

Correlates Of Vulnerability: A Quantified Study of People's Vulnerability on the Impact of Super Typhoon Yolanda in Guiuan, Eastern Samar, Philippines

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Abstract : *The Philippines experiences an average of 19 typhoons each year being a tropical country situated within the "Ring of Fire". Guiuan, a coastal municipality and centrally located in the eastern part of the country is not spared from these typhoons. In fact, super typhoon Yolanda made its first landfall in Guiuan, at 350 kph wind, resulting in the death of 101 people with 100 more bodies remaining unaccounted because of the storm surge.*

This study investigated the social vulnerability level of the people in the municipality based on their conditions prior to super typhoon Yolanda. The identified vulnerability factors grouped into socio-economic status, health and social services, and typhoon preparedness were further correlated against the impact of the typhoon. Vulnerability indicators under socio-economic status were source of income, composition of household, house structure, and nearness to a hazard area; while under health and social services were capacity to get medical attention, access to public school facilities, and social support to safety; and under typhoon preparedness were family support to safety, disaster preparedness training and perception of risk, and food and water supply. On the other hand, the impact variable was measured in terms of number of lives lost, number of injured household members, cost on source of income, cost on house, and cost on properties.

As a descriptive research, a survey questionnaire was administered to 386 respondents who were randomly selected on the bases of being the head of the family, a resident of Guiuan, and living in the place during the time of super typhoon Yolanda. The survey data were quantified according to established vulnerability indicator criteria.

The study revealed that the respondents had a social vulnerability index of 0.502 which put the respondents in a slightly unsafe condition during the time of super typhoon Yolanda. Using "Pearson's r", the vulnerability factors such as

source of income, capability of house structure, capacity to get medical attention, access to public school facility, social support to safety and family support to safety were found to have significant correlation against the impact of the typhoon. Most importantly, results showed that vulnerability in terms of family support to safety is positively and significantly correlated to the number of lives lost, number of injured family members, and cost on source of income.

The results indicated that super typhoon Yolanda compounded the already vulnerable condition of the people in Guiuan. It also affirmed that, indeed, disaster preparedness in terms of family support to safety which includes pre-evacuation, house resiliency and relocating away from any source of hazard reduces the impact of typhoons. The study concluded that being complacent, unresponsive and unheeding to the call for disaster preparedness can led to unacceptable events. It is further concluded that higher socio-economic status, presence of health and social services, and family disaster preparedness are essential to the survival of an individual at the time of a disaster.

Keywords: *Climate change, vulnerability, impact, super typhoon Yolanda, Guiuan, Eastern Samar*

Introduction

Climate change has become more than obvious in the past decade. According to an article written by Clifford (2010), "the last decade (2000-2009) has been the warmest decade on record. The rise in temperature has also ensured that the equations on the planet have gone for a toss". The frequency of very intense hurricanes and typhoons (category 4 and 5) in the Atlantic Basin has doubled since the 1970s as a result of rising sea surface temperatures (Stern, 2007, p. 19).

Additionally, the Norwegian Ministry of Foreign Affairs (O'Brien et al., 2008) cited records that disaster frequency appears to be increasing

from about 100 events per decade in 1900-1940, to 650 per decade in the 1960s, to 2,000 per decade in the 1980s. By the 1990s, this number had reached almost 2,800 events per decade.

On the other hand, Kostro et al. (2013) pointed out that many of the most destructive disasters within the past few decades have occurred in Pacific Rim countries, the region dubbed as the "Ring of Fire" for its prevalence of earthquakes and volcanic eruptions. They further stated that it is home to over 75% of Earth's active and dormant volcanoes, and around 81% of the largest earthquakes with predicted increase in significant storms in the coming years. Moreover, they revealed that the Philippines as a tropical country made up of 7,107 volcanic islands is vulnerable to a variety of natural disasters such as earthquakes, floods, tsunamis and landslides; and frequently hit at an average of 19 typhoons each year.

Climate change is gradually taking its toll on the lives and properties of the people. In an online review of The World Natural Disasters Ever, Live Science Staff (2008) published that in the United States on August 2005, hurricane Katrina left 1,833 people dead and a total damage to property estimated at \$ 81 billion (2005 USD). According to them, it was the deadliest and costliest Atlantic tropical cyclone in U.S. history. Three years later, in China on May 12, 2008, the death toll from Cyclone Nargis was estimated at 220,000 people, and damage to property of \$ 200 billion. Then, there was an 8.9 magnitude earthquake that struck the north-east coast of Japan on March 2011 which triggered a massive tsunami leaving 350 people dead and about 500 missing. The quake was the fifth-largest in the world since 1900 and nearly 8,000 times stronger than the one which devastated Christchurch, New Zealand in February 2011.

Reyes (2009) revealed that in the Philippines on September 26, 2009, typhoon Ondoy (Ketsana) brought in a month's volume of rain in just 9 hours, which caused flooding in Metro Manila and other parts of Central Luzon, leaving 243 people dead. Two years later, on December 15, 2011, a deadly typhoon Sendong hit the northern part of Mindanao and killed 1,439 people. Again, in nearly two years, on November 8, 2013, typhoon Haiyan, locally known as super typhoon Yolanda, draw out first time storm surge up to 20 meters high of water over Samar and Leyte, which left with a death toll that remains uncertain but has been put at 8,000 people, and wrecked about 1.2 million homes and damaged more than Php 200 billion worth of properties. Super typhoon Yolanda hit the Philippines at a time when more than 344,300 people in Bohol province were suffering and struggling to live in makeshift

shelters after being struck by a 7.2 magnitude earthquake on October 15, 2013.

Some experts hold that since disasters are unpredictable and strike anywhere and anytime less expected, having clear, actionable plans in place before a typhoon strikes can help minimize damage to people and property and enable them to recover quickly (Sutton and Tierney, 2006).

On the other hand, the Advanced Centre for Enabling Disaster Risk Reduction (n.d.) provides that only by answering the question on what are the actual critical and systemic issues that are keeping people vulnerable will agencies be able to improve the way they implement disaster risk reduction programs. Likewise, Action Against Hunger or ACF (2010) holds that a vulnerability and risk study provides an evidence base for Disaster Risk Management (DRM). Additionally, Wright and Husemann (2006) stressed that understanding vulnerability in the context of disaster preparedness are fundamental to attempts at appropriate capacity building and long term recovery.

Lying at the eastern side of the Philippines, and situated at the southernmost tip of the province of Eastern Samar; Guiuan, with a total population of 48,431, is a coastal municipality almost surrounded by water. At the east is the Pacific Ocean, and at the west is the Samar Sea. Its area is mostly flat terrain with highest elevation reaching 63 meters, and inherently weak geology. It lies along the typhoon path originating from the Pacific Ocean. In fact, super typhoon (ST) Yolanda resulted in the death of 101 people with 100 more bodies remaining unaccounted because of the storm surge (Municipal Planning Office, 2014).

This study is conducted to help facilitate decision making in planning out programs and projects with respect to typhoon preparedness, response, recovery and mitigation of the municipality. It aims to determine the social vulnerability level of the people in Guiuan, Eastern Samar in terms of quantifying the socio-economic status, health and social services, and preparedness. It further correlates the vulnerability factors to the impact of ST Yolanda. Hejimens (2001) states, "the vulnerable condition in which people live, can turn not only extreme events, but even normal events into disaster situations".

Statement of the Problem

This study tried to correlate vulnerability to the impact of the typhoon in Guiuan, Eastern Samar. Specifically, it sought to:

1. Describe the socio-economic status of the respondents in terms of gender, age, civil status, educational attainment, average monthly

income, source of income, number of persons in the household, number of children in the family, number of members below 6 years of age, number of members aged 60 years old and above, number of sick / differently-abled members, house structure, source of hazard, nearness of house to a hazard area, and family savings during the time of super typhoon Yolanda.

2. Describe the health and social services available to the respondents at the time of typhoon Yolanda.

3. Describe the preparations made by the respondents to mitigate the destructive effects of typhoon Yolanda.

4. Determine the impact of super typhoon Yolanda on the respondents in terms of the number of lives lost, number of injured family members, cost on source of income, cost on house, and cost on properties.

5. Determine the environmental activities perceived by the respondents that contributed to increase the risk of typhoon Yolanda.

6. Determine the vulnerability level of the typhoon victims based on the potential effect on the source of income, composition of household, capability of house structure, nearness to a hazard area, capacity to get medical attention, access to public school facilities, social support to safety, family support to safety, disaster preparedness and perception of risk, and food and water supply.

7. Relate the selected vulnerability factors against the impact of super typhoon Yolanda.

Hypothesis of the Study

There is a significant relationship between the vulnerability factors to the impact of super typhoon Yolanda.

Theoretical Framework of the Study

This study is anchored on the Decision Framework of Velasquez (2003) on his paper, "Quantifying the Social Aspects of Disaster Vulnerability". Velasquez describes social vulnerability by transforming survey data to

numbers. He contended that people have different levels of awareness of hazards and they have different degrees of vulnerabilities, and because of the different scales upon which criteria are measured, it is necessary that factors that establish vulnerability be standardized or normalized.

As a tool for decision making, he claimed that individuals or communities be assigned to a certain decision set. A scale of issues may be made based on a review of damage reports, interviews, surveys, and observations from which the elements considered may be categorized and scored. These issues are then correlated to a range of consequences (e.g. damage to property, injury to person, the potential disruption to a person's livelihood) that had resulted or could result from being exposed to a particular hazard.

Individual responses are evaluated using the criteria established in the study and scored. The factors (e.g. the degree of safety, the ability to cope with a particular disaster) considered should be comprehensive to assess the condition of a person, family or bigger group. The scale proposed has a zero (0) to five (5) scales which carries the meaning of having least or zero vulnerability to being totally vulnerable with respect to the issue. The scores are combined using aggregation and simple averages. A weighted linear combination of factors can be made by applying weights to each factor. The results give a social vulnerability index to a certain physical vulnerability. The usefulness of the index is in the weights established for each criterion that shows which aspect is contributing to the social vulnerability issue in the community studied.

To establish the relative weights of the factors in assessing an index of safety, the factor needs to be standardized using the equation $X = (R_i - R_{min}) / (R_{max} - R_{min})$ where R equals raw score. Criterion weights are then assigned using a simple pairing procedure utilizing a nine (9) step scale indicating the relative scale of importance. The rater selects a factor and places it as a standard issue giving it a value of one (1). The individual or group makes every possible pairing with the standard issue using the scale given.

1/9	1/7	1/5	1/3	1	3	5	7	9
Extremely	very strongly	strongly	moderately	equally	moderately	strongly	very strongly	extremely
Less important?				Standard	More important?			

A normalized scale of importance is obtained by dividing each score by the highest rated factor considered. This provides a normalized score of each factor relative to the most important factor

(having a score of 1). To establish a weight among the normalized scores, the sum is taken and the weights are obtained by dividing the normalized scores by their sum.

This theoretical framework forms the foundation of the research and the suggestions were taken as bases for data analysis.

Methodology

This descriptive research gathered data from a sample of 386 respondents who were randomly and proportionately selected from 10,808 households on the bases that they were heads of the family, a resident of Guiuan and living in the place when ST Yolanda occurred.

The survey instrument used in this study was patterned from the structured questionnaire utilized in the Vulnerability Analysis Survey of ACF International conducted in Bicol, Philippines in 2010 obtained online. Geography, cultural similarity, the catastrophe studied and the established validity of the instrument were the reasons why the researchers took the idea of adopting the questionnaire. The instrument however was modified to limit the issues as needed in this study. Unlike their study which was descriptive and qualitative in nature, this research utilizes the survey results to fit into a set of vulnerability criteria following the quantification procedure and criteria guide suggested by Velasquez (2003). The criteria guide was also modified to fit the need of this research.

Ten (10) vulnerability factors were identified namely; vulnerability in terms of the potential effect on the source of income, composition of household, capability of house structure, nearness to a hazard area, capacity to get medical attention, access to public school facilities, social support to safety, family support to safety, disaster preparedness and perception of risk, and food and water supply. Considerations in setting-up the criteria were source of income and average monthly family income for vulnerability in terms of source of income, age and health of members under composition of household, housing materials and condition of house for capability of house structure, distance and hazard on nearness to a hazard area, medical services and savings/health insurance under capacity to get medical attention, school condition and accessibility for access to public health facilities, information sources and warnings for social support to safety, conduct of evacuation and house resiliency under family support to safety, disaster training and personal insight of typhoon Yolanda on disaster preparedness training and perception of risk, and food and water availability under storage of food and water. The social vulnerability index was measured using a Likert scale of 0 to 1. The following descriptions were used:

Weighted Rating	Description
0.0	Extremely safe
0.01 - 0.25	Hardly ever unsafe
0.26 – 0.50	Slightly unsafe
0.51 – 0.75	Moderately unsafe
0.76 – 0.99	Highly unsafe
1.0	Extremely unsafe

The relationship between vulnerability factors against the impact of ST Yolanda was determined by Pearson's Product Moment Correlation, and the null hypothesis which states that there is no relationship between the vulnerability factors and impact of super typhoon Yolanda on the victims of Guiuan, Eastern Samar was tested at 5% level of significance.

Results and Discussions

Socio-economic Profile of the Respondents

As reflected in Table 1, majority of the households were headed by males (63%), aged above 40 years old (75.2%), married (82.9%), college graduate (26.2%), with an average monthly family income of less than or equal to Php 5,000.00 (52.1%), engaged in fishing (29.5%) or self-

employed (22%), with 5 to 6 persons in a household, mostly with 3 to 4 children, nearly half of which had a child below 6 years old, with about one-third of the households having 60 years old and older family members, and with 1 out of 10 households who had sick/differently-abled member, with most households having no savings (63%), living in weak structured houses (80.1%), built near the sea (84.7%), which were extremely hazardous to a few (26.1%).

The data on gender revealed that more than one-third of the household heads were assumed by females. Traditionally, the role of the wife in the household is to upkeep the house and to tend to their children while the husband is away earning for a living. In the literature, Thomalla et al. (2006) and the Federal Emergency Management Agency (n.d) cited that females have higher vulnerability in a disaster. Likewise, Philip and

Rayhan (2004) stated that vulnerability of social groups is affected by gender equality.

In terms of age, the study revealed that there were elderly, aged 60 years old and above, who assumed as head of the family. According to Thomalla et al. (2006) these elderly are vulnerable to disaster because of age. During disaster, younger members of the household have to tend these elder members and keep them secure and safe. But for a large family size, this family presents a scenario in which a loss more on the lives of a few elderly will happen in favor of saving children during typhoons.

Quite a lot of the respondents remained single, 17.1%, which tend to be the group vulnerable to ST Yolanda for single-handedly facing the threat of a calamity. This result indicates that either a couple lives out of marriage, or had a family without a partner. Accordingly, marriage strongly binds a family together. It is the family unit that brings upon morally upright children (www.kaieteurnewsonline.com). The stronger the family ties, the less vulnerable the family in facing life's challenges including facing a disaster like ST Yolanda. Philip and Rayhan (2004) found in their study that disintegration of social patterns contributes to people's social vulnerability.

Time and again, education is tested to be a key to better life. It plays an important role in improving one's socio-economic status. Hence, the government is giving free basic elementary and secondary education as a means to eradicate poverty. Indeed, the survey showed that college graduates earned higher income than any other educational categories. Most of them were employed, and others got opportunities to work abroad as overseas Filipino workers. Along this, college education is of paramount importance, and awareness on the part of school children while still in the elementary and secondary level perhaps would make a difference. In the literature, Philip and Rayhan (2004) linked low levels of education to vulnerability. In fact, Lucagbo (2016) claimed that education hones cognitive skills and willingness to change risky behavior to a more acceptable and riskless situation. Therefore, it can be said that with a higher educational attainment of the individual, he can better judge situations and respond steadfastly on the side that would provide security and safety to his family.

The study revealed that more than half (52.1%) of the respondents had an income of P 5,000 or less. This result is not surprising considering that there were only a small proportion of the population pursuing higher education and finishing it. A family income of P 5,000 or less would likely invoke some children to stop schooling and earn income rather than live in starvation. Millennium Development Goals

Provincial Report (2010) provides that Eastern Samar has a poverty threshold of Php 5,773.00 in 2006 for a family of 5 members. With this poverty threshold, results in this study revealed that Guiuan has more than half of its population living below the poverty level. In the literature, ACF (2010) maintained that the amount of income is one factor that contributes to vulnerability since larger incomes mean that people can build better homes. In addition, Thomalla et al. (2006) stressed that low income relates to the vulnerability of people particularly in the face of disasters.

As a coastal municipality, fishing is the main livelihood of many respondents (29.5%), followed by the self-employed respondents who were classified as mechanic, carpenter, mason, handicraft, retail store operator, transport service, buy and sell, and garment business. Since only the employed (22%) and those classified as others (pensioners and remittance dependent) (2.5%) had higher income, approximately 80% of the population had sources of income needing financial assistance to augment their livelihood. Fishing as a main source of income suggests of several households highly exposed to hazardous location and sudden threats of calamitous events. In the literature, Thomalla et al. (2006) stated that those most vulnerable to natural hazards include the people engaged in marginal livelihoods.

Respondents had a large household size of 6. A large household is one which consists of 5 members. Data revealed that around two out of three households (67.3%) were a bit vulnerable to the typhoon. This composition of household to a large extent makes them vulnerable because according to ACF (2010), a large size family has difficulty in evacuating because of their number compared to a smaller size family.

Data showed that households had an average number of 4 children. ACF (2010) contends that a family with 3 or more children is more vulnerable to a disaster. Moreover, Ferreira (2013) cited that taking care of children during a disaster is an extra burden on the individual. The same author said that a parent can handle one child at a time, such that if there are more children to attend to, it exposed the parent to a more distressful situation, and therefore makes him more vulnerable. This statement is backed up by ACF (2010) when it says that households with more children can experience more difficulties during evacuation and will require greater resources like food and water after a disaster.

The most vulnerable household is a household with children below 6 years old. According to ACF (2010), this group is vulnerable because younger children have difficulty evacuating, and therefore need to be tended by adults or by parents for them to ensure safe

evacuation. It can be seen from the table that nearly half of the children in a household had ages below 6 years old.

Around 1 out of 3 households had an elder member aged 60 years old. The literature provides that older members of the household have more difficulty in evacuating during a disaster and therefore need the assistance of an adult. In the literature, Thomalla et al. (2006) cited that those most vulnerable to natural hazards tend to be particular social groups, which include the elderly among others.

Furthermore, around 1 out of 5 households had sick and differently-abled member. Thomalla et al. (2006) further noted that those particular social groups which include the sick and differently-abled tend to be most vulnerable to natural hazards. In this study, there were accounts during the interview with the respondents that they lost their children because of the storm surge that grew to a height of around 6 meters, of elder member who were drowned, and of those who died because they were sick and left out in their homes. In a disaster, the municipal disaster risk and reduction management council shall therefore consider saving the lives of the elderly as they happen to be a neglected member in some households when a disaster strikes.

Sad to note that majority of the respondents did not have savings (63%). Considering that the respondents are characterized by large household size with meager income, they cannot even make both ends meet. Hence, without savings to lean on and with no institutions to assist them, these respondents became more vulnerable with the devastation of ST Yolanda. ACF (2010) emphasized that savings are the most accessible source of cash to cushion the adverse impacts of disasters like ST Yolanda.

Only around 19.9% of the respondents had built stronger houses. This means that 1 out of 5 respondents had houses built of concrete materials and galvanized iron roofs. Other houses were built mostly of a combination of materials. A lot of houses were built with galvanized iron roof and concrete walls using wooden posts, some were constructed with galvanized iron roof and wooden walls, and others with wooden post and nipa shingles for roof and walls. Almost all of these types of houses were totally destroyed during

typhoon Yolanda. Other types of houses were made of assorted materials like concrete, wood and nipa combined. ACF (2010) claims that the quality of houses can approximate the risks that people face from a disaster like typhoons. Wooden and thatched (nipa) houses can be easily blown by strong winds.

Since Guiuan is a coastal municipality, most of its residents were living near the sea (84.7%) as source of potential hazard. The risk of the respondents in this location is higher compared to those living away from the sea. In fact, this study found, as will be discussed later, that most of those who died and were injured by ST Yolanda were living along coastal areas. Relocation of these residents to safer grounds is needed to minimize risk during a disaster.

Data showed that there were around 1 out of 4 respondents (26.2%) who were living 0 to 20 meters away from the sea. In a study conducted by Philip and Rayhan (2004), they found that fragile and hazardous location contribute to social vulnerability. On the other hand, Thomalla et al. (2006) pointed out that many poor and marginalized people are directly dependent on ecosystem services for their livelihood activities and are therefore particularly vulnerable to changes in environmental conditions and factors that may limit their access to natural resources.

Based on the foregoing literature, and FEMA (n.d) which claimed that social vulnerability can be determined by demographic characteristics like gender, age, education, income, among others; it is approximated at this point that vulnerability status of the respondents, taking things equal, is placed at 48.27%. This suggests that nearly half of the respondents were vulnerable to ST Yolanda, and most likely had experienced greater impact against the typhoon.

The described socio-economic status indicates incapacity of the respondents to build for themselves a place that can withstand typhoons even less severe to ST Yolanda. As Hejimens (2001) contends, “the vulnerable condition in which people live, can turn not only extreme events, but even normal events into disaster situations”. Hence, the socio-economic status of the people living in a particular community is a point for consideration in Disaster Risk Reduction Management.

Table 1. Socio-economic Profile of the Respondents

Characteristic	Number of Respondents	Per cent
Gender (Head of the Family): Male	243	63
Female	143	37
Age		
39 & below	96	24.8

40 & above	290	75.2
Civil Status		
Single	14	3.6
Married	320	82.9
Separated/widow or widower	52	13.5
Educational Attainment		
No schooling	2	0.5
Elementary level	39	10.0
Elementary graduate	74	19.2
High school level	44	11.4
High school graduate	76	19.7
Attended vocational school	5	1.3
College level	45	11.7
College graduate	101	26.2
Average Monthly Family Income		
P 5,000.00 & less	201	52.1
P 5,001 – P 10,000	110	28.5
P10,001 & up	75	19.4
Source of Income		
Employed	85	22
Fishing	114	29.5
Farming/Copra Production	43	11.1
Wage labor	30	7.8
Self- employed	104	27
Others (Pensioner, remittance dependent)	10	2.6
Average number of persons in the household	5.5	
Average number of children in the family	4.0	
Average number of children below 6 years old	.47	
Average number of 60 years old & above members	.37	
Average number of sick & differently-abled members	.14	
Family with savings	143	37
Family without savings	244	63
House Structure		
Galvanized iron (GI) roof & concrete walls	77	19.9
House made of light materials	172	80.1
Source of potential hazard		
Sea	327	84.7
Mountain	51	13.2
River	8	2.1
Nearness of House to hazard area		
0 – 20 meters	101	26.2
More than 20 but less than 1,000 meters	215	55.7
More than 1,000 meters	70	18.1

Health and Social Services

The sixty (60) communities of the municipality is served each with a community health center, but with only one (1) Community hospital, one (1) District hospital, and one (1) Rural Health Unit (RHU) aside from two other private hospitals for the entire locality. As shown in Table 2, of the 386 respondents, 66.6% were nearest a community health center. Almost half of the respondents (47.9%), estimated that the public health facility was less than half kilometer from their residence; and to more than half respondents (59.8%), these health facilities were described to be

of average condition (72.1%) and can be reached by foot/bicycle or tricycle by 96.6% of the respondents. Majority of the respondents (78.8%) had Phil-health insurance.

Many respondents identified that the nearest public school facility was an elementary school (80.8%), of average condition (62.2%), and can be reached by foot (74.6%). In terms of water supply, nearly half of the respondents (44.8%) relied on bottled water which source was less than half kilometer from the water source by 56% of the respondents. Electricity was available to a majority of the respondents (87%) before ST Yolanda.

The data revealed that 66.6% of the respondents were more vulnerable to the typhoon than other respondents because they are away from a hospital. Krol et al., (2009) holds that access to health services post-disaster can ensure that the individual receives the needed attention, limiting possible health complication that causes an increase in the vulnerability of the individual.

In terms of health insurance, majority of the respondents had Phil-health insurance, 78.8%. Ehrenreich & McQuaide (2001) as cited by Ferreira (2013) stressed that having health insurance coverage decreases the level of social vulnerability and distress among individuals.

Public schools are commonly used as emergency evacuation centers at a time of disaster. Phongsavan et al. (2006) as cited by Ferreira (2013) expressed that schools are great resources for housing incident command centers, and can be utilized as shelters when needed. Unfortunately, the schools used as shelters in the locality were blown off and flattened resulting in injuries and even death to some evacuees.

The data indicates inadequacy of health facilities and social services considering the 60 communities with 48,810 inhabitants and 10,808 households the municipality have.

Table 2. Health Facility and Social Services

Description	Number	Percentage
Nearest public health facility		
Served by a community health center	257	66.6
Served by a community hospital	2	0.6
Served by a rural health unit	59	15.3
Served by a district hospital	68	17.5
Nearness to public health facility		
Less than ½ kilometer	185	47.9
½ to 1 kilometer	123	31.9
More than 1 but less than 2 kilometers	49	12.7
2 kilometers and more	29	7.5
Condition of health facility		
Good	38	9.8
Average	278	72.1
Poor/needs repair	70	18.1
Mode of transportation		
By foot	186	48.2
By bicycle/tricycle	187	48.4
By jeepney	3	0.8
By motorboat	10	2.6
Phil-health membership		
With Phil-health membership	304	78.8
No Phil-health membership	82	21.2
Nearest public school		
Primary school	27	7.0
Elementary school	312	80.8
High school	34	8.8
College	13	3.4
Physical condition of nearest public school		
Good	73	18.9
Average	240	62.2
Poor/needs repair	73	18.9
Mode of transportation to nearest public school		
By foot	288	74.6
By bicycle/motorcycle/tricycle	98	25.4
Source of Potable Water		
Commercial/Bottled Water	173	44.8
Nearness of potable water source		
Less than ½ kilometer	216	56
Availability of electricity	336	87

Disaster Preparedness

The data in Table 3 showed that due to the availability of electricity to around 87% of the respondents, it provides them the opportunity to acquire household appliances particularly sources of information like television, mobile phones and radio. The Municipal Disaster Risk Reduction and Management Council (MDRRMC) warned families (82.9%) while the Local Government Unit (LGU) of Guiuan through its community officials also gave warnings to their constituents regarding the typhoon (55.7%).

Majority of the respondents evacuated before the typhoon's landfall (86.4%), most of them to their neighbors'/relatives' house, and with respect to disaster preparedness training, all respondents affirmed that they have not attended any training related to disaster preparedness. The Local Government Unit of Guiuan through the Municipal Social Welfare and Development

(MSWD) distributed relief goods such as rice and sardines to the evacuees in public buildings and to some community officials in the mainland areas a day prior to Yolanda's landfall as acknowledged by 45.3% of the respondents, but most of them (70.5%) stored food and water to last for 2 days to over a week.

Despite the high technology experienced by most people in the country, Guiuan has still residents, especially those living in the island communities that are not served by electricity. These people lack information sources, not even a transistor radio. ACF (2010) says that having access to a landline telephone or a cell phone can ensure people receive disaster alert in time.

It should be noted that disaster preparedness is crucial to the survival of an individual at a time of disaster, such that, delay in the mitigation efforts is consequential in the present threats of climate change.

Table 3. Disaster Preparedness of Respondents

Description	Number	Per cent
Information Sources		
Television only	86	22.3
Radio only	108	28
Mobile phone only	17	4.4
Mobile phone / radio / television	167	43.2
No information source available	8	2.1
Other sources of information		
Informed by the Local Disaster Risk & Management Council	320	82.9
Informed by local officials	215	55.7
Informed by neighbor/family member	169	43.8
No information received	2	.5
Conduct of evacuation		
Before the typhoon strikes	254	65.8
At the height of the typhoon	44	11.4
No evacuation conducted	88	22.8
Evacuation Area		
Neighbors/relatives	177	45.9
Public school building	51	13.2
Private school building	31	8.0
Gymnasium	8	2.1
Church	21	5.4
Caves	10	2.6
Training on disaster preparedness		
Attended disaster preparedness training	0	0
Distribution of relief goods from local government prior to ST Yolanda		
Recipients of local relief goods	175	45.3
Unable to receive local relief goods	211	54.7
Storage of food and water		
Stored food and water	272	70.5
Unable to store food and water	114	29.5
Perception of super typhoon Yolanda		

Very dangerous typhoons unlike past typhoons	276	71.5
Dangerous typhoon just like past typhoons	58	15
The typhoon would re-route or dissipate	52	13.5

Impact of Super Typhoon Yolanda

The strongest typhoon in recorded history ever to hit the Philippines, super typhoon Yolanda brought so much grief and devastation to the municipality. Accounts of how families fought to survive the violent, deadly winds and storm surge of typhoon Yolanda differ from each other, and each is a narration of a fight against death. As shown in Table 4, among the 386 respondents, 3.1% had 14 dead family members most of which came from coastal communities. In an interview with these respondents, some of them claimed that their family members died during the typhoon because of the storm surge. The storm surge brought water waves to a height of more than 5 meters affecting about 33.7% of the respondents mostly living along the coast of the Pacific Ocean. Some children died because they lost grip from their parents, and thus swallowed by the fierce whirling current and turbulent flow of the water waves. Others particularly the sick and elderly preferred to be left in their homes rather than evacuate, hence after the typhoon they were found either swept with the house or drowned in water.

According to Ferreira (2013), the number of deaths gives an idea of the severity of a disaster, and is an indication of the overall impact of a disaster. The 3.1% of the respondents reporting 14 household members dead is severe enough compared to a 0% incidence of death.

In terms of injuries, the ravaging winds of typhoon Yolanda resulted also to 210 household members injured or wounded as reported by 202 or 52.3% of the respondents. Recorded the most number of wounded members were communities along the sea coast to the side of the Samar sea where most of the respondents were required to evacuate to designated public buildings by the MDRRMC. Unfortunately, since all the designated public buildings were old and in poor condition, evacuees had to fight for their lives to be spared from overhead galvanized iron sheets and from broken concrete walls ready to bury them.

In terms of cost on house, ST Yolanda made its first landfall in the municipality, thus it whipped its strongest might over the place leaving partially damaged houses to 31.87% households which amount went up to Php 14,810,000.00, and

totally damaged houses to 68.13% households amounting to approximately Php 24,570,000.00. All respondents (100%) had reported damages of houses amounting to a total of Php 39,380,000.00.

With respect to cost on source of income, the main source of income of the respondents is fishing, followed by the self-employed, employed, farming and those engaged in copra production. In the literature, ACF (2010) revealed that some sources of income are very vulnerable to typhoons and landslides, particularly open sea fishing as it depends on the waves of the sea. Open sea fishing is the practice of fishermen in Guiuan as the place is almost surrounded by sea. Those engaged in copra production, and farmers who are dependent on root crops, and other farm products can experience longer recovery period if the plantations are devastated because it takes years or months before the coconuts or crops can be harvested. On the other hand, self-employed respondents can take fewer weeks or months to recover from a typhoon.

With the foregoing conditions, ST Yolanda created 82.9% jobless residents resulting to an estimated loss in the source of income worth Php 4,366,000.00.

In the literature, Philip and Rayhan (2004) identified that vulnerability is closely linked to asset ownership. They said that the more assets people have the less vulnerable they are, and the greater the erosion of people’s assets, the greater their insecurity. The damage of ST Yolanda to the houses of the respondents is clear indication of an increased level of distress and disappointment on all the victims of ST Yolanda.

In this study, properties refer to real and personal properties except the house. This includes coconut trees, farm products, fishing boats and paraphernalia, appliances and other personal assets. Cost on properties reported by respondents went up to approximately Php 17,318,000.00.

The amount approximated the level of vulnerability of the respondents. Philip & Rayhan (2004) pointed out that the lower damages in assets the less vulnerable the victims. Further considering the average monthly income of Php 5,000.00 for most of the respondents, the little amount of damage to their properties is enough to increase their level of vulnerability.

Table 4. Impact of Super Typhoon Yolanda on the Respondents

Impact	Number of Respondents	Value
Loss of life	12 (3.1%)	14 deaths

Injury/wounded	184 (47.67%)	210 injured
Damaged house		
Partially damaged house	123 (31.87%)	Php 14,810,000.00
Totally damaged house	263 (68.13%)	Php 24,570,000.00
Loss on the source of income	320 (82.9%)	Php 4,366,000.00
Loss of properties	386 (100%)	Php 17,318,000.00
Total (house, source of income & properties)		Php 61,064,000.00

Environmental Activities Attributed to Increase Risk of Super Typhoon Yolanda

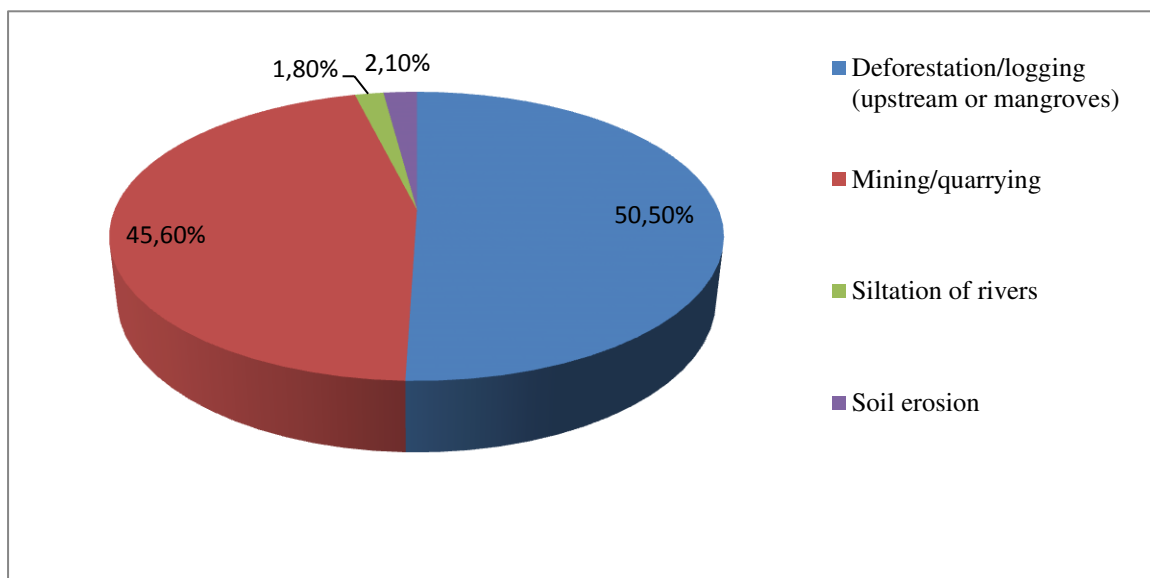
It can be seen from Figure 1 that deforestation or logging is one of the aggravating environmental activities that contributed to the increased suffering from the devastation of ST Yolanda, according to half of the respondents (50.5%). This activity is done upland and in mangrove areas for housing and fuel purposes, and which should be stopped to minimize the effect of future landslides and storm surges. It is noteworthy that forest denudation results in oxygen depletion that greatly contributes to global warming.

Besides, there is a need to preserve the forest cover to ensure continuous supply of water to mankind.

Additionally, 176 or 45.6% of the respondents claimed that putting up of mining industries is another culprit as it clears a larger portion of the forest cover destroying the land and water around it.

This result is in accordance with the findings of Hejimens (2001) who concluded that local communities in the uplands of the Philippines were exposed to the negative impact of typhoons and drought. In fact they blame the government's logging policies and mining operations for the increasing occurrence of flashfloods and landslides.

Figure 1. Respondents' Identified Environmental Activities which Increase the Risk of Super Typhoon Yolanda



Level of Vulnerability

The vulnerability of the respondents was measured using the criteria for the ten (10) factors; potential effect on the source of income, composition of household, capability of house structure, nearness of house to a hazard area, capacity to get medical attention, access to public school facilities, social support to safety, family support to safety, disaster preparedness training and

perception of risk, and food and water supply. Just with the use of the criteria, as shown in Table 5, the vulnerability level (mean) of the respondents was estimated to be 2.55 which may be rated as slightly vulnerable.

For decision making, however, according to Velasquez (2003), the mean result of each vulnerability (v) factor should be quantified and weighted using the 9 step scale as shown below:

1/9	1/7	1/5	1/3	1	3	5	7	9
extremely	very strongly	strongly	moderately	equally	moderately	strongly	very strongly	extremely
			(V9)	(V2) (V4) (V10)	(V6) (V7)	(V3) (V5)	(v1) (v8)	
Less important?				Standard	More important?			

The vulnerability factor on the potential effect on the source of income (v1) is given a normalized scale of importance of 7 (very strongly important) because of the poverty status of the population. Composition of household (v2) is assigned a normalized value of importance of 1 (equally important), because equally in a disaster, concern for the elderly and children shall be taken into account more than any age group. Capability of house structure (v3) is another important consideration, hence, given a normalized importance of 5 (strongly important) because safety of the family shall start at home by building a resilient house, strongly important since satisfying this requirement follows after the improvement of family income. Nearness of house to hazard area (v4) is assigned a normalized value of 1 (equally important) because most of the incidences of death and injuries were residents living along coastal areas. Capacity to get medical attention (v5) is assigned a normalized value of importance of 5 (strongly important) because of its importance in saving lives during and after a disaster. Access to school facilities (v6) is given a normalized degree of importance of 3 (moderately important) because of its utility as temporary evacuation centers during a disaster. Similarly, social support to safety (v7) is assigned a normalized degree of importance of 3 (moderately important) because it serves as a government support. More importantly, family support to safety (v8) is given a normalized degree of importance of 7 (very strongly important) because the family has its primary responsibility to take care of their own members before all others. Disaster preparedness training and perception of risk (v9) is given a normalized degree of importance of 1/3 (moderately less important) as it is less important among other endeavors. Storage of food and water (v10) is assigned a value of 1

(equally important) as it is equally important for the survival of people during and after a disaster.

Each value is divided by the highest rated factor seven (7). This normalized score is given weight by dividing each score by its sum. The result is a weighted score which represents the contribution of the social vulnerability factor to the risk. For example, the weighted score of the potential effect on the source of income which is .21, refers to the weight of the factor contributing to the risk of the respondents against typhoon Yolanda. This weight may also be used in the decision making process of whether to improve livelihood or not. In this study .21 or 21% is among the highest factors contributory to the risk.

Finally, the social vulnerability index is obtained by getting the sum of the products of the weighted score and the standardized mean. This study revealed a **social vulnerability index of 0.502** which put the respondents in a slightly unsafe condition during the time of super typhoon Yolanda. This result is consistent with the approximated percentage vulnerability status of 48.27% described earlier in this paper.

The slightly unsafe condition of the people in Guiuan, Eastern Samar prior to super typhoon Yolanda indicates that people become totally vulnerable with the devastation of the typhoon. Along this, efforts should be exerted, both at the household level and the community level to lessen the effect of an impending disaster. A resilient evacuation center may be constructed, and social service facilities including transportation and communication networks should be made available and accessible to everyone at a time that a natural or man-made disaster will occur. More importantly, the result suggests that self-reliant communities shall be geared up through livelihood and employment opportunities so as to produce resilient families.

Table 5. Standardized and Normalized Index of Vulnerability

Vulnerability Measure	Mean	Standardized Score	Weight	Normalized Score	Weighted Score	Vulnerability Factor index
1.Potential effect on the source of income	2.95	.59	7	1	.21	.124
2.Composition of	1.63	.326	1	.143	.03	.010

household							
3.Capability of house structure	3.02	.604	5	.714	.15	.091	
4.Nearness of house to hazard area	3.03	.606	1	.143	.03	.018	
5.Capacity to get medical attention	2.27	.454	5	.714	.15	.068	
6.Access to public school facility	2.98	.596	3	.429	.09	.054	
7.Social support to safety	2.42	.484	3	.429	.09	.044	
8.Family support to safety	1.74	.348	7	1	.21	.073	
9.Disaster preparedness training and perception of risk	3.35	.67	1/3	.048	.01	.007	
10.Storage of food and water	2.11	.433	1	.143	.03	.013	
Total	2.55			4.763		.502 Slightly Unsafe	

Relationship Between the Selected Vulnerability Factors and the Impact of Super Typhoon Yolanda

Using SPSS and computing Pearson's r, results presented in Table 6 showed that a positively moderate (.463) and very significant ($p = .000$) relationship exists between the vulnerability criterion on the potential effect on source of income against the actual impact of the typhoon on the respondents' source of income. The same vulnerability variable demonstrates a negatively low (-.241) but very significantly associated ($p = .000$) with actual damaged to house, and likewise shows significantly ($p = .035$) but negatively (-.108) related against damaged to properties. Based on the established criteria, these results indicate that families who were dependent on fishing, farming and copra production tend to lose these sources of income after a typhoon, and that the respondents incurred heavier or total damages on house and property, at a lower cost though than other sources of income.

Ferreira (2013) cited Myers & Wee (2005) that exposure to a disaster may result in a lower degree of livelihood security for the individual post – disaster. Loss of employment and livelihood as a result of a disaster create social vulnerability for the individual.

When the vulnerability of the respondents based on house structure were analyzed against the impact of super typhoon Yolanda, the results show negligible relationship (.195) against cost on source of income, negatively low (-.303) against cost on house, and negatively low (-.333) against damaged to properties. All three impact variables resulted to

a very significant ($p = .000$) relationship. The direct or positive relationship indicates that weaker houses tend to loss source of income with the typhoon, and the inverse relationship implies that weaker houses tend to be totally damaged during a typhoon including its properties, but at a lower cost compared to houses built with stronger materials. This study supports ACF (2010) claims that the housing materials families live in relates to their incomes. It also indicates that the stronger the materials used in house construction, the resilient the house to calamities. Moreover, Ferreira (2013) pointed out that building types appear to correlate with social vulnerability and individual features of a structure.

The vulnerability of the respondents to get medical attention has positively low (.280) but with very significant relationship ($p = .000$) against damaged on source of income, while negatively low (-.228) but very significant association (.000) against damaged to house. Likewise, this vulnerability variable has a negatively low (-.226) relationship yet very significant ($p = .000$) against damaged to properties. The results imply that the respondents who can least afford to get medical services were those whose sources of income tend to loss during typhoon. On the other hand, the negative relationship indicates that the respondents who can least afford of medical services were susceptible to be damaged, but at a lesser cost, in terms of house and property. The results were consistent with what Philip & Rayhan (2004), and Thomalla et al., (2006) found, that factors such as poverty, and lack of access to resources and services contribute to vulnerability.

There is a positive but negligible relationship (.149) between the vulnerability of respondents to access school facilities against damaged on source of income yet the relationship is very significant ($p = .003$). The same vulnerability factor shows negatively negligible (-.119) but significant relationship ($p = .019$) against damaged on house. Similarly, it has negatively negligible (-.112) but significant ($p = .027$) relationship against damaged to properties. These results indicate that the less accessible the respondents from school facilities the higher the tendency of their sources of income as well as their house and properties to be damaged but not as costly as those with partially damaged houses.

The vulnerability in terms of social support to safety resulted in a negatively low (-.123) but significant relationship ($p = .015$) against cost on damage to house. Other impact variables resulted in negligible and no significant relationships toward the same vulnerability variable. This result reveals that the least served respondents in terms of social support to safety were closely linked to respondents with houses made of lighter materials. It indicates that the people who needed the most help during ST Yolanda were not given the assistance they needed. This result shows consistency with the findings of Leeftink (2013) that during the reconstruction phase after typhoon Peping there is a decreasing social cohesion within the communities in Northern Luzon. The decreasing social cohesion observed by the author may have been present before the typhoon hence also noted after the typhoon, and this attribute may likewise exist in other communities in the Philippines as found in this study.

Based on vulnerability of the respondents on family support to safety, a directly negligible (.100) and significant (.049) relationship is noted against loss of lives, while directly low (.217) but very significant (.000) relationship against injuries incurred by family members. Further, the same variable showed a directly negligible (.109) yet significant relationship (.033) against effect on source of income. These results imply that family support to safety is indeed crucial to the survival of members in times of disaster like typhoon Yolanda. The direct relationship indicates that the less supportive the family members, the greater the chances of tragedy to occur. In addition, the result means that constructing a more resilient house for the family, or the conduct of early evacuation to a more stable evacuation center, loss of lives and injuries of members may be prevented. On the other hand, the direct relationship between

vulnerability on family support to safety and effect on source of income indicates that the less supported family members were evident on families whose sources of income tend to be lost during a typhoon. Furthermore, the results show that the family, as a basic unit of society, has a basic responsibility of reducing vulnerability to potential risks to its members. It has been said that the family has an enormous impact on the lives of children and the society they live in (www.kaieteurnewsonline.com). Hence, the head of the family which is assumed by the male parent should provide ways to save his members in all forms of human and natural harm.

In this study, vulnerability in terms of family support to safety is based on the criteria of house resiliency and evacuation measures of household. These are made as bases because according to UN/ASDR (2004) as cited by Wright & Husemann (2006), preparedness refers to “activities and measures taken in advance to ensure effective response to the impact of hazards”. This includes the use of early warnings and measures to evacuate people from areas that might be affected. Such being the case, this result is consistent with the belief that, indeed, construction of concrete houses that follows building standards ensures safety to the occupants, otherwise in case of disasters like typhoons, pre-evacuation is necessary for safekeeping of family members from detrimental effects of a disaster. It also follows that complacency, unresponsiveness, being carefree and unheeding to the call for disaster preparedness are detrimental to the safety and well-being of everyone in the household and/or community, and therefore, a need for every individual to be vigilant, proactive and supportive to the efforts of preserving the earth’s natural resources.

All other vulnerability factors considered like household composition, nearness of house, disaster preparedness training and perception of risk, and availability of food and water were not justified to have significant relationship against all the impact variables.

Therefore, the null hypothesis which states that there is no significant relationship between the vulnerability factors and the impact of super typhoon Yolanda on the respondents is rejected.

The findings of this study conforms with the result of a related study conducted in China by Jiang et al., (2011) that precautionary activity was strongly related with socio-demographic characteristics. In the present research, this is evidenced by vulnerability in terms of family support to safety against damaged to source of income.

Table 6. Relationship Between the Selected Vulnerability Factors and Impact of Super Typhoon Yolanda

Vulnerability Factor	Impact of ST Yolanda									
	Loss of lives		Injured Family Members		Cost on Source of Income		Cost on Houses		Cost on Properties	
	R	p	r	P	r	P	r	p	r	p
1. Potential effect on the source of income	.070	.171	.073	.154	.463	.000	-.241	.000	-.108	.035
2. Composition of household	-.044	.388	.056	.274	-.090	.079	-.007	.888	.093	.069
3. Capability of house structure	.035	.496	.054	.290	.195	.000	-.303	.000	-.333	.000
4. Nearness of house to a hazard area	-.014	.787	-.016	.752	.065	.202	.046	.364	-.089	.082
5. Capacity to get medical attention	.004	.933	-.070	.170	.280	.000	-.228	.000	-.226	.000
6. Access to public school facility	-.026	.611	-.070	.169	.149	.003	-.119	.019	-.112	.027
7. Social support to safety	-.006	.913	.045	.383	.054	.286	-.123	.015	-.046	.371
8. Family support to safety	.100	.049	.217	.000	.109	.033	-.030	.554	-.094	.064
9. Disaster preparedness training & perception of risk	.020	.700	.028	.585	-.030	.560	.026	.609	-.031	.540
10. Storage of food and water	-.033	.520	.020	.689	.065	.206	-.090	.076	.023	.651

Level of significance = .05

Conclusions

Based on the findings of the study, the following conclusions are drawn:

The vulnerability status of the respondents in terms of gender, age, civil status, educational attainment, average monthly income, source of income, number of persons in the household, number of children in the family, number of members below 6 years of age, number of members aged 60 years old and above, number of sick/differently-abled members, house structure, source of hazard, nearness of house to a hazard area, and family savings, taking things equal, is estimated at 48.27% indicating a vulnerability that can soar higher with ST Yolanda's landfall.

The respondents were served by community health centers, a District hospital, and a Rural health unit. Unfortunately, there were 1 out of 5 respondents who have no Phil-health insurance coverage. All respondents had access to public schools, however, all the community health centers, hospitals and school facilities were damaged by ST Yolanda. Less than half of the respondents relied

on commercial bottled water as a source of potable water. There were some respondents who had no electricity before ST Yolanda. These results indicate inadequacy of resilient public facilities and lack of social services.

There were some respondents who evacuated at the height of ST Yolanda, some respondents were not informed, and others even lack the means of communication to be updated of what is happening around the world. These indicate that warnings have not been sufficient and efficient enough to drive respondents for an early evacuation, and efforts toward building active and responsible communities have not been made in place.

Super typhoon Yolanda resulted in the death of 14 family members and 210 injured. It estimated loss in the source of income worth Php 4,366,000.00, damaged houses amounting to Php 39,380,000.00 and properties worth Php 17,318,000.00. The cost could have been lesser had people take safety precautions, and public buildings had been constructed strong enough to withstand the devastation of the typhoon. The

impact which resulted from ST Yolanda implies a need to launch disaster risk reduction campaigns and programs to inculcate in the minds of people the seriousness of the consequences of climate change.

Half of the respondents pinpointed deforestation as one of the aggravating environmental activities that may have contributed to the increase of risk of ST Yolanda. Therefore, reforestation, tree planting and preservation of natural resources are things to be considered in climate change mitigation. Mining may also be stopped.

The respondents' social vulnerability index is 0.502 which is described as moderately vulnerable, and indicates a slightly unsafe condition for the respondents prior to ST Yolanda. This condition made the people in Guiuan, Eastern Samar totally vulnerable with the devastation of the typhoon. This social vulnerability index which took into account the socio-economic status, health and social services and disaster preparedness may, therefore, be considered in disaster risk reduction management.

Very significant in reducing the vulnerability of individuals during a disaster are family support to safety, having a stable source of income, resilient house structure, availability of medical services, accessibility of resilient school facilities, and social support to safety. Family support to safety revealed the most significant factor that relates to loss of lives and injuries, and effect on source of income. This result implies that with the present inadequacy of families and threats in their midst, evacuation centers that are accessible and provided with necessary facilities may be considered by DRRMCs as an immediate response to lessen the impact of climate change.

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