ESTIMATING THE HEALTH AND ECONOMIC VULNERABILITIES OF THE INDIGENOUS PEOPLE (IP) IN ZAMBOANGA DEL NORTE TO THE EFFECTS OF CLIMATE CHANGE

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Abstract

An analytical framework for estimating the health and economic vulnerabilities of the indigenous people of Zamboanga del Norte to the effects of climate change is proposed and validated in this paper. Vulnerability, as used in this research, refers to the extent of risk and exposure of the IPs to the physical manifestations of climate change considering their coping mechanisms. Applying such a framework to the Subanen and Kalibogan tribes in Zamboanga del Norte, results show that : (a.) the indigenous people of Zamboanga del Norte were very vulnerable in terms of their economic and livelihood sources consisting mainly of traditional farming and fishing, and (b.) the indigenous people were likewise found to be highly vulnerable in terms of their health in the event of aberrant weather conditions. The IP's low educational attainment coupled with unstable, albeit, subsistence level income make their ability to cope with the effects of climate change minimal and insufficient to surmount the adverse effects of extreme weather conditions. Results further show that the analytical framework for estimating vulnerabilities tend to underestimate the true vulnerability values because of the absence of more information that can be used to enhance these estimates.

Keywords: *vulnerability, climate change, indigenous people*

Introduction

Climate change are events associated with the increase in global temperature, changes in precipitation pattern, occurrence of extreme events and increase in sea level (PCARRD, 2009). Modern science has determined that this phenomenon is caused by carbon emissions brought about by contemporary human activities. Molles (2005) reported that humans have exploited tropical rainforest for many years through a mixture of hunting and gathering and shifting agriculture. The country's contribution to the global greenhouse gas emissions as a cause of climate change may be insignificant as compared with those of the more developed nations but because of the archipelagic topography of the Philippines, it is highly vulnerable to the damaging direct and indirect impact of

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climate change. The Asian Development Bank, for instance, estimated that the mean cost of climate change for the Philippines is about 6.7% of combined gross domestic product each year by 2100. In fact, some parts of the country are already feeling the adverse effects of climate change to the food, water and energy supply as well as to their health conditions.

Eakin (2008) defined vulnerability as a susceptibility of populations, resources and places to harm associated with the global environment changes or climate change. It is believed that the disadvantage groups of people are more vulnerable to the great risks of the climate change than the more advantaged one. In the Philippines, the Indigenous People usually belong to the former group who may be susceptible to the environment changes. They usually live in the rural environs and are mostly doing traditional agriculture. According to Macchi, et al (2000), people who live in marginal lands whose livelihoods are highly dependent on natural resources are among the most vulnerable to climate change. This is supported by the study of Gunter, Rahman and Rahman (2008) who stressed that the indigenous people's individual capability to adapt climate change is determined by many factors such as poverty, landlessness and illiteracy.

Vulnerability is an often used term in relation to the potential of groups of people to be adversely affected by climate change. However, to date, we find no uniformity in terms of how this phenomenon is actually measured. Eakin (2008), Macchi et al. (2000) and Gunter et al. (2008) are but a few examples of researchers who measured the vulnerability in different ways, usually, by inferring from the current situations of the people in relation to the degree to which they are exposed to the manifestation of climate change. The need to establish, scientifically, a common understanding of the term "vulnerability" is urgent since only when such is accomplished can strategies be formulated to reduce people's vulnerability to climate change. This study attempted to determine the vulnerability to the IPs in Zamboanga del Norte to climate change in terms of its health and economic impact to them using a scientifically derived index of vulnerability.

Research Method and Design

The descriptive method of research was used in this study. The study was conducted in Mutya, Dapitan, Katipunan, Sindangan, Siayan, Salug and Gutalac, Zamboanga delo Norte where there are a number of Subanen, and Muslim residents. There were 160 Subanen and 40 Muslim respondents of this study. In – depth narratives, structured interviews, and the researchers' observation document the health and livelihood practices of the respondents.

The quantitative framework for the computation of vulnerability is as follows:

$V = (R + E – C) / 2$; where R stands for risk, E stands for exposure, C stands for coping.

Risk is defined as the "expected loss" should an event occur. It is computed as the product of the probability that an event will occur and the value of the random variable in question:

R = Expected (loss) = P (event happens) x P (no individual is affected) + P (event does not happen) x P (effects are noted) = P $(1-p_E)$ + (1-p) (p_E)

Note the similarity of the risk formula with the "variance" of a binomial random variable. However, while the variance of a binomial random variable is maximized with a value of 0.25, the formula above is maximized when its value is 1 (i.e. 100% risky)

Exposure, on the other hand, is an estimate of how much (in terms of percentage) in the population is actually going to be affected by the event. In the formulation above, this is simple p_E.

Coping refers to the percentage of the population able to resist the effect of an event due to their peculiar characteristics. If the desirable characteristics (those which enable the population to resist the effects of an event e.g. education, financial stability etc.) have percentages p_1, p_2,…,pn, then:

$C = p_1 p_2 .. p_n$.

Result

Profile of the Respondents. Table 1 shows the profile of the respondent that would situate them in relation to their ability to adopt to climate change on extreme weather condition.

For all practical purposes, the respondents are mainly belonging to the Subanen tribe since they constitute 80% of the bulk of respondent. The socio – demographic characteristics of these respondents that imagine on their ability to **cope** with the effects of climate change include: (a) their level of education which, as data would show, is mainly elementary level or none at all (63%), (b) their livelihood or source of income which is vary traditional farming (82%), (c) their income averaging P 3,000 per month which could be as low as P500 to as high as P12,000 per month, and (d) their **age** with a mean of 41 (relatively young) and a standard deviation of 9.5 years.

Table 1. Profile of the Respondent

A. Tribe	Number	Percentage
• Subanen	160	80%
• Kalibogan	40	20%
Total	200	100%

B. Gender	Number	Percentage
• Male	108	54%
• Female	92	46%
Total	200	100%

C. Education	Number	Percentage
• Elementary	118	59%
• High School	56	28%
• College Graduate	18	9%
• No Schooling	8	4%
Total	200	100%

D. Religion	Number	Percentage
• Roman Catholic	132	66%
• Islamic	40	20%
• Paatan (Indigenous)	18	9%
• Protestant	10	5%
Total	200	100%

E. Livelihood / Income Source	Number	Percentage
• Farming	164	82%
• Fisherman	12	6%
• OFW Remittance	20	10%
• Other (Driver/ Brgy. Official)	4	2%
Total	200	100%

F. Others		
• Age	• Mean: 41	• SD: 9.5 years
• Income	• Median: P 3,100	• SD: P 1,900

Healthy Vulnerability Estimation. Table 2 shows the leading causes of morbidity for these IP's. While the leading cause of morbidity in all the areas is headache/ fever, this cause is non – informative since headache / fever are asymptomatic of other more serious diseases e.g. dengue fever, typhoid fever. The available data, however, did not indicate the diseases associated with the fever / headache symptoms. We assume (although a debatable point) that all these cases referred to in the health centers with fever/ headache suffer from one of the diseases with flu-like symptoms.

Table 2. Leading causes of morbidity

Diseases	Places (Estimated Average Number of Cases per month) - 2009						
	Sigayan	Buenasuerte	Miatan	Mande	Munoz	Cocob	Mucas
Head ache/fever	20	25	20	15	25	20	15
hypertension	2	2	3	4	2	2	4
Diarrhea	10	12	10	10	15	14	10
Upper Respiratory Tract Infection (URTI) /TB/ARI/Bronchitis	5	6	6	4	7	6	15
Abdominal Pain/Peptic Ulcer	7	8	7	6	6	6	9

Source: Health Centers (Estimated average value)

Risk. Auxiliary data from the PAG – ASA (2010) revealed that, in the last five years, massive flooding (unusual amount of rainfall) and periods of drought (high temperature coupled with low rainfall) occurred in the Subanen areas at least twice (2) so that estimates of the probability of climate change can be computed as figures over the last five years.

$$\mathrm{P} = \text{probability of drought / flood} = \frac{2}{5} = 40\%$$

$$1 - \mathrm{P} = \text{probability of drought/flood} = \frac{3}{5} = 60\%$$

The National Census and Statistics Office (NCSO-9., 2010) also provided information in the population of Subanen as 2,100 as of 2009. Thus:

$$\mathrm{P_h} = \text{proportion of population reported to have health problems} = \frac{338}{2100} = 16.10\%$$

$$1 - \mathrm{P_h} = \text{proportion without health problems} = \frac{338}{2100} = 16.10\%$$

It follows that an estimate of health risk due to the effects of climate for this sector is:

$$\text{Risk} = p(1 - p_h) + (1 - p)p_H$$

$$= (.40)(.8390) + (.60)(.1610)$$

$$= .4322 \; or \; 43.22\%$$

Exposure. The computation for the estimate of exposure rate is simply:
Exposure = P_h = .1610 or 16.10%

Coping. In order to estimate the coping mechanisms (in percentage) of the Subanen, we examine the socio – demographic pursued characteristic that impact directly on their health and health case such as: (a) education, (b) age, and (c) financial stability.

P_1 = **Education**: $Proportion\ of\ Subanens\ with\ at\ least\ secondary\ education = .28 + .09 = .37\ or\ 37\%$

P_2 = **Age**: $Proportion\ of\ Subanens\ who\ are\ young\ 20 - 45\ yrs\ range = .6814 = 68\%$

P_3 = **Financial Stability**: $Proportion\ of\ Subanens\ with\ minimum\ Wage\ Income\ (at\ least\ P\ 6{,}000/month) = .05 = 5\%$

$$Coping = P_1 \cdot P_2 \cdot P_3 = 1.30\%$$

Hence, Health Vulnerability Index = 43.22% + 16.10% - 1.30% = 29%

The health vulnerability index (HVI) shows that more than one fourth (29%) IP's (Subanens) will be vulnerable to the effect of climate change (droughts, severe heat, floods, excessive rainfall) in terms of their health.

Discussions

The health risks (expected health loss) are amplified by the recent higher incidence (40%) of their flooding or drought which are just two of the possibly several climatological abenetions brought about by climate change in the province. Under normal conditions, a morbidity prevalence rate (MPR) is estimated at only 16.10% but this figure dramatically increase to 51.02% (or 51%) with the recent spate of either heavy rainfall or lack of it.

Although we have not imputed into the health risk computations made, the health risk figure used even go higher when the sanitation practices, health care practice and other rituals of the tribe are factored in. To provide an insight into just how much the health risk figures can inflate with these further considerations, we conducted a interviews and en situ visits to the places mentioned in this paper.

Health Care practices

When they were asked about their practices whenever the members of their family get sick, the Subanen usually prescribed with their own based on their intuition. They used herbal medicines for this purpose. If ever the sickness is not healed, they consulted the "Balyan" the quack doctor. Simultaneously, they asked for medicines from the Botika sa Barangay. If ever the sickness becomes complicated, this is the time where they consult a doctor. Since the Kalibogan are mostly residing in lowland areas, they are very

accessible to the health centers. They used to consult the health center if the diseases are common only. If ever complicated, they went directly to the hospital.

Sanitation Practices

Garbage Disposal. More the one half or fifty two percent of the respondents threw garbage at the back of their houses, twenty four percent burned the garbage, sixteen used compost pit and eight percent thrown to the river or to the sea.

Food preparation and preservation. Since almost all of the respondents have no refrigerators, they only used salt, sunlight and concentrated vinegar in the preservation of foods. They usually prepared salted fish (tinabal) and dried fish (bulad). Most of the time, they cooked the fish with concentrated vinegar (paksiw) and the meat (adobo). This is the traditional way of food preservation practiced during the absence of electricity.

Garbage disposed at the back of the house

Accessibility to Health Facilities and Health Personnel

Comport rooms. Among the 160 Subanen respondents, sixty one of them used a simple closed pit comport room; twenty six percent had water sealed and thirteen percent had none. It was noted that the simple closed pit comport rooms are unsanitary since they are not well – constructed. Some were provided with toilet bowls by the Department of Health as part of its sanitary program. In other municipalities, the residents were asked to pay P50 for the bowl to defray expense. But only very few had availed of it. They said they cannot afford to pay the bowl even at P50.00.

To motivate the Subanen to construct a comport room and to maintain the cleanliness of their surrounding, the Department of Health through its Midwives with the cooperation of the local government, gave rewards to the households that maintained cleanliness. When there were unannounced inspections, the health workers were surprised because of very clean comport rooms. It turned out that these were for inspection only. Most of them still defecate in the open field usually at the back of their houses. According to a midwife of Sigayan, Dapitan "Almost all the time, she reprimanded these people especially the children to use the comport rooms but they can hardly understand". Most of the respondents said, they can hardly use the comfort rooms because they are far from the source of water. Majority of the thirteen percent who have no comfort rooms were residing at the hilly areas and far from the poblacion barangays.

The presence of the health workers in every barangay has contributed a lot tot he awareness of the IP's in terms of sanitation. Compared to their situations a couple of decades ago, almost all of the IP's knew already the importance of sanitation. Although some of them have poor houses but they are not as untidy as long years ago. This could be due to a serious intervention of the Department of health.

However, their access to water facilities plays a very important role in their personal and community hygiene. Since, some of them are far from the source of water; the sanitation at home is greatly affected. In fact, during the immersion, most of the family members especially children had not taken a bath. They were affected with the long drought where the spring as the source of water was dried. The river became a substitute for drinking water. This situation made them more susceptible to diseases as an indirect impact of the mentioned phenomenon.

The kalibugan respondents on the other hand had different sanitation practices. More than 30% of them defecated along the river or the sea. Their culture of spitting anywhere made them susceptible to respiratory tract diseases which would eventually weaken their immune system. With this, any change in the climate could directly affect them so t hat, at least, this could not be identified as a potential source of health problems for the tribe.

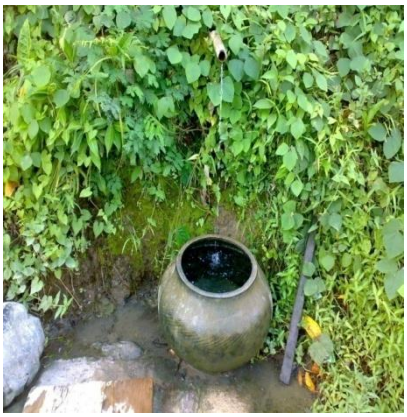
Water supply

Out of seven barangays under study, four of them have already access to water facilities. The barangays have already faucets but are not yet connected to the individual houses. But still many of the respondents are not accessible to this facility because they are residing in the remote part of the barangay. This year's EL Nino phenomenon had devastating impacts to the IPs.

Poor access to water results to poor sanitation and hygiene. The distance to potable water among the respondents results in tremendous human and economic costs. Inadequate water supply could discourage everyone to practice proper personal hygiene which would then result to their susceptibility to diseases. Although, the diseases present in the barangay are normal and have not yet been an outbreak but still the people are considered vulnerable to climate condition. The productive activities of poor rural people,

such as schooling and farming, are affected by the time and energy spent fetching water. In fact, in 2002, 21% of the people living in developing countries did not have sustained access to an improved water source and 51% did not have access to improved sanitation (Frankson, 2009). That is why, the World Health Organization in its Vision 2030 study concluded that climate change is widely perceived as a threat than opportunity. Thus, "systematic assessments of the climate change resilience of all utilities and of rural water and sanitation programmes are needed" (WHO 2009).

Water system as project of the Local Government Unit



Different sources of water in a barangay

Educations and financial stability are two main factors that greatly improve the IP's chance of coping with sudden and unexpected weather observations. However, both factors appear to be very low for the Subanens whose model education is elementary or even, without education at all and whose mean income per month is way below the poverty threshold. Here, government intervention is extremely necessary viz. provide free

access to adult literacy education programs for the IP's with particular attention to health and science, and livelihood education programs.

Economic Vulnerability Estimates for the IP's

Economic Risk Estimates. The weather / climate parameters are the same as before with p = 0.40 and (1 - p) = 0.60. Since the main source of livelihood is agriculture and fishing, we estimate to preparation of individuals engaged in these two activities:

$P_E = proportion\ of\ Subanen\ engaged\ in\ Agriculture\ and\ Fisheris = 0.82 + 0.06 = 88\%$

$1 - P_E = 12\%$

Hence, Economic Risk = $P(1 - P_E) + (1 - P)(P_E) = (0.40)(.12) + (.60)(.88)$ 57.60%

Economic Exposure. The exposure estimate is simply $P_E = 0.88$ or 88%.

Coping. The index of economic ability to cope will be the product of the following factors:(a) percentage of individual with income higher than P 6,000 or the poverty threshold (P_h) and (b) the percentage of individual with secondary or higher education (P_1) and therefore, potentially economically productive:

P_1 = Percentage of Subanen Families with income greater than equal to P 6,00
= 0.05 or 5%

P_1 = Percentage of Subanen with secondary or higher education
= .28 + .09 = .37 or 37%

Hence, Economic Vulnerability = 57.60% + .88% - 37% = 75.6%

As expected, the IP's have a very high economic vulnerability index of 75.6%, that is, more than three quantities of the IP's are in danger of losing their means of livelihood (and hence, income) should severe weather disturbance prevent.

Discussions

The high economic vulnerability index found for this particular group of IP's can be attributed mainly to the fact that almost all the families depend on traditional farming and fishing for their livelihood source. Traditional farming, as a rule, is highly dependent on the climatological conditions in the province. Too little rain (during drought) has the potential to greatly reduce farm yields; too much rain, on the other, can wreck havoc on the crops planted by the farmers.

Corollarily, there is a need to buttress the coping mechanisms for this group in the event of aberrant weather disturbances e.g. find alternative attainment of must at to IP's hinder the search for such alternatives.

Agriculture was the major occupational choice of Subanen almost one hundred percent of the respondents depending on it for their livelihood. The major agricultural crops grown were corn and root crops. In other areas where the Hi – Green program of the Department of Agriculture is active, the respondents produced vegetables such as eggplants, cabbage, and ampalaya. (The Hi – Green is a joint program of the Provincial Government and the Department of Agriculture which encourages farmers to plant vegetables using organic fertilizer).

The kaingin system of farming in the Municipality of Siayan

Regarding the sufficiency of production, seventy percent of the respondents were suffering food deficiency for a couple of months due to a long drought or EL Nino. Besides, their geographical location is a factor of a minimum production. In the municipality of Siayan, the terrain is hilly and the soil is not fertile. Only few areas can be planted with corn in which the farmers are compelled to apply commercial fertilizer to increase production. Some of them complained that they cannot leave their land unfertilized with inorganic fertilizer or else the production will sacrifice. The application of fertilizer is not also a guarantee of high production due to poor soil condition.

The Subanen's traditional farming practices (the slash and burn farming) aggravated the situation of decreasing production and income. They believe that continuous adopting the "kaingin" system of farming may harm the environment. But they cannot avoid it because they are very much dependent in this type of livelihood. In fact, during the immersion, the researchers documented few cases of kaingin.

When the respondents were asked about the effects of the climate change to their livelihood, the following are their answers:

If there is a long drought, everybody is affected because their livelihood is a climate sensitive one. The respondents said that their harvest cannot suffice to support them. In effect, root crops become their staple food. However, few of them still have experienced shortage even in root crops. This situation prompted them to eat a wild and poisonous root crop called "Kubong". Another solution for the food storage is to work as a farm labourer in other farms. The P100 a day is already a big help to the family."

Kubong – an alternative food during famine

The long rainy season (La Nina) on the other hand affect the livelihood of the IPs particularly Subanen farmers. Since agricultural products are perishable, continuous rain can rotten the produce which eventually decreases their quality. Their sidline as farm labourer of other farms is also affected. The farming activity is usually stopped when it is raining. As a means of survival, the root crops serve as alternate to cereals as staple food.

This phenomenon has also an indirect impact tot he fishermen whose long hours in fishing under the rain could weaken the immune system in their bodies and would eventually susceptible to lung – related diseases.

Majority of the Kalibogan respondents on the other hand are not so vulnerable to climate change in terms of livelihood because most of them are not dependent on natural resources as a source of living. They have allotments from their family members working abroad as a source of income. Although, few of them claimed to be farmers but not all the time they till the land they own. They have tenants to do the dirty jobs. Only the fishermen were more vulnerable to climate change because of their exposure to the sea night and day.

Both the El Nino and La Nina as climate cjange induced hazards could have devastating impacts to the Subanen lives and livelihood. The El Nino phenomenon affected so much to the famers because they cannot plant some cash crops like corn and vegetables because upland farming is too much dependent on the rainfall in which any change in air temperature can result to a change in climate conditions resulting in the shift in Agriculture pattern (Lama and Devkok, 2009). This pointed out that the Subanen group of IPs are more vulnerable to climate change than the Kalibogan. Heltberg, Siegel and Jorgensen (2008) stressed that the most vulnerable households are those with assets and livelihood exposed and sensitive to climate risk and who have weak management capacity. The poorer household are the most at risk. Besides Rai (2008) found out that the Indigenous People are often disproportionally adversely affected because they are amongst the poorest people globally and are heavily depended on and resources for basic needs and livelihood. This confirmed the study of National Adaptation Program for Action (NAPA) of Sudan who identified the Agriculture, water resources and health as the sectors most vulnerable to climate change (ZAkieldeen, 2009).on the other hand, the La Nina is associated with continuous rain. In general, floods damage standing

agricultural crops and may also carry away the top soil making the land barren. Floods damage all immovable properties that get submerged in flood waters. Any other properties which cannot removed to safer places during floods are also damaged.

References:

Gunter, B. G., A. Rahman and A. F. Rahman (2008). How Vulnerable are Bangladesh's Indigenous People to Climate Change? Bangladesh Development Research Working Paper Series. Http://www.bangladeshstudies.org

Lama, S. And B. Devkota (2009). Vulnerability of Mountain Communities to Climate Change and their Adaptation Strategies. Journal of Agriculture and Environment. Volume 10.

Linachan, E. N. (2009). Indigenous peoples of Ifugao: responding to climate change. Earth and Environmental Science. IOP Publishing Ltd. Manila.

Macchi, et al, (2008).Indigenous and Traditional Peoples and Climate Change. IUCN.

Molles, M.C. Jr. 2005. Ecology: Concepts and Applications, 3rd edition. Mc Graw Hill Companies, Inc.

PCCARD, 2009. Philippines S&T Agenda on Climate Change. www.PCCARD.GOV.PH

Rai, N. 2008. Indigenous People and Climate Change: High Vulnerability and Unique Challenges. Social Dimensions of Climate Exchange Workshop. World Bank, Washington D.C.

Rawlins, S. C., A. Chen, J.M. Rawlins, D. Chades and G. Legal. 2007. A Knowledge, Attitude and Practices Study of the Issued of climate change/variability impacts and public health in Trinidad, Tobago. St. Kitts and Nevis. West Indian Medical Journal. Vol. 56, No.2 West Indian Medical Journal. ISSN 0043 – 3144;

Zakieldeen. S.A. (2009). Adaptation to Climate Change: A Vulnerability Assessment for Sudan. Gatekeeper. Iied

_____ (2009). Summary and Policy Implications Vision 2030. The Resilience of Water Supply and Sanitation in the face of Climate Change. Department of International Development, United Kingdom. World Health organization Press. ISBN 978 924 1598422.