

CLIMATE CHANGE-RELATED INDICATORS: FINDINGS FROM FIVE MUNICIPALITIES IN THE PHILIPPINES¹

Introduction

The latest version of the Community-based Monitoring System (CBMS) Household Profile Questionnaire (HPQ) and Barangay Profile Questionnaire (BPQ), VN: 01-2011-01, contains questions that aims to capture information on the manifestations and impact of climate change on households and how do households and government respond to the risks brought about by climate change in terms of mitigating and adaptive strategies. These particular questions can also be used to generate various climate change-related indicators both at the household-level and community-level. The said indicators can assist policy makers and all community stakeholders in planning for the inevitable effects of climate change.

This research paper presents some findings using municipal data from four local government units that had implemented CBMS and made use of the latest version of HPQ and BPQ in 2011 namely Anda in Pangasinan, Carasi in Ilocos Norte, Hagonoy in Bulacan, Magallanes in Cavite, and Olongapo City in Zambales. Table 1 shows some physical and demographic characteristics of the five sites.

Table 1. Some Characteristics of Study Sites

Municipality (Province)	Location	Topography	Population	No. of households
Anda (Pangasinan)	Northern Luzon	Island	39,417	8,856
Carasi (Ilocos Norte)	Northern Luzon	Landlocked	1,354	279
Hagonoy (Bulacan)	Central Luzon	Coastal	101,234	23,353
Magallanes (Cavite)	Southern Luzon	Landlocked	20,900	4,534
Olongapo City (Zambales)	Central Luzon	Coastal	195,223	50,507
Total	--	--	358,128	87,529

The structure of the paper is as follows. First section discusses the indicators related to manifestations of climate change. The second section focuses on the indicators related to the impact of climate change on welfare and livelihood of households. Third section highlights the indicators related to risk-mitigation strategies that households and governments adopt in response to climate change. Fourth section tackles indicators related to role of government in managing the impact of climate changes. The last section summarizes the findings and lists some concluding remarks.

A. Manifestations of climate change

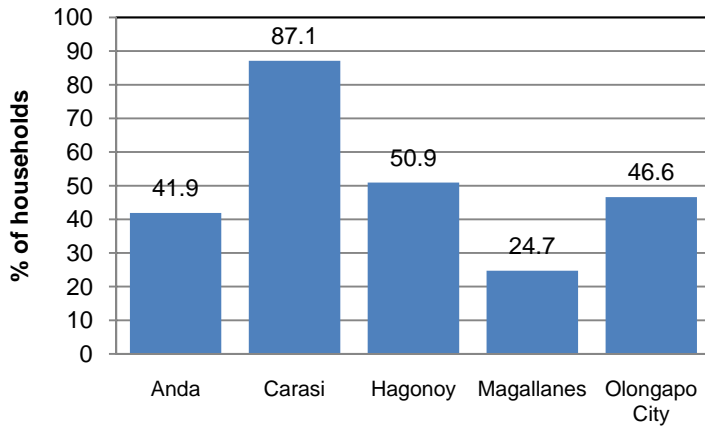
1. Increase in temperature

There is apparent disparity among municipalities in terms of proportion of households reporting increase in temperature at recent compared to three years before. About 87.1 percent of households in Carasi, Ilocos Norte perceived that temperature has become hotter now compared to three years ago – the highest

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proportion among the five municipalities. On the other hand, the lowest proportion was reported in Magallanes, Cavite at 24.7 percent.

Figure 1. Proportion of households which reported an increase in the temperature, by municipality



2. Sea Level Rise

Higher proportion of households who reported increase in sea level was observed in Hagonoy compared to Olongapo City. In the case of Hagonoy, the proportion of households who reported increase in sea level in its four coastal barangays namely San Pascual, San Roque, Pugad, and Tibaguin are 71.2 percent, 42.1 percent, 75.8 percent, and 41.4 percent respectively.

Figure 2. Proportion of households which reported an increase in the sea level in Hagonoy, by barangay

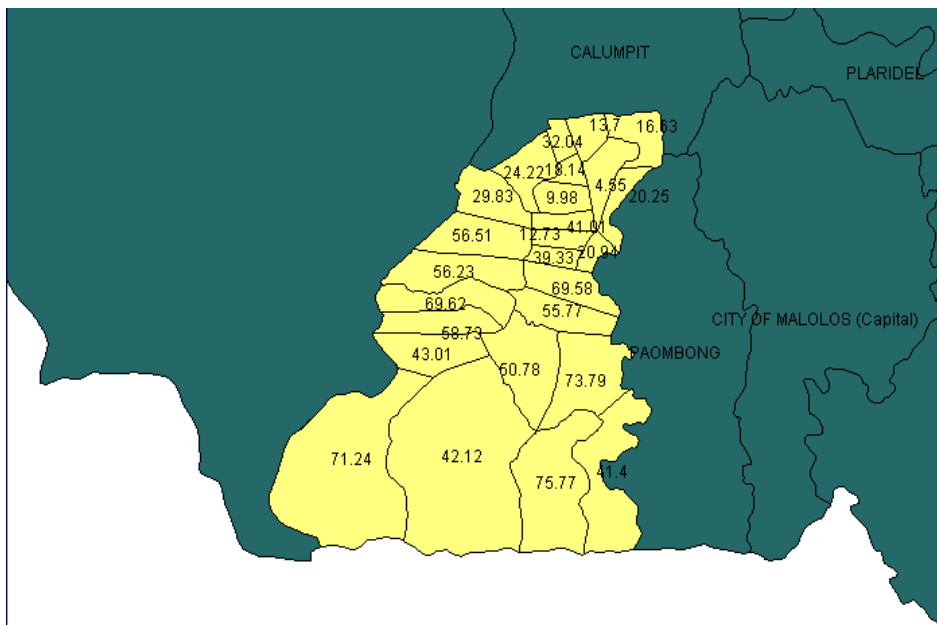
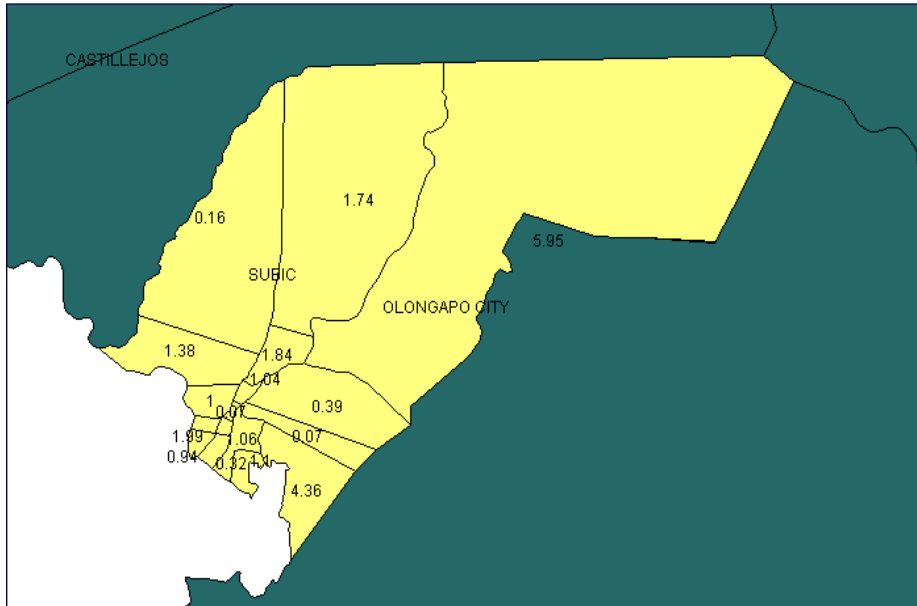


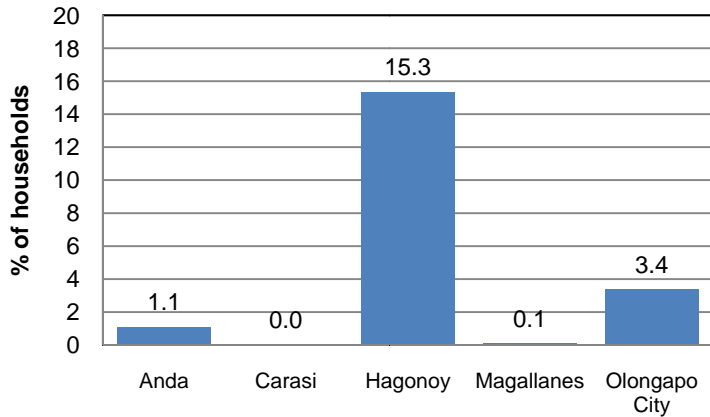
Figure 3. Proportion of households which reported an increase in the sea level in Olongapo City, by barangay



3. More frequent occurrence of natural calamities and longer time of occurrence

Results show that households in Hagonoy, Bulacan reported the highest proportion of households which experienced increase in frequency of flooding during the past three years (15.3%). In the case of Hagonoy, on the average, households reported that during the past 12 months, it usually takes 11.5 hours (about half-a-day) for the flood to subside while three years before, it usually takes 66.4 hours (almost three days) for the flood to subside. However about 6.5 percent of households which experienced increase in frequency of flooding in Hagonoy also experienced longer time for flooding to subside. On the other hand, almost all of households in Carasi, Ilocos Norte and Magallanes, Cavite reported that they did not experience flooding primarily because of geography. Magallanes for instance is situated 2,000 feet above sea level.

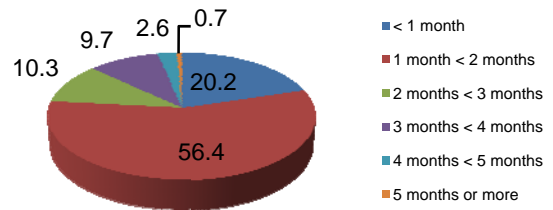
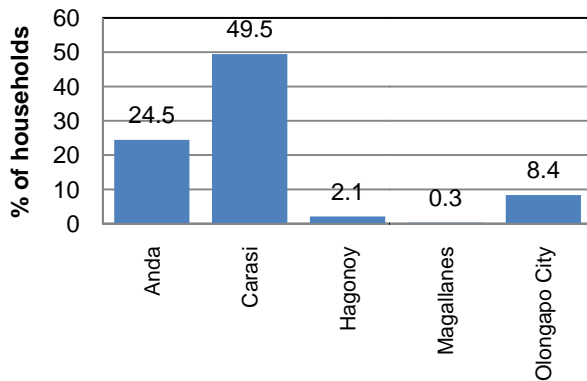
Figure 4. Proportion of households which experienced an increase in the frequency of occurrence of flood, by municipality



Households from Carasi, Ilocos Norte and Anda, Pangasinan reported the highest proportion of households which experienced increase in frequency of drought at recent compared to three years ago -- 49.5 percent and 24.5 percent respectively. Note that both Carasi and Anda are located in Region I or the Ilocos Region. In terms of duration, more than half (56.4%) of households who reported increase in frequency of drought in their area said that the most recent drought lasted for about one month to less than two months. Moreover, about 20.2 percent said that the previous drought in their area lasted for less than one month.

Figure 5. Proportion of households which experienced an increase in the frequency of occurrence of drought, by municipality

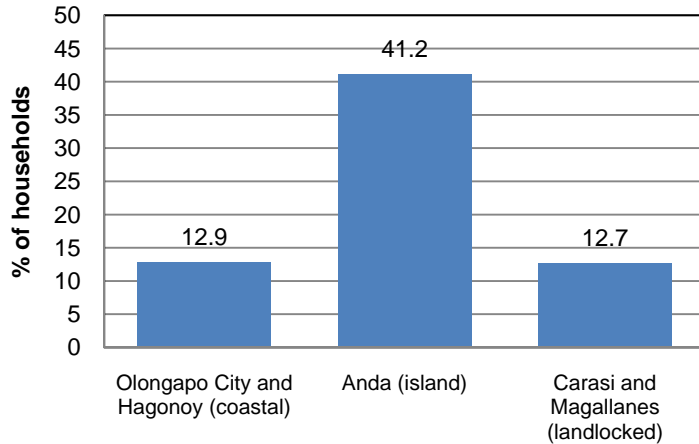
Figure 6. Duration of last drought



4. Decrease in the supply of water due to drought or less rain

Given the importance of water to everyday activities of people, any decrease to its supply poses a threat not only to health but also to agricultural production. Around 13 percent of households in coastal and landlocked municipalities reported decrease in water supply. Meanwhile, the highest percentage of households reporting decline in water supply was observed in Anda, an island-municipality. The main reason cited by households in Anda is drought due to decreased precipitation (79.8%).

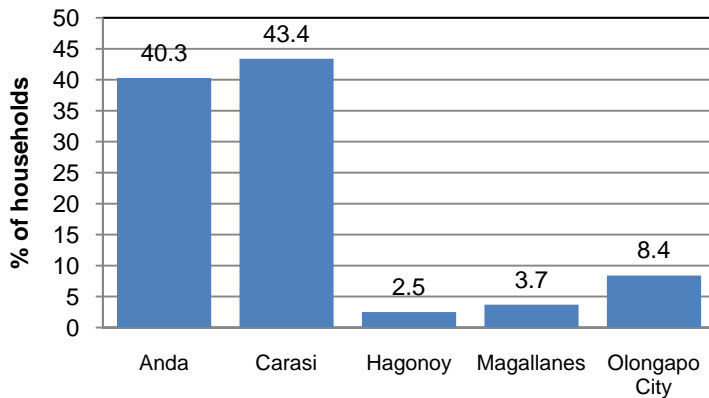
Figure 7. Proportion of households which experienced a decrease in water supply due to drought or less rain, by type of geography



5. More frequent power shortage

The proportion of households in Olongapo City, Hagonoy, and Magallanes who reported more frequent brownouts in their area is 8.4 percent, 2.5 percent, and 3.7 percent respectively. In the case of Anda, Pangasinan and Carasi, Ilocos Norte which is both in Region I (Ilocos Region) posted a much higher proportion of households who reported more frequent power outages at recent compared to three years ago.

Figure 8. Proportion of households which experienced an increase in the frequency of brownouts or power shortage in their community, by municipality



B. Indicators of impact of climate change

On agriculture production

1. Decrease in crop yield due to typhoon, flood, pests, drought, or decrease in supply of water from the irrigation

Of the five sites, three have significant proportion of households that are engaged in crop farming. These are Anda (34.6%), Carasi (72.8%), and Magallanes (37.6%). Among the farming households in Anda, Carasi, and Magallanes, 63.5 percent, 30.0 percent, and 32.3 percent reported decrease in crop harvest due to typhoon, flood, pests, drought or decrease in water supply from the irrigation respectively.

Figure 9. Proportion of households which are engaged in crop farming, by municipality

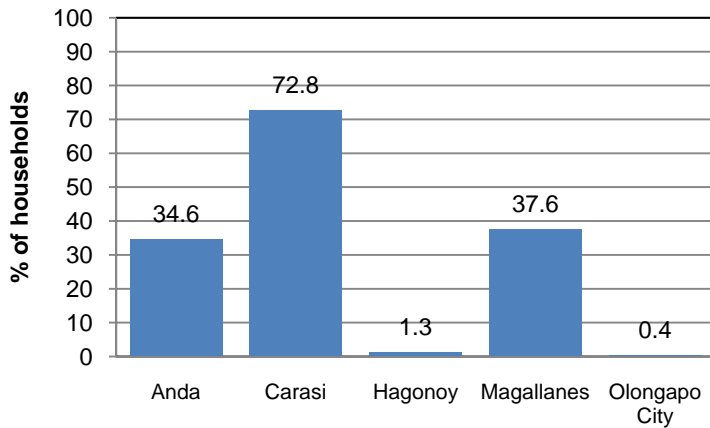
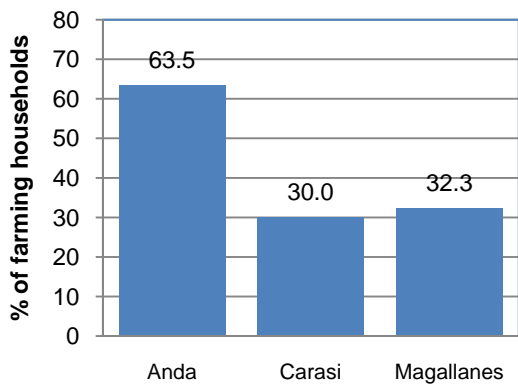


Figure 10. Proportion of farm households which experienced a decrease in crop yields due to typhoon, flood, pests, drought or decrease in supply of water from the irrigation

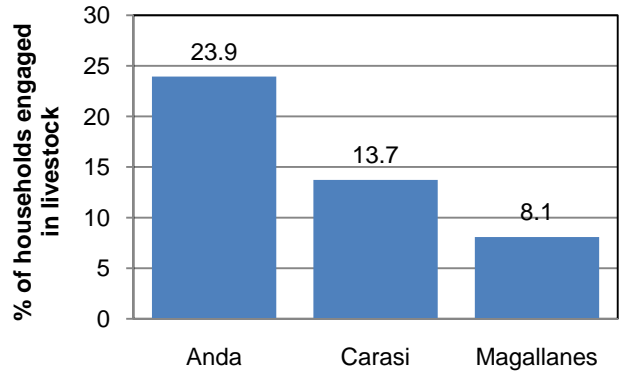
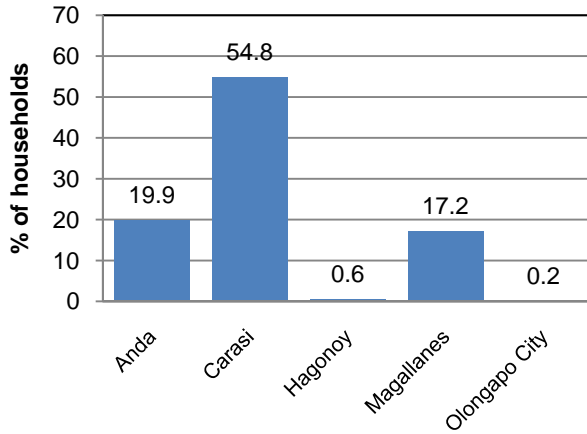


2. Decrease in livestock and poultry production because of animal diseases, typhoon, flood or extreme hot weather condition

Similar to agricultural production, Anda, Carasi and Magallanes had all significant proportion of households that are engaged in livestock/poultry – 19.9 percent, 54.8 percent, and 17.2 percent respectively. These households reported a decrease in livestock/poultry production due to animal diseases, typhoon, flood or extreme hot weather at recent compared to three years before with Carasi posting the highest proportion (23.9%) and Magallanes posting the lowest proportion (8.1%).

Figure 11. Proportion of households that are engaged in livestock/poultry, by area

Figure 12. Proportion of households engaged in livestock and poultry production which experienced a decrease in production because of animal diseases, typhoon, flood or extreme hot weather condition, by municipality



3. Decrease in fish catch due to occurrence of coral bleaching, frequent occurrence of typhoons or merely due to the fact that there are fewer fishes in the fishing area

Anda, Carasi, and Hagonoy had significant proportion of households which are engaged in fishing – 36.9 percent, 25.8 percent, and 6.7 percent respectively. In Hagonoy, a mainly fishing municipality, about 8.2 percent of households engaged in fishing reported decrease in fish catch due to occurrence of coral bleaching, frequent occurrence of typhoons or fewer fish in the area. Due to climate change, the chemistry of seas and oceans changes resulting to disrupted reproduction of fish species and destruction of coral reefs which provide sanctuary for various kinds of marine life. On the other hand in Anda, an island-municipality in Pangasinan, about 20.1% of households engaged in fishing reported lower fish catch due to similar reasons.

Figure 13. Proportion of households that are engaged in fishing, by area

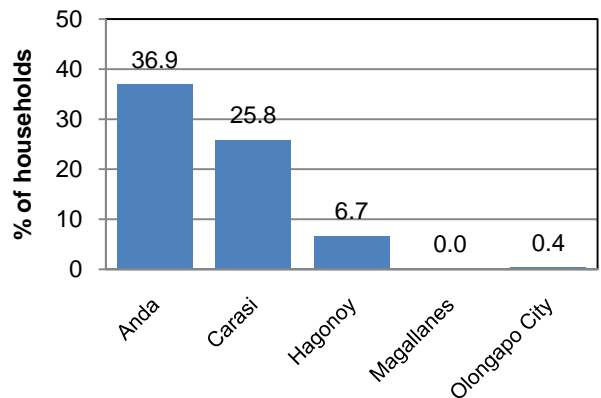
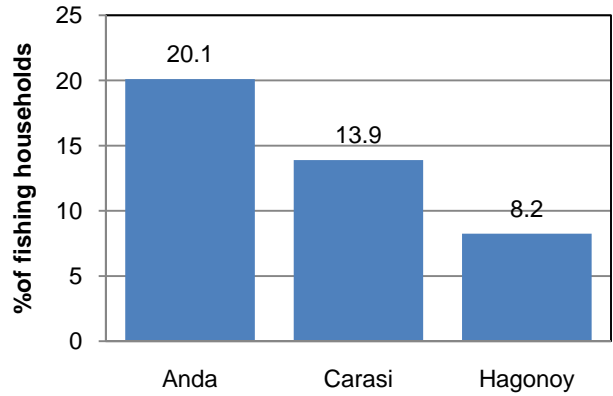


Figure 14. Proportion of households engaged in fishing which experienced a decrease in fish catch due to the occurrence of coral bleaching,

frequent occurrence of typhoons or due to the fact that there are fewer fishes in the fishing area



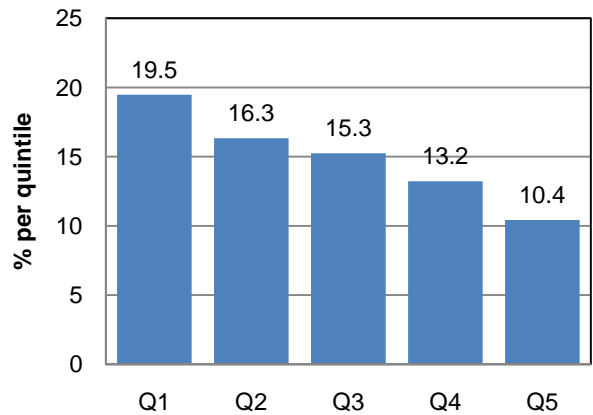
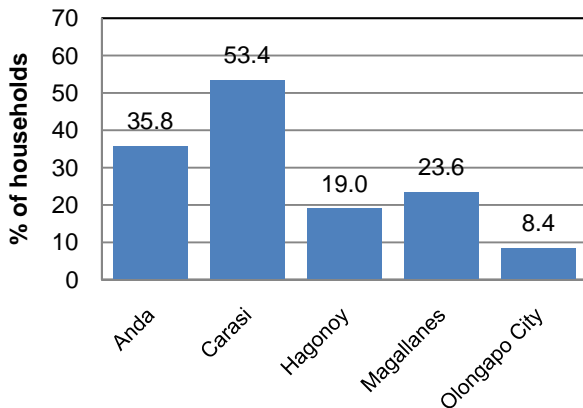
On human health

4. Increase in the occurrence diseases such as dengue fever, malaria, diarrhea, cholera, typhoid fever or heat stroke

In terms of sickness of any member of the household, the highest proportion of households that reported such occurrence was found in Carasi (53.4%). Meanwhile, Olongapo City reported the lowest proportion at 8.4 percent. Over-all, about 14.9 percent of households surveyed in all areas reported a member got sick aside from common cough, colds, and fever during the past 12 months prior to survey date. Moreover, results show that higher proportions of households who reported a member got sick in the past 12 months can be observed in lower income groups.

Figure 15. Proportion of households reporting a member got sick in past 12 months, by area

Figure 16. Proportion of households reporting a member got sick in past 12 months, by income group



Diseases whose prevalence is highly associated with changes in the climate can be monitored using CBMS. For instance, for all households surveyed in Anda, Carasi, Hagonoy, Magallanes, and Olongapo City 25.0 percent, 14.1 percent, 15.7 percent, 14.0 percent, and 15.3 percent reported that a member got sick of dengue fever, malaria, diarrhea, cholera, typhoid fever, or heat stroke respectively. In particular, prevalence of dengue fever among households for example was estimated to be 3.4 percent. Lower prevalence rates were reported for heat stroke, typhoid fever, malaria and cholera.

Figure 17. Proportion of households with at least one member of the household who got sick which experienced dengue fever, malaria, diarrhea, cholera, typhoid fever or heat stroke

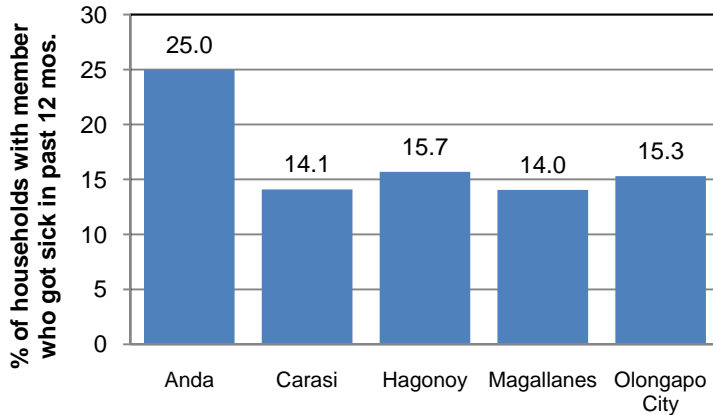
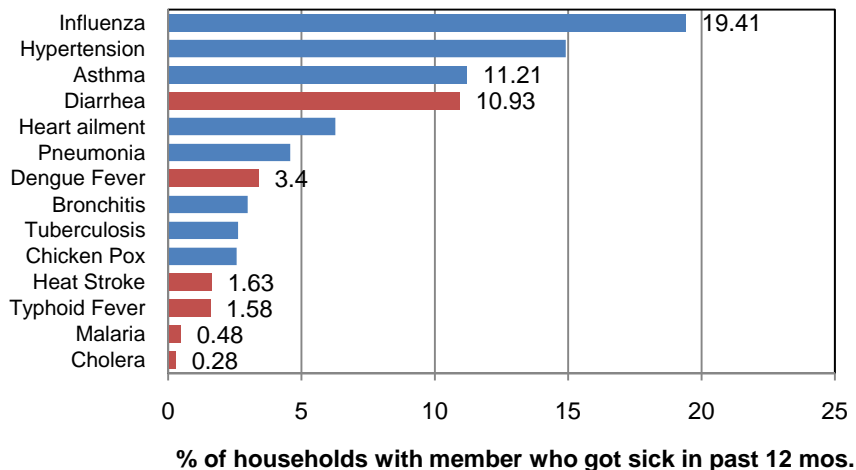


Figure 18. Prevalence of illnesses among households



On housing

5. Displacement of households

Among the five areas covered, only Anda reported a significant proportion of households that were temporarily evacuated during the past three years which is about 29.4 percent. Furthermore, around 23.2 percent of households in Anda reported moving out/leaving their previous dwelling unit because of a calamity. When it comes to place of temporary evacuation, households surveyed in five areas went to a relative's house (50.9%), neighbor or friend's house (25.1%), or school (14.3%).

Figure 19. Proportion of households which moved out or leave previous dwelling unit because of any calamity, by municipality

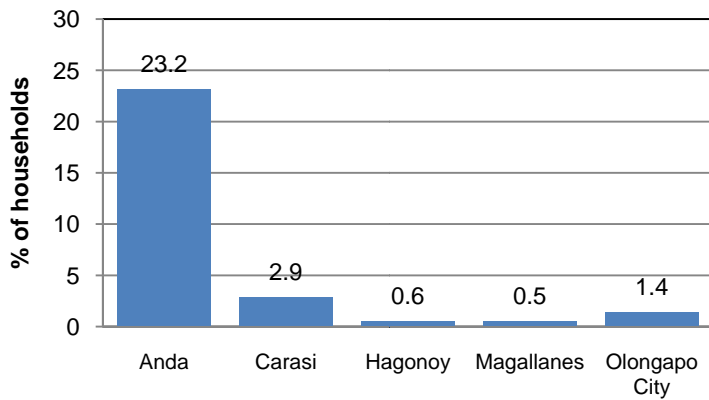


Figure 20. Proportion of households which temporarily evacuated from their dwelling unit because of any calamity, by municipality

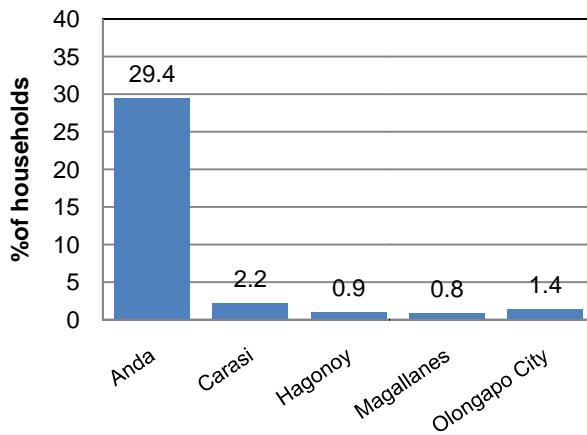
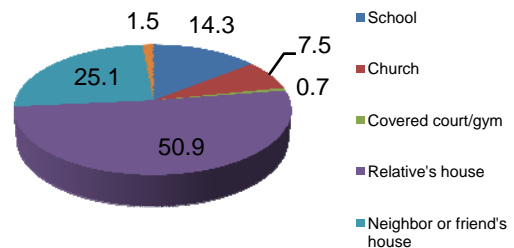


Figure 21. Place of evacuation

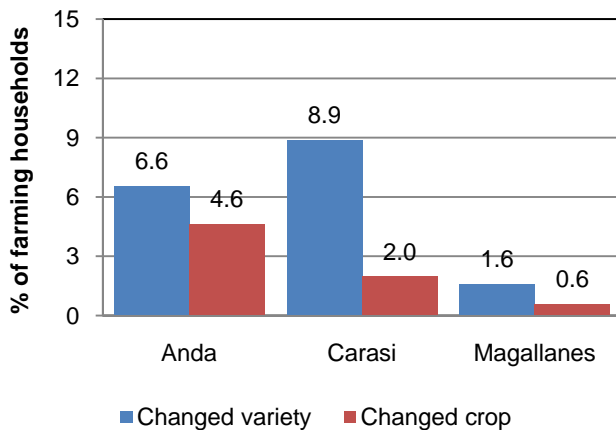


C. Reducing the risk and adapting to the potential impact of climate change

1. Changes in agriculture production practices

Carasi posted the highest proportion of farming households who changed the variety of the crop they are producing which is more resistant to pests and diseases or does not require much water (8.9%), Magallanes posted the lowest proportion at only 1.6 percent. Lower proportions of households engaged in agriculture in three sites reported changing the type of the crop they are farming.

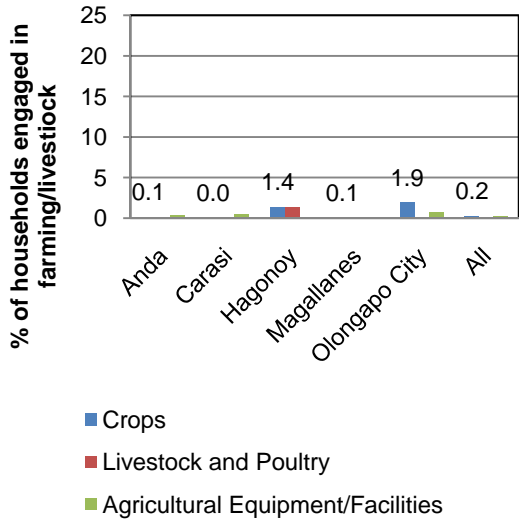
Figure 22. Proportion of households engaged in crops production which shifted to a variety of crop/other (major) crop which is more resistant to pests and diseases or does not require much water, by municipality



2. Increase in the availment of insurance

Generally speaking, almost all of households in the five areas have uninsured houses and appliances. Insurance coverage rates were estimated to be less than 1 percent. However, about 3.4 percent have insurance for their motor vehicles with Carasi posting the highest rate at 19.1 percent and Olongapo City posting the lowest rate at 1 percent. Insurance coverage for crops, livestock and poultry, and agricultural equipment is virtually absent. As expected, households who reported having insurance for any type of asset belong to richer income groups.

Figure 23. Proportion of households engaged in crop farming/livestock which availed of insurance for their crops, livestock and poultry or agricultural equipments, by municipality (values indicated for crops)



vehicle or appliances, by municipality (values indicated for motorized vehicle)

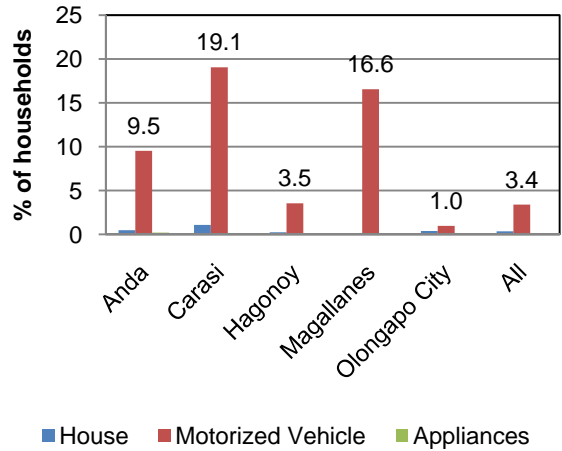
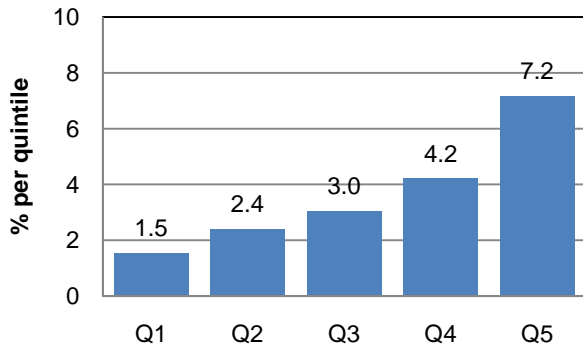


Figure 24. Proportion of households which availed of insurance for their house, motorized

Figure 25. Proportion of households that have at least one insurance (either for any type of asset or agricultural produce), by income group



3. Increase in the proportion of households with disaster preparedness kit

Only about 1 out of 10 households in all areas has a disaster preparedness kit. The highest proportion of households with disaster preparedness kit is reported in Anda (38.9%) while the lowest proportion is posted by Magallanes (1.3%). Richer households, those that belong to fourth and fifth quintiles, reported higher proportion of households with disaster preparedness kit compared with poorer households. The most common items that households reported to be included in their kits are water, matches, food, blanket, and clothes. The least common however are important documents, radio, medical kit, and whistle.

Figure 26. Proportion of households with disaster preparedness kit, by municipality

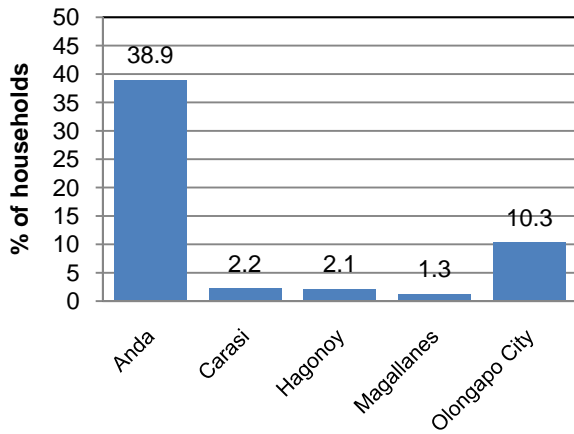


Figure 27. Proportion of households with disaster preparedness kit, by income group

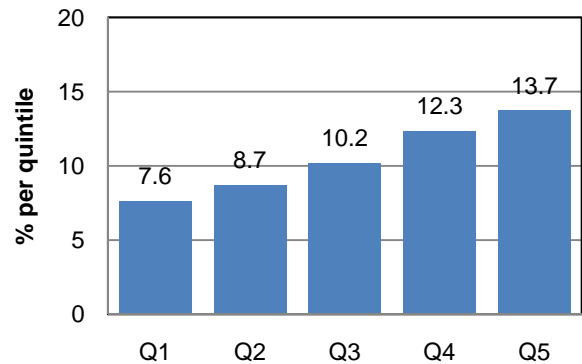
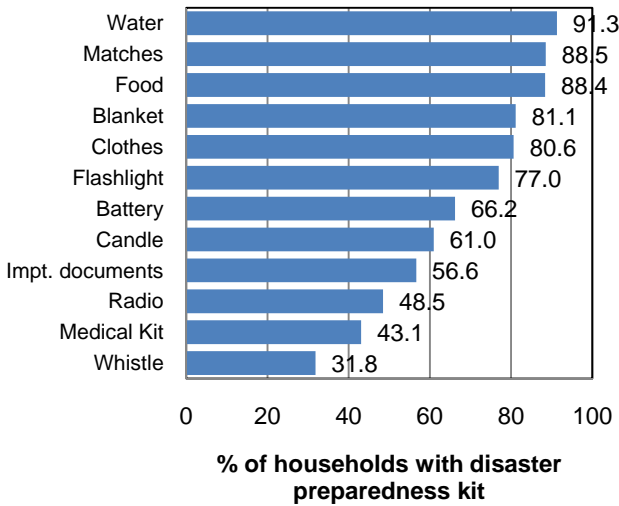


Figure 28. Items included in the disaster preparedness kit



D. Government Response

1. Providing assistance to households affected by natural calamities

Focusing on government's response to impact of natural calamities on households, data reveal difference between municipalities in terms of proportion of affected households which received government assistance. Carasi, for instance, had 79 percent of its affected households assisted by government. However, only 1 percent of affected households in Magallanes were able to receive assistance from government. The municipalities of Hagonoy and Anda reported significant proportion of affected households that were able to receive assistance. Data also reveal that in almost all municipalities, affected households which belong to lower income groups reported higher proportion of households who received assistance from the government.

Figure 29. Proportion of households affected by any type of calamity which received assistance from government, by municipality

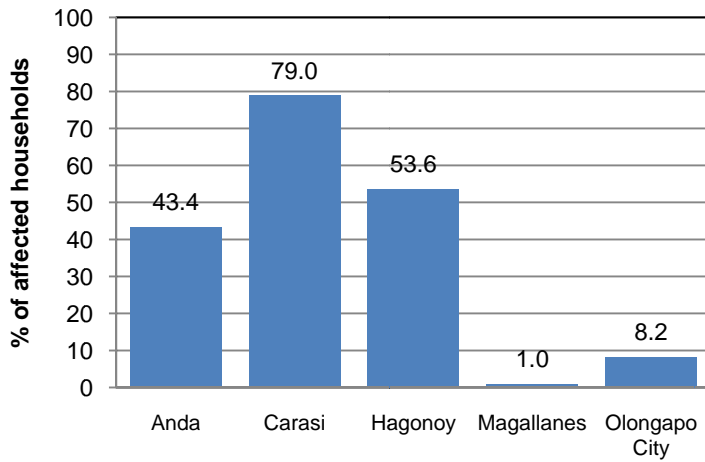


Figure 30. Proportion of affected households who received government assistance per income group, by municipality (line graph representation for visual convenience only)

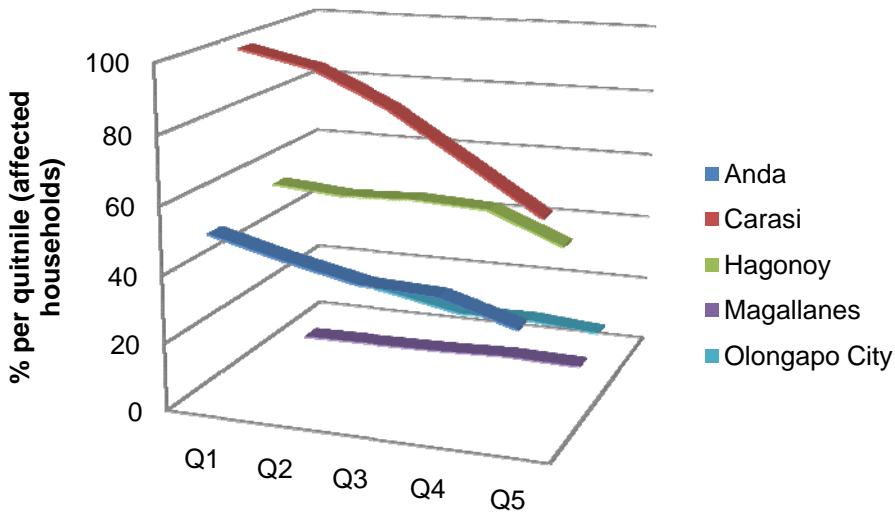
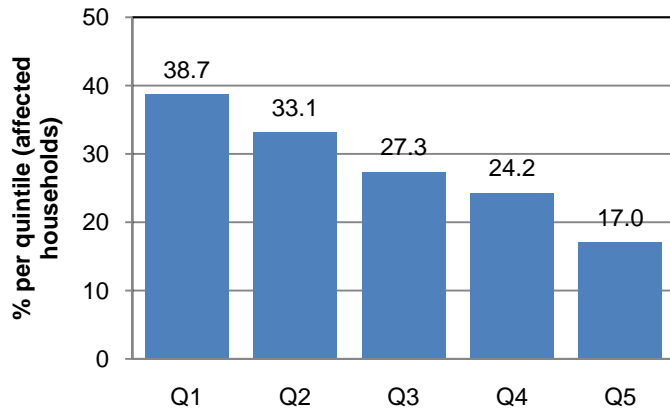


Figure 31. Proportion of affected households who received government assistance, by income group



Concluding remarks

This paper presented findings from climate change-related data from five municipalities in the Philippines. Several proposed indicators are likewise shown in this paper. Based on the results of the climate-change related indicators, there are findings and observations that merit highlighting. Below is summary of these findings.

- Manifestations of climate change are not yet apparent however monitoring is essential. Panel data would be very useful.
- Differences were observed between municipalities in terms of perceptions regarding the manifestations of climate change. Vulnerability of areas to effects and impact of climate change dependent on its location and topography.
- Impact of climate change on agricultural production and livelihood can be captured and monitored using the survey instrument. Households had reported lower yields in crop production, livestock, and fish catch.
- Monitoring of trends in prevalence of water-borne and vector-borne diseases that are linked to climate change is likewise possible.
- Results indicate that practice of risk-mitigation and adaptive farming strategies among farm households in the study sites is not yet widespread.
- Availment rate of insurance for productive assets and other assets is very low. More likely non-poor households are the ones which are insured.
- Only 1 out 10 households surveyed have disaster preparedness kit and poor less likely to have one.
- Government assistance to affected households is noteworthy albeit not for all municipalities. Results indicative of targeted provision of assistance especially for Carasi, Ilocos Norte and Olongapo City, Zambales.