the ocean at the city's northern coast. The largest of these—the Cagayan River—is fed by a mountainous, 1500-square-kilometer watershed located in Bukidnon, a province adjacent to the city.

In recent years, Cagayan de Oro City has experienced the damaging impacts of flooding. The City, which serves as the major gateway to various destinations in Mindanao, has experienced deadly and costly flooding. In January 2009, a tropical depression caused the flooding of major business districts and highways. Then in December 2011, rains brought by Tropical Storm Sendong (Washi) made two of the city's river systems rise to unprecedented levels. It became one of the most devastating and deadly events in the country's recent history. Sendong claimed 1, 259 lives, 6,071 injured and 182 missing settlers and caused Php 1.7 billion cost of damages (Lo, et al., 2017).

With these, the researchers were driven to conduct this study to generally measure the knowledge, attitude, and practices of the villagers on climate change, including their understanding of what climate change is, what causes the change, and the level of concern about their perceptions on the importance of various actions that can be taken at all levels and their willingness to take action to prevent or lessen the impact of climate change.

## FRAMEWORK

The study was anchored on the concept of Behavioural Change Model by Hungerford and Volk (1990). This reasoning was directly associated with the supposition that if people were better informed, they would become more aware of environmental problems and consequently, would be motivated to behave in an environmentally responsible manner. Many other similar models link knowledge to attitudes and attitudes to behaviour. Thus, as evident in Figure 1, when knowledge increases, environmentally favourable attitudes that lead to responsible environmental actions are developed (Hungerford and Volk, 1990)]. Figure 1 illustrates the relationships emanating from the models proposed at that time (Boudreau, 2010)].



*Figure 1.* Behavioural Change Model

## OBJECTIVES OF THE STUDY

This study aimed to determine the knowledge, attitudes, practices, and action on climate change and environmental awareness of the twenty-two villages along the river banks in Cagayan de Oro City, Philippines.

## METHODOLOGY

### Research Design

The study used the descriptive- quantitative research design. Survey was conducted among selected households from identified communities.

### Research Setting

The study was conducted in the twenty-two villages along the river banks of Cagayan de Oro City.

### Respondents and Sampling Procedure

The respondents were composed of 1,208 residents taken from the twenty-two villages. Stratified purposeful sampling technique was used, with the following criteria of selection: a) household located along the 22 river villages; b) at least 2 respondents per household who were either mothers and family members; c) 18 years and above; d) at least 5 years of stay in the city; and e) were willing to give their informed consent as respondents. Patton (2001) describes these as samples within samples and suggests that purposeful samples can be stratified or nested by selecting particular units or cases that vary according to a key dimension.

### Research Instrument

A modified set of Climate Change Questionnaire from the study of Lubos et al. (2015) was used in the study. Part I dealt with the respondents' level of knowledge on the causes and possible consequences of climate. Part II gathered data on the attitude and practices on climate change. Part III gathered data on the awareness of climate change and Part IV gathered data on the action taken to adapt to Climate Change. The questionnaire was subjected to a reliability test to 30 respondents.

### Data Gathering Procedure

Research protocol was strictly observed in the study. Written informed consent was also obtained from the respondents.

### Statistical Techniques

The data were presented, analyzed, and integrated through the frequency counts, percentages, and weighted mean.

## RESULTS AND DISCUSSION

In this cross-sectional study, samples were taken from all twenty-two villages along the river banks in the city. Data were gathered in relation to their knowledge on the cause and possible effects of climate change, their attitude, and practices; action is taken to adapt and mitigate climate change.

**Objective 1: To determine the level of knowledge of the respondents about climate change in terms of its causes and possible consequences.**

Table 1

*Level of knowledge on climate change as perceived by the respondents*

<b><i>How much do you know about climate change?</i></b>	<b>Frequency</b>	<b>Percentage</b>
At least a fair amount	545	45.11
Not much	278	23.01
Hardly anything	385	31.87
<b>Total</b>	<b>1,208</b>	<b>100.00</b>

Most people in Cagayan de Oro City can relate to climate change through personal experiences. Several super typhoons have hit the city in 2011 and 2012. Tropical storm Washi, for example, resulted in severe flooding which swept away thousands of communities living along the Cagayan River and about 2000 people dead or missing (Sealza and Sealza, 2014). When the respondents were asked on how much they know about climate change, 45.11% replied that they know about on the phenomenon. About 23.01 % claimed that they do not know much and 31.87% said they hardly know anything about it. This data can be gleaned from Table 1. From their own perceptions, they have admitted that they only know a thing or two about climate change.

Table 2

*Frequency and percentage distribution of the respondents' knowledge in terms of the causes of climate change*

<b><i>Do you think any of the following causes climate change?</i></b>	<b>YES</b>		<b>NOT SURE</b>		<b>NO</b>	
	<b>Frequency</b>	<b>Percentage</b>	<b>Frequency</b>	<b>Percentage</b>	<b>Frequency</b>	<b>Percentage</b>
Poor industrial practices (eg. Factory emissions, improper waste disposal)	568	47.01	336	27.83	304	25.16
Land clearing (eg. Deforestations)	647	53.56	200	16.56	361	29.88
Transportation, such as driving car, bus or boat (vehicle emissions)	892	73.84	128	10.60	188	15.56
Burning fossils such as coal, oil, natural gas	864	71.52	99	8.19	245	20.29

Table 2 Continued

Electricity generation						
Improper garbage disposable such as burning garbage	902	74.67	127	10.51	179	14.82
Poor agricultural practices (eg. Pesticide misuse )	658	54.47	321	26.57	229	18.96
Sea level rise	723	59.85	223	18.46	262	21.69
Coral bleaching	615	50.91	317	26.24	276	22.85
<b>AVERAGE</b>	<b>734</b>	<b>60.73</b>	<b>219</b>	<b>18.12</b>	<b>255</b>	<b>21.15</b>

Table 2 presents the collected data on the respondent's knowledge in terms of the causes of climate change. Almost 61 percent agreed that climate change is caused by various factors led by improper garbage disposable such as burning garbage (74.67%). This is followed by transportation, such as driving car, bus or boat (vehicle emissions) about 73.84 percent; burning fossils such as coal, oil, natural gas electricity generation (71.52%); sea level rise (59.85%); poor agricultural practices (54.47%); land clearing, eg. deforestations (53.56%); coral bleaching (50.91%); and poor industrial practices, eg. factory emissions and improper waste disposal (47.01%).

About 18.12 percent are still not sure that the mentioned factors are actual causes of climate change, while around 21.15 percent believed that these do not cause climate change. This means that majority of the respondents know the causes of climate change, but a third is still not yet convinced or do not know these causes.

These findings are supported by the studies of Wachholz, Artz and Chene (2014), Eggers, Kayser, and Isselstein (2015), and Lorenzoni and Pidgeon (2006). Wachholz et al. (2014) stated that climate change is real and is caused by human-induced factors. The study of Eggers et al. (2015) and Lorenzoni and Pidgeon (2006) also confirmed that they themselves had experienced the effects of climate change and thus, they are no longer skeptical about it.

Table 3

*Frequency and percentage distribution of the respondents' knowledge in terms of its possible consequences*

Do you associate any of the following with climate change?	YES		NOT SURE		NO	
	F	P	F	P	F	P
Global warming	588	48.68	345	28.56	275	22.76
Typhoon	458	37.91	388	32.12	362	29.97
Floods	569	47.1	367	30.38	272	22.52
El Nino / La Nina	457	37.83	412	34.11	339	28.06
Climate variability	612	50.66	346	28.64	250	20.7
Ozone layer depletion	645	53.39	401	33.2	162	13.41
Earthquakes	678	56.13	347	28.73	183	15.15
More intense storm surges	488	40.4	421	34.85	299	24.75
Sea level rise	614	50.83	329	27.24	265	21.94
Fish kill	601	49.75	318	26.32	289	23.92
Landslide	584	48.34	346	28.64	278	23.01
Increased greenhouse gases	619	51.24	380	31.46	209	17.3
Droughts	641	53.06	309	25.58	258	21.36
Health epidemics	589	48.76	365	30.22	254	21.03
Coral reef bleaching	592	49.01	319	26.41	297	24.59
Volcanic eruptions	601	49.75	356	29.47	251	20.78
<b>AVERAGE</b>	584	48.3	359	29.75	265	21.95

Table 3 contains the data on the respondents' knowledge of the possible consequences of climate change. Majority (48.3%) of the respondents agreed that most extreme environmental events are effects of climate change. Most of these environmental events associated with climate change are global warming, typhoons, floods, El Nino/La Nina, and variations in climate. Other environmental occurrences highly associated with climate change according to



the respondents are depletion of the ozone layer, earthquakes, intense storm surges, sea level rise, and fish kill, among others.

About 29.75 percent of the respondents are not sure that these events are real consequences of climate change and almost 21.95 percent do not believe that these events are associated with climate change at all.

A similar study among American citizens in 2010 revealed that majority of the respondents knew the causes of climate change. However, they do not know why these factors caused changes in the climate (Leiserowitz, Smith and Marlon, 2010).

**Objective 3. To determine the respondents' awareness of the possible effects of climate change.**

Table 4

*Frequency and percentage distribution of the respondents' awareness of the possible effects of climate change*

<i><b>Do the following occur in your community?</b></i>	<b>YES</b>		<b>NOT SURE</b>		<b>NO</b>	
	<b>F</b>	<b>P</b>	<b>F</b>	<b>P</b>	<b>F</b>	<b>P</b>
1. Increased flooding	512	42.38	475	39.32	221	18.29
2. Increased severity of tropical storms	539	44.62	427	35.35	242	20.03
3. River flooding	540	44.7	429	35.51	239	19.78
4. Land slippage	579	47.93	407	33.69	222	18.38
5. Decreased productivity of fisheries	562	46.52	408	33.77	238	19.7
6. Deterioration of river Ecosystem	698	57.78	337	27.9	173	14.32
7. Salt water intrusion into the river	512	42.38	457	37.83	239	19.78
8. riverbank erosion	599	49.59	393	32.53	216	17.88
9. Decreased agricultural productivity	571	47.27	394	32.62	243	20.12
<b>AVERAGE</b>	568	47.02	414	34.28	226	18.70

Table 4 illustrates the frequency and distribution of the respondents' experiences or observations on the possible effects of climate change in their area of residence. About 47.02 percent of the respondents claimed that they have experienced or have observed increased flooding and severity of tropical storms. They have also noticed river flooding, land slippage, as well as decreased productivity of fisheries. On the other hand, almost 34.28 percent of the respondents said that they are not sure and 18.70 percent said No.

According to the 2015 Global Climate Risk Index, the Philippines is one of the most affected by climate change due to its geography (Kreft, Eckstein, Junghans, Kerestan, and Hagen, 2015). This country is surrounded by the western Pacific Ocean, which brings about warm water temperature. Being an archipelago, the Philippines lacks natural barriers between its seas and land areas, thus increasing the risk of tropical storms. On the average, 20 cyclones enter the Philippine waters each year, with 8 or 9 of these cyclones making landfall. The responses of the study participants confirmed that many of them have felt the environmental changes brought about by frequent variability of the weather and extreme changes in the climate.

Table 5

*Frequency and percentage distribution of the respondents' perception of the extent of environmental awareness changes related to climate change*

Have you noticed any of the following changes in your community?	Always		Sometimes		Never	
	F	P	F	P	F	P
Increase in river erosion	523	43.29	380	31.46	305	25.25
More drought	612	50.66	357	29.55	239	19.78
Decrease in fish supplies	515	42.63	394	32.62	299	24.75
Increase in insect pest	556	46.03	383	31.71	269	22.27
Vegetation changes	518	42.88	391	32.37	299	24.75
More intense tropical storms/ typhoons	523	43.29	386	31.95	299	24.75
More landslide	599	49.59	381	31.54	228	18.87
Increase in rainfall	524	43.38	392	32.45	292	24.17
Rising river water	588	48.68	392	32.45	228	18.87

Table 5 Continued

More flooding	525	43.46	386	31.95	297	24.59
Temperature fluctuation	512	42.38	409	33.86	287	23.76
Differences in seasonality of crops	547	45.28	406	33.61	255	21.11
<b>AVERAGE</b>	545	45.13	388	32.13	275	22.74

When the respondents were asked about their perceptions regarding the extent of environmental changes related to climate change, approximately 45.13 percent have consistently replied that they had noticed changes. This is presented in Table 5 on the frequency and percentage distribution of the respondents' perception of the extent of environmental changes related to climate change.

**Objective 4: To determine the respondents' attitude and practices towards climate change.**

Table 6

*The weighted mean of the respondents' attitude towards climate change mitigation*

<b><i>Do you think any of the following can be important in helping your community deal with climate change?</i></b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Verbal Description</b>
Public education on health-related impacts of climate change	3.97	1.022	Moderately concerned
Disaster management plans	3.63	1.210	Moderately concerned
Improved water storage	4.11	0.828	Moderately concerned
Flood warning systems	4.18	0.811	Moderately concerned
Increased public awareness of climate change issues	3.98	0.889	Moderately concerned
Early warning systems for health-related impacts (such as dengue)	4.10	0.831	Moderately concerned
Improved crop cultivation in the agricultural sector	3.97	1.022	Moderately concerned
Improved pest management strategies	3.72	1.122	Moderately concerned
Increased and better surveillance systems	3.72	1.122	Moderately concerned

Table 6 Continued

Increased research and development of renewable energy technologies	4.04	0.882	Moderately concerned
Reduction in fossil fuel (coal, oil, natural gas) use	4.11	0.828	Moderately concerned
Observing building code	3.77	1.180	Moderately concerned
Reduction in consumption of electricity	3.90	1.119	Moderately concerned
Implementation of energy efficient measures in the industrial and commercial sectors	4.13	0.832	Moderately concerned
<b>Total</b>	<b>4.16</b>	<b>1.167</b>	<b>Moderately concerned</b>
Legend:			
4.50 – 5.00	-	Very concerned	
3.50 – 4.49	-	Moderately concerned	
2.50 – 3.49	-	Concerned	
1.50 – 2.49	-	A little bit concerned	
1.00 – 1.49	-	Not concern at all	

Another variable of the study is the attitude of the study participants toward climate change mitigation. The data on attitude are presented in Table 6. On average (4.16%), the respondents were “moderately concerned” with the importance of the mentioned mitigating strategies to prevent or solve the problems associated with climate change. The highest mean (4.18%) was on the Flood warning system and the lowest mean (3.63%) was on the Disaster management plans.

Table 7

*Weighted mean of the respondents' practices towards climate change mitigation*

<i>To what extent do you practice the following?</i>	Mean	Standard Deviation	Verbal Description
Use environmentally safe products	3.22	0.790	Moderate
Proper waste segregation	3.43	0.699	Moderate
Conserve energy	3.22	0.790	Moderate
Maintenance of safe household drains	3.43	0.699	Moderate

Table 7 Continued

Avoid burning of solid waste	3.26	0.834	Moderate
Practice soil conservation	3.43	0.699	Moderate
Participate in reforestation/tree planting	3.15	0.903	Moderate
Maintaining a compost pit	3.29	0.722	Moderate
Reduction in harmful emission	3.22	0.838	Moderate
Conduct impact assessment studies on climate change	3.23	0.795	Moderate
<b>Total</b>	<b>3.44</b>	<b>0.925</b>	Moderate

Legend:

3.50 – 4.00	-	High
2.50 – 3.49	-	Moderate
1.50 – 2.49	-	Low
1.00 – 1.49	-	Not at all

With regard to the respondents' practices towards climate change mitigation, the overall mean revealed that the respondents just "moderately" practice these. This means that they have accepted that they are not really practicing climate change mitigation strategies at all times. This data are presented in Table 7.

**Objective 5. To determine the respondents' action taken to adapt to climate change.**

Table 8

*Showing Action was taken to adapt to Climate Change*

Have you taken the following actions already to adapt to climate change?	YES		NO		NOT SURE	
	F	%	F	%	F	%
1. planted trees	478	39.57	421	34.85	309	25.58
2. planted plants in the house yard	560	46.36	345	28.56	303	25.08
3. stopped cutting trees	429	35.51	426	35.26	353	29.22
4. maintained vegetation	435	36.01	409	33.86	364	30.13
5. built/fixed dikes	512	42.38	427	35.35	269	22.27
6. built well sand other water resources	489	40.48	403	33.36	316	26.16
7. cleaned or helped to maintain public drainage systems from waste	512	42.38	415	34.35	281	23.26

Table 8 Continued

8. turned off lights when not in use(energy efficiency)	499	41.31	409	33.86	300	24.83
9. turned off water when not in use	518	42.88	419	34.69	271	22.43
10. built or helped to build green spaces, such as parks or gardens	488	40.4	400	33.11	320	26.49
11. stopped/reduced time taking car or bus and walked or cycled	545	45.12	363	30.05	300	24.83
12. not litter even when bins are not available	527	43.63	428	35.43	253	20.94
<b>AVERAGE</b>	499	41.34	405	33.56	304	25.10

Table 8 shows that 41.34 percent of the general respondents stated they adapted practices in one or more ways to climate change. This means that the respondents have taken actions and developed a sustainable climate change awareness strategy.

## CONCLUSION

Based on the findings of the study, it can be concluded that the respondents perceived that they only have moderate knowledge about climate change causes and the possible negative effects on people and the environment. Thus, they have accepted that they lack full knowledge about climate change. As to attitude and practices towards climate change mitigation, they are only moderately concerned about the issue and are moderately practicing mitigating actions. The general population saw the need for more information about climate change.

## RECOMMENDATIONS

Based on the results of the study, the authors recommend that:

1. Across all the surveys, there was the suggestion by the respondents that there is a need for more awareness and public education activities in the community;
2. Other members of the family should be part and involved in the survey;

3. The vulnerable sector should be involved in formulating climate change action plan in the local government unit; and
4. Increase communication tools for helping public understand climate change

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