ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2019; 5(1): 36-41
www.allresearchjournal.com
Received: 26-11-2018
Accepted: 30-12-2018

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Disaster preparedness, frequency, and severity of impact of the natural hazard occurrences in coastal and upland secondary schools

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Abstract
The main purpose of this paper was to determine whether or not the secondary school teachers' level of disaster preparedness is significantly related to the frequency and severity of the natural hazards' impact in their respective school locales. The descriptive-correlational method was used in this study with 582 school teachers as respondents from the 27 coastal and upland secondary schools in the Congressional District I of Negros Oriental, Philippines. Spearman Rho was used in testing the significant relationship. Findings reveal that the respondents' level of disaster preparedness is not enough, the frequency of the natural hazard occurrences is generally rare, and the severity of the hazards' impact is not critical. Moreover, the frequency of the natural hazard occurrences has no effect whatsoever on the respondents' level of disaster preparedness. Furthermore, the severity of the hazards' impact and the teachers 'level of disaster preparedness in terms of awareness of the school community to the threats and impacts of hazards, risks and vulnerabilities, skills of the school community to cope with the negative impacts of a disaster, and capacity of the institution are positively correlated. This suggests that as the severity of the hazards 'impact increases, the teachers' level of disaster preparedness also increases. It can be indicated that the experience of personal injury or material losses during a disaster can motivate the people to become more prepared for future disaster events.

Keywords: disaster preparedness, frequency, impact, secondary school personnel

1. Introduction
Recently, dramatic increases in the frequency and impact of the natural hazard occurrences have been experienced around the globe (Ozmen, 2006) [15] The Philippines as one of the most disaster-prone countries has experienced its share of disasters. According to the Commission on Audit (COA, 2014) due to the countries geographical conditions along two major tectonic plates of the world – the Eurasian and Pacific Plates – it experiences an average of 20 earthquakes per day or 100 to 200 earthquakes every year. There have been 90 destructive earthquakes in the country in the past 400 years. There are also 300 volcanoes in the country, 22 of these are active and 36,289 kilometers of its coastline is vulnerable to tsunami. Typhoons or tropical cyclones are also perennial threats to the country due to its location along the typhoon belt on the North Pacific Basin in the Pacific, where 75% of typhoons originate.

Aside from geographical factor, the modernization of societies worldwide and the harmful effects of the industrial activities have contributed to the environment, many weather-related natural hazards have gained in both frequency and intensity which translates to the increased global impact of disasters at all levels (Sharrieff, 2017).

These disaster events can cause catastrophic impacts on societies, schools, environment, and economy of the affected countries**.** In the Philippines**,** Super Typhoon Yolanda in 2013 killed 6,300 people and damaged 3,171 schools (Geronimo, 2013). The 7.2 magnitude earthquake in Bohol in 2013 had a total of Php 2,203,930,000 worth of damaged roads, bridges, flood control, school buildings, hospitals, and other public buildings (National Disaster Risk Reduction and Management Council (NDRRMC), 2013). The 6.9 magnitude earthquake in Negros Oriental in 2012 killed 58 people and damaged government and private infrastructures, agriculture, school buildings, and other properties (Pal & Baesa, 2012) [16].

In other countries, data from Southeast Asian Ministers of Education Organization (SEAMEO, 2014) [17] showed that Cambodia experienced extreme floods making academic institutions inaccessible and causing students to drop out. Malaysia's monsoon season likewise affects schools in the country. In Indonesia, more than 70% of schools were found to be prone to earthquake.

Disaster occurrences greatly disrupt the education process in various ways, with human losses and injuries, social upheaval, school property damages and closings, and sometimes with students having to leave school for long periods in the recovery period (Federal Emergency Management Agency (FEMA), 2007) [6]. They deprive the students of their right to a continuous quality basic education in a safe environment and threaten the lives of children, their families, and education personnel (Department of Education, 2012) [2].

School preparedness is always the best way to face future disasters to make sure that in the event of a catastrophe, the loss of life is at very least minimal (Smart Schools Program, 2012) [19]. Preparedness planning should be based on accurate knowledge of the threat.Part of knowing the threat means understanding the basic characteristics of these hazards, such as speed of onset, scope and duration of impact, and potential for producing casualties and property damage (Lindell & Perry, 2008) [11]. Preparedness must start with knowing the facts first (Sutton &Tierney, 2006) [20]. It is based on a good risk analysis (United Nations Office for the Coordination of Humanitarian Affairs (UN-OCHA), 2013) [22].

Some researches indicate a correlation between disaster preparedness and severity of previous disaster experience. Espina and Calleja (2015) [5] claim that the severity of previous disaster experience and risk perception predict disaster preparedness. Further, it shows that people who experienced more losses and damage from previous disasters seemed to prepare more for disasters. The study of Sharrieff (2017) [18] shows that how well the negative impacts of a disaster event is handled by the community has much to do with the severity of the impact and the level of preparedness and resilience of the subject impacted.

It is in this context that this study was undertaken. The correlation of the secondary school teachers' level of disaster preparedness to the frequency and severity of the hazards' impact can be used as basis for appropriate interventions to reduce the impacts of disaster and improve the level of disaster preparedness of the school communities.

Statement of the Problem

The Philippines has suffered from an inexhaustible number of deadly typhoons, earthquakes, volcano eruptions, and other disasters. People must have learned from these disaster events to become more prepared for disasters. It is in this light that the researcher felt the need to test whether or not the secondary school teachers' level of disaster preparedness is significantly related to the frequency and severity of the hazards' impact.

Specifically, this study answers the following questions:

1. What is the frequency of the natural hazard occurrences experienced by the secondary school teachers in their respective school locales?
2. What is the severity of the hazards' impact?
3. What is the secondary school teachers' level of disaster preparedness in their respective school locales in terms of:
    1. awareness of the school community to the threats and impacts of hazards, risks, and vulnerabilities;
    2. skills of the school community to cope with the negative impact of a disaster;
    3. capacity of the institution;
    4. school disaster preparedness plans and policies; and
    5. partnership among all stakeholders?
4. Is there a significant relationship between the frequency of the natural hazard occurrences and the teachers' level of disaster preparedness?
5. Is there a significant relationship between the severity of the hazards 'impact and the teachers' level of disaster preparedness?

Research Hypothesis

Ho_1: There is no significant relationship between the frequency of the natural hazard occurrences and the secondary school teachers' level of disaster preparedness.

Ho_2: There is no significant relationship between the severity of the hazards' impact and the secondary school teachers' level of disaster preparedness.

Methodology

This is a descriptive-correlational study utilizing the survey method in the gathering of data. It is correlational as it goes to the extent of determining the association between two or more variables. It is descriptive since it describes the secondary school teachers 'level of disaster preparedness, the frequency, and severity of the hazards 'impact.

The research was conducted in 27 secondary schools offering Science, Technology, Engineering, and Mathematics (STEM) and General Academic Strand (GAS) in their senior high school based on the database of the Department of Education in 2016 in the first congressional district of Negros Oriental. The respondents of this study are the 582 secondary school teachers who willingly participated in the survey.

Spearman Rho was used in testing the significant relationship between the respondents' level of disaster preparedness and their frequency of experience and the severity of the hazards 'impact. It is a statistical measure of strength and direction of the association between two ranked variables.

Findings

Table 1: Frequency of the natural hazard occurrences

Natural Hazards	Coastal Schools (n=15)		Upland Schools (n=12)		Over-all $w\bar{x}$	Description	Rank
	$w\bar{x}$	Description	$w\bar{x}$	Description			
1.Earthquake	3.74	Often	3.58	Often	3.66	Often	3
2. Typhoon	4.20	Often	4.25	More Often	4.22	More often	1
3. Flood	3.17	Sometimes	2.61	Sometimes	2.89	Some- times	4
4. Landslide	2.20	Rarely	2.23	Rarely	2.22	Rarely	5

5. Thunder Storm	3.91	Often	3.80	Often	3.86	Often	2
6. Volcanic Eruption	1.36	Never	1.60	Never	1.48	Never	6
7. Storm Surge	1.48	Never	1.24	Never	1.36	Never	7
8.Tornado	1.27	Never	1.18	Never	1.22	Never	8
9. Tsunami	1.29	Never	1.09	Never	1.19	Never	9
Over-all $w\bar{x}$	2.51	Rarely	2.40	Rarely	2.46	Rarely	

Legend:

Range of Values	**Verbal Interpretation**
4.21 - 5.00	More Often
3.41 - 4.20	Often
2.61 - 3.40	Sometimes
1.81 - 2.60	Rarely
1.00 - 1.80	Never

The results from table 1 show that typhoon is the most frequent natural hazard experienced by the coastal and upland secondary school teachers. It is followed by thunderstorm, and earthquake respectively. However, other calamities were never experienced by the respondents. Further, the result of this study shows the rare occurrences of the calamities in general.

The findings of this study suggest the strict and regular implementation of school disaster preparedness measures whether the occurrences of the calamities are frequent or not for the school community to be ready all the time in times of disaster events. Moreover, the result is confirmed by EM DAT: The International Disaster Database from 1990-2014 which cited typhoon as the most frequent natural hazard in the Philippines.

The Philippines is highly susceptible to typhoon and earthquake due to its location along the typhoon belt on the North Pacific Basin in the Pacific and along two major tectonic plates of the world (COA, 2014). Thunderstorms also occur frequently in the country due to its location near the equatorial zone (Department of Education, 2008) [3].

Table 2: Severity of the hazards' impact

Natural Hazards	**Coastal Schools (n=15)**		**Upland Schools (n=12)**		**Over-all $w\bar{x}$**	**Description**	**Rank**
	$w\bar{x}$	**Description**	**$w\bar{x}$**	**Description**			
1.Earthquake	3.13	Moderate	2.67	Moderate	2.90	Moderate	1
2. Typhoon	2.69	Moderate	2.64	Moderate	2.67	Moderate	2
3. Flood	2.37	Negligible	1.85	Negligible	2.11	negligible	4
4. Landslide	1.85	Negligible	1.76	none	1.81	Negligible	5
5. Thunder Storm	2.17	Negligible	2.31	Negligible	2.24	Negligible	3
6. Volcanic Eruption	1.00	None	1.28	None	1.14	None	7
7. Storm Surge	1.19	None	1.00	None	1.10	None	8
8.Tornado	1.31	None	1.30	None	1.31	None	6
9. Tsunami	1.11	None	1.00	none	1.06	None	9
Over-all $w\bar{x}$	1.87	Negligible	1.76	None	1.82	Negligible	5

Legend:

Interpretation	**Range of Values**	**Verbal**
4.21 - 5.00	Catastrophic	
3.41 - 4.20	Critical	
2.61 - 3.40	Moderate	
1.81 - 2.60	Negligible	
1.00 - 1.80	None	

The findings from table 2 reveal that the hazards' impact to the coastal and upland school communities is generally not critical. Only earthquake and typhoon are rated with moderate severity of impact. This suggests that the vulnerability factors of these calamities have to be addressed accordingly to reduce their impact. Moreover, the preparedness measures on typhoons and earthquakes can be given more attention and priority by the school authorities without compromising the disaster preparedness efforts of other natural hazards. Further, this study is supported by the finding of EM DAT: International disaster database in terms of ranking which shows typhoon as the most disastrous disaster that affected the Philippines based on Typhoon Yolanda (Haiyan) in 2013 [9].

Table 3: Respondents' level of disaster preparedness

Disaster Preparedness Criteria	**Coastal Schools (n=15)**		**Upland Schools (n=12)**		**Over-all $w\bar{x}$**	**Des-Cription**
	$w\bar{x}$	**Description**	**$w\bar{x}$**	**Description**		
Awareness of the school community to the threats and impacts of hazards, risks, and vulnerabilities	3.29	Satisfactory	3.11	Satisfactory	3.20	Satisfactory
Skills of the school community to cope with the negative impacts of a disaster	3.12	Satisfactory	3.00	Satisfactory	3.06	Satisfactory
Capacity of the institution	3.29	Satisfactory	3.18	Satisfactory	3.24	Satisfactory
School disaster preparedness plans and policies	3.28	Satisfactory	3.11	Satisfactory	3.20	Satisfactory
Partnership among all stakeholders	3.26	Satisfactory	3.06	Satisfactory	3.16	Satisfactory
Over-all $w\bar{x}$	3.25	Satisfactory	3.09	Satisfactory	3.17	Satisfactory

Legend

Range of Values	Verbal Interpretation
4.21 - 5.00	Outstanding
3.41 - 4.20	Very Satisfactory
2.61 - 3.40	Satisfactory
1.81 - 2.60	Fair
1.00 - 1.80	Poor

As disclosed in table3, the respondents' level of disaster preparedness is not enough since the preparedness measures are only done sometimes. This is strengthened by some related studies. Viloria, Mammon, Escuadra, Anaya, and Landong (2014) [23] found out that most barangays in Iligan City are unprepared to disasters due to lack of budget, lack of information, and ignorance of the residents which apparently resulted to negligence. Further, the study of Galindo, Villanueva, and Enguito (2014) [8] showed that government and non-government organizations in Ozamiz City were not adequately prepared for natural disasters due to lack of knowledge, expertise, funds, equipment, leadership, and coordination. Another study of Labrague, Yboa, McEnroe–Petitte, Lobrino, and Brennan (2015) [10] revealed that nurses in Catbalogan, Samar were not sufficiently prepared for disasters nor were they aware of disaster management protocols in the workplace.

The findings suggest that the school authorities have to seriously improve the implementation of the disaster preparedness measures to prepare the school community for future disaster events.

Table 4: Correlation between the frequency of the natural hazard occurrences and the respondents' level of disaster preparedness

Frequency of the Natural Hazard Occurrences versus the Respondents' Level of Disaster preparedness Criteria	rho	Verbal Interpretation	P-Value α =.05	Decision	Remarks
A. Awareness of the School Community to the Threats and Impacts of Hazards, Risks, and Vulnerabilities	-.023	Slight Correlation	.909	Accept H_{01}	Relationship is Not Significant
B. Skills of the School Community to Cope with the Negative Impact of a Disaster	.230	Low Correlation	.248	Accept H_{01}	Relationship is Not Significant
C. Capacity of the Institution (Non-Structural)	.232	Low Correlation	.245	Accept H_{01}	Relationship is Not Significant
D. Capacity of the Institution (Structural)	.237	Low Correlation	.234	Accept H_{01}	Relationship is Not Significant
E. School Disaster Preparedness Plans and Policies	.243	Low Correlation	.221	Accept H_{01}	Relationship is Not Significant
F. Partnership Among All Stakeholders	.260	Low Correlation	.190	Accept H_{01}	Relationship is Not Significant

Legend:

r_s-value	Interpretation
±< 0.20	±slight correlation
±0.20 – 0.39	±low correlation
±0.40 – 0.59	±moderate correlation
±0.60 – 0.79	±high correlation
±0.80-1.00	±very high correlation

Data from table 4 reveal that the frequency of the natural hazard occurrences and the respondents' level of disaster preparedness are not significantly related. This indicates that the frequency of the natural hazard occurrences is not a predictor on the respondents' level of disaster preparedness. It is recommended that whether the natural hazard occurrences are frequent or not. the school disaster preparedness measures must be regularly complied.

In contrast, many studies imply the high positive correlation between the past experience and disaster preparedness. Friedman, Rose, and Koskan's Study (as cited in Mohammad-pajooh & Ab. Aziz, 2014) [7, 12] reveals that past experience can increase the preparedness to a natural disaster since it influences people to gather more information about the natural disaster, it informs the individual about the probability of occurrence of similar events in the future and as a result it brings better judgment toward natural disaster preparedness recovery.

On the other hand, minor studies justify the result of this study. Paton, Jhonsto and Bebbington (2001) [13] reveal that past experience does not always enhance disaster preparedness of individuals. Further, Lindell and Whitney's study (as cited in Mohammad-pajooh & Ab. Aziz, 2014) [7, 12] discloses that experience to disaster might not always directly affect preparedness but its indirect effect has been proven by several studies and it has shown to be one of the preparedness determinants. Moreover, the past experience can be used by the government as a basis to improve the response and preparedness of individuals to future disasters according to the findings of Said, Ahmadun, Mahmud and Abas (as cited in Mohammad-pajooh & Ab. Aziz,2014) [7, 12].

Table 5: Correlation between the severity of hazards' impact and the respondents' level of disaster preparedness

Severity of Hazards' Impact versus the Respondents' Level of Disaster Preparedness Criteria	rho	Verbal Interpretation	P-Value α =.05	Decision	Remarks
A. Awareness of the School Community to the Threats and Impacts of Hazards, Risks, and Vulnerabilities	.484	Moderate Correlation	.010	Reject Ho_2	Relationship is Significant
B. Skills of the School Community to Cope with the Negative Impact of a Disaster	.414	Moderate Correlation	.032	Reject Ho_2	Relationship is Significant
C. Capacity of the Institution (Non-Structural)	.522	Moderate Correlation	.005	Reject Ho_2	Relationship is Significant
D. Capacity of the Institution (Structural)	.468	Moderate Correlation	.014	Reject Ho_2	Relationship is Significant
E. School Disaster Preparedness Plans and Policies	.347	Low Correlation	.076	Accept Ho_2	Relationship is Not Significant
F. Partnership Among All Stakeholders	.344	Low Correlation	.079	Accept Ho_2	Relationship is Not Significant

Legend

r_s -value	Interpretation
±< 0.20	±slight correlation
±0.20 – 0.39	±low correlation
±0.40 – 0.59	±moderate correlation
±0.60 – 0.79	±high correlation
±0.80-1.00	±very high correlation

As presented in table 5, the severity of hazards 'impact and the respondents' level of disaster preparedness in terms of awareness of the school community to the threats and impacts of hazards, risks and vulnerabilities; skills of the school community to cope with the negative impacts of a disaster; and capacity of the institution are positively correlated. It implies that as the severity of hazards 'impact increases, the respondents' level of disaster preparedness also increases. This further indicates that the negative experiences during and after the natural hazard occurrences remind the school personnel to be always ready for future disasters. Intense Information drive on hazards' impacts can be done to motivate the people to be more prepared.

The findings of this study may justify the popular adage that "experience is the best teacher." The severity of hazards' impact experienced by the school personnel can make them realize the importance of preparedness.

The result of this study is strengthened by the findings of Takao, Motoyoshi, Sato, Fukuzono, Seo, and Ikeda (2004) that the degree of damage experienced in previous disasters determines preparedness. This suggests that the experience of personal injury or injury of family members, losing family members or relatives, and/or other material damages can leave a lasting imprint on the minds of people. These experiences seem to serve as reminders of the consequences of not being prepared for disasters. Further, Espina and Calleja (2015) [5] claim that people who experienced more losses and damage from previous disasters seemed to prepare more for disasters.

Conclusion

The frequency of natural hazard occurrences is generally rare and the severity of the hazards' impact is not critical. The secondary school teachers 'level of disaster preparedness is not enough since the preparedness measures are only done sometimes. Further, the frequency of the natural hazard occurrences is not a predictor on the respondents' level of disaster preparedness. Furthermore, the severity of hazards' impact and the respondents' level of disaster preparedness in terms of awareness of the school community to the threats and impacts of hazards, risks and vulnerabilities, skills of the school community to cope with the negative impacts of a disaster, and capacity of the institution have positive correlations. Hence, it can be indicated that the severity of the hazards' impact can motivate the people to become more prepared for future disasters.

Recommendations

Whether the natural hazard occurrences are frequent or not, the school authorities must implement the disaster preparedness measures strictly and regularly for the school community to be ready all the time in times of future disasters. The school vulnerability factors must be addressed appropriately to reduce the severity of hazards' impact. Further, the school management and the entire school community can work together by conducting a regular needs assessment as the basis for formulating various intervention programs aimed to improve the school disaster preparedness. Moreover, regular conduct of information drive on disaster preparedness must be done by the school authorities to inform, educate, and motivate the school community to be more prepared for future disaster events.

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