Psychological Risk Assessment of Residents in Flood/Landslide-Prone Areas in the Province of Bukidnon

Marites M. Egar,
ORCID No. 0000-0002-8316-6350

Joan M. Recente
ORCID No. 0000-0001-6104-0610

Desiree C. Arbutante
ORCID No. 0000-0003-1309-247X

Abstract

Natural disasters like floods and landslides are potential threats to both the physical and emotional well-being of individuals. The psychological effect could influence the way people look at themselves and adapt to any untoward incidence in the future. The study aimed to assess the residents' psychological state in terms of depression, anxiety, and stress in the aftermath of a disaster. Also, it assessed the adaptive capacity of affected populations to disaster; and recommended a program for disaster mitigation on psychological resilience at the barangay level. Questionnaires were used to gather data on disaster risk reduction elements, which determined the hazard, exposure, and vulnerability of the populations. With these variables, the risk and the adaptive capacity were computed. The adopted 42-item DASS questionnaire of Lovibond and Lovibond (1995) measures the three subscales of psychological health conditions which are depression, anxiety, and stress. Results showed that most of the respondents are on the normal scale in the three subscales. Of the three negative emotional states, the anxiety scale was consistently higher than depression and stress scales among respondents of the five barangays. The risk assessment of the five barangays showed that among the barangays, Barangay Batangan had the highest hazard and exposure. However, vulnerability was low in this barangay due to the high readiness factor, thus resulting in a higher adaptive capacity compared to the other four barangays.

Keywords and phrases: disaster risk reduction, psychological health condition, risk, adaptive capacity, flood

Introduction

Natural disasters happen when there are calamities like typhoons, earthquakes, and the like, anticipated and not. The psychological effect could influence the way people look at themselves and adapt to any untoward incidence in the future. In the aftermath of the disaster, affected residents may manifest significant psychiatric disorders (Foa et al., 2006). Natural disasters may have behavioral and psychological changes on the people affected by the catastrophe, which could help the proper authorities plan out strategies to mitigate and adapt measures for risk reduction.

Flood events can be seen as a threat to the well-being of individuals, both physically and emotionally (Johari & Marzuki, 2013). Flood disasters can still give a shock and pressure

to the flood victims even though it can be predicted several days before the incident. Even though flood disasters can be predicted and detected several days before the incident, it can still give a surprise, shock, and pressure to the flood victims. A flood could provide pressure and alter the function of the victim's daily routines (La Greca et al., 1996; Ralf & Ute, 2001). Flood victims also will have to deal with the stress response and ongoing trauma (La Greca et al., 1996).

Damage and destruction of property and loss of life are some of the scenarios that make a person feel depressed besides being worried. Other psychological conditions, such as stress and anxiety (Matteoli & Boeckxstaens, 2013), have been recognized as factors that could lead to depression and affect the quality of life (Bilac et al, 2009) of impacted residents (Johari & Marzuki, 2013). Many adults experience mild transient complaints (e.g., sadness, anxiety, somatic concerns) that resolve with the return to safe, predictable routines (Cook & Bickman,1990).

The World Health Organization (2002) recognized that the mental health consequences of floods have not been fully addressed by those in the field of disaster preparedness or service delivery. However, natural disasters such as earthquakes, floods, and hurricanes are generally accepted as taking a heavy toll on the mental health of the people who are mostly living in developing countries where the capacity to manage these problems is minimal (Ahern, 2005).

Understanding the potential risk of residents in the flood-prone areas to psychological trauma and disorders and knowing the adaptive mechanisms to withstand and manage these shocks are essential data to attain the community's mental resilience. As Weichselgartner (2001) stated, a part of ongoing policies and programs must integrate reduction of vulnerability to disasters.

The occurrence of natural hazards and disasters in the Philippines is frequent due to the physical environment of the country which faces the Pacific Ocean where catastrophic typhoons originate (Cabrera & Lee, 2019). Approximately 20 typhoons per year approach or make landfall, which is the highest frequency of typhoon events in the world (Sagala, 2006). Storms and floods are the most significant risks among the occurrence of natural disasters from the year 1980-2010 faced by the population (Pellini et al., 2013). Mindanao island was known to be a typhoon free region; however, disasters due to tropical storm Sendong in 2011 and super typhoon Pablo in 2012 changed that; Mindanao is now one of the typhoon paths (Cabrera & Lee, 2019).

Besides, the majority of highly susceptible areas to landslide are within the vicinity of Bukidnon province. The Provincial Development and Physical Framework Plan (PDPFP) report of Bukidnon in 2014 revealed that all provincial roads in Talakag, Cabanglasan, San Fernando, Impasug-ong, Sumilao, Lantapan, and the city of Malaybalay are prone to rain-induced landslides.

The residents' frequent exposure to flood in the identified flood-prone areas provided an exciting research opportunity in determining the link between a natural disaster and the psychological conditions of the residents during and after a flood.

This study will provide baseline information to the concerned government and private entities for risk reduction. Moreover, the study's results are of the significant components for emergency planners to include mental/psychological health issues in the disaster planning process. This leads to the formulation of an effective mental health program that would consist of the appropriate psychological intervention/s the community needs before, during, and after a disaster. The plan will then be a basis for a proper funding allocation specific to mental health programs from concerned agencies. The collaboration of researchers, emergency responders, and relief workers will also be an

excellent opportunity for an alliance to share new findings and experiences. They will also provide new directions for further research.

The study aimed to assess the psychological risk of residents in disaster-prone areas. Specifically, it intends to determine the psychological state of the residents in flood and landslide-prone areas in terms of depression, anxiety, and stress; assess the adaptive capacity of the affected population in the disaster-risk areas; and, recommend a program for disaster mitigation on psychological resilience at the barangay level.

Conceptual and/or Theoretical Framework of the Study

In this study, several psychological theories are adopted, such as the stressful life events theory of Holmes and Rahe (1967), Freud's anxiety theory, and Beck's (1967) cognitive theory of depression. The theory of stressful life events presents that the occurrence of specific life events can have an impact on one's physical and mental self. According to this theory, stress stems from experiences that change someone's life. Freud's anxiety theory postulate that anxiety is caused by threats or harassment individuals received, and is part of the instinct for self-safety stemming from emotional shock. Beck's cognitive theory underscored that stress and capacity can create symptoms of depression and that it is due to the attitude and mindset of private individuals (Johari & Marzuki, 2013). The symptoms showing signs of depression are a result of non-peaceful thoughts.

This study is also anchored on the concept of Hyogo Framework for Action 2005-2015 and UNDP: Mainstreaming Disaster Risk Reduction Framework. The Hyogo Framework for Action is formulated to promote a strategic and systematic approach to reducing vulnerabilities and risks to hazards. It highlights the need for and identified ways of building the resilience of nations and communities to disasters. Hyogo framework adopted the five priorities for action, namely: ensuring that disaster risk reduction is a national and local priority with a strong institutional basis for implementation; identify, assess and monitor disaster risks and enhance early warning; use knowledge, innovation, and education to build a culture of safety and resilience at all levels; reduce the underlying risk factors; and, strengthen disaster preparedness for effective response at all levels.

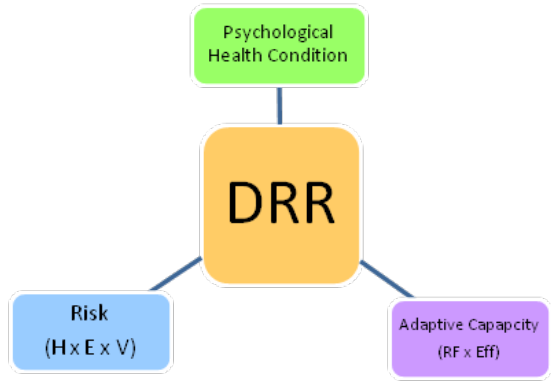

Figure 1. Conceptual framework of the study

Figure 1 shows the relationship of variables where the psychological health conditions (depression, anxiety, and stress) of residents is a significant factor in the disaster risk reduction. The elements of risk and adaptive capacity are essential in disaster risk reduction.

Disaster risk reduction is the concept and practice of reducing disaster risks through systematic efforts to analyze and mitigate disasters' causal factors. Reducing exposure to hazards, lessening the vulnerability of people and property, wise management of land and the environment, and improving preparedness and early warning for adverse events are examples of disaster risk reduction (UNISDR, 2009a).

The process of conducting a risk assessment is based on a review of both the technical features of hazards such as their location, intensity, frequency, and probability; and the analysis on vulnerability and exposure to physical, social, economic, and environmental dimensions while taking particular account of the coping capabilities/adaptive capacities pertinent to the risk scenarios (UNESCO). Thus, in this study, risk considers the following

elements: hazard, exposure, and vulnerability.

According to Weichselgartner (2011), hazard is the physical process itself, while exposure refers to all those individuals, infrastructure, etc. which are exposed to disaster.Further, vulnerability is described as a social vulnerability that includes the susceptibility of social groups or society at large to potential losses from disastrous events. It considers the degree of the loss to a given element or set of elements at risk resulting from a natural phenomenon. Mitchell et al., (1999), UNDRO (1991), and Cutter and Guyette (1993), defined vulnerability as the likelihood that an individual or group will be exposed to and adversely affected by a hazard.

An individual or community's adaptive capacity is another critical factor to survive or cope with specific stressful life events like floods, and is one of the essential factors to consider in the process of disaster risk reduction. Burkett (2012) described the adaptive capacity or coping capacity as how people or organizations use available resources and abilities to face adverse consequences that could lead to a disaster. In general, this involves managing resources, both in normal times and during crises or adverse conditions (UNISDR, 2009a).

Given the definitions and descriptions mentioned above on the essential elements of disaster risk reduction (DRR), the equation in measuring the disaster risk reduction (DRR) is considered: DRR = Risk – AC

Methodology

Ethical Considerations

The conduct of the study followed the essential steps and ethical considerations in psychological research. Courtesy call was undertaken at the city, municipality, and barangay levels. Debriefing and informed consent were carried, detailing the important information of the study. During the debriefing activity, the researchers ensured that the participants were fully aware of their voluntary participation. The participants reserved the right not to answer the uncomfortable and less or not applicable questions. They have the right to withdraw their participation anytime from the survey/assessment. The resident psychologist of the university was part of the research program. Maintaining the utmost confidentiality of all data and information disclosed by the participants is another means of observing the *do-no-harm* approach. All accomplished questionnaires were kept in appropriate file storage where accessibility was limited to the study's researchers. Following the ISO standards, all files would be kept for five years and be shredded and adequately disposed of after that.

Research Sites

The study was made in five identified disaster-prone areas in Bukidnon (Fig.2), namely: Aglayan, Malaybalay; Batangan, Valencia; Guihean, Impasug-ong; Sampaguita and Magsaysay, Kibawe; and Palacapao, Quezon. Based on the literature review, these five areas often experienced floods and landslides. The selection of these sites was referred to the DRR Provincial Office. Residents of the mentioned identified areas were the respondents of the study.

Instrument and Data Collection

There were two sets of questionnaires administered to the same respondents. These respondents were purposively sampled. These respondents were residents and experienced natural disasters in their barangay for the past three years before the interview. The residents' participation was voluntary. The first questionnaire measured the DRR elements such as hazard and exposure. Indicators for readiness factors and efficiency were used in computing the adaptive capacity.

The second was a 42-item questionnaire that measures the negative emotional states of depression, anxiety, and stress adopted from Lovibond and Lovibond (1995). The University

psychologist assessed the questionnaire's applicability. It is a 4- point rating scale with a response category ranging from 0 (did not apply to me at all) to 3 (applies to me most of the time). The depression scale measure the major dimensions of depression experienced during natural disasters. The anxiety scale assessed autonomic arousal, skeletal muscle effects, situational anxiety, and subjective non-specific arousal. The stress scale assessed non-specific arousal like difficulty relaxing, nervous arousal, being easily upset/agitated, irritable/ over-reactive, and impatient.

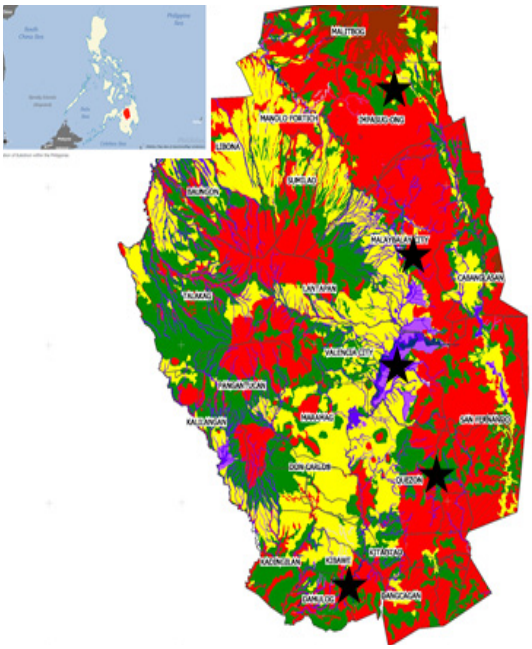

Figure. 2. Location map of Bukidnon (inset) and the map of Bukidnonshowing the five study sites from DENR Mines and Geosciences Bureau "Geohazard Map of Bukidnon."

The adopted DASS instrument was subjected to a reliability test to ensureits applicability to the Philippine setting. The tool has high internal consistency, with a Cronbach alpha of 0.945. Brief explanations were given to all the respondents regarding the item and the procedures in answering the inquiries.

Mathematical Calculations on DRR

The equation for Disaster Risk Reduction of the affected barangays is:

$$DRR = Risk - AC$$

Where risk is:

$$Risk = Hazard\ (H) \times Exposure\ (E) \times Vulnerability\ (V)$$

The elements of risk that include hazard, exposure, and vulnerability are operationally defined as follows:

Hazard (H) is the probability of a potentially damaging phenomenon to occur in a given time, period, and area. Using these elements, hazard, therefore is;

$$H = \frac{\text{total number of disaster occurrence in a locality}}{\text{Total number of disaster occurrence in Bukidnon}}$$

For exposure (E), these are the people exposed to hazard in a given area. It is expressed as the percentage of people exposed to hazard in a given area. Thus,

$$E = \frac{\text{No. of residents affected by a disaster in a locality}}{\text{Population of a locality}}$$

Vulnerability (V) is the degree of the psychological state of a community exposed to a potentially damaging event or hazard.

$$V = \frac{\text{Total number of residents with PHC}}{\text{The population of a locality}}$$

The adaptive capacity (AC) includes the preventive strategies such as making choices to avoid an event. It also includes the impact minimizing strategies that seek to facilitate recovery (Wisner et al., 2003). These elements expressed in terms of (i) readiness factor (RF) and (ii) efficiency (Eff). Readiness factors are factors that could determine the readiness preparedness of a community. Efficiency is the ability to do something or produce something without wasting materials, time, or energy (Difference between Efficiency and Productivity, 2020). Therefore, AC is:

$$AC_{PHC} = RF \times Eff$$

Where: AC_{PHC} = adaptive capacity on psychological health conditions

RF = readiness Factor

Eff = efficiency

The readiness factors considered in this study are the following:

RF1 - Attendance to training/seminars on preventing DAS
RF2 - Awareness in first aid exercises to manage DAS
RF3 - Availability of disaster supplies kit (i.e., battery-operated radio, flashlights and extra batteries, first aid supplies, sleeping supplies, and clothing)
RF4 - Availability of food and water supply
RF5 - Communitydeclogging activities

Given these readiness factors, the RF value is;

$$RF = \coprod_{i=1}^{5} \delta i$$

Specifically, the RF values are expressed as:

$$\delta_1 = \frac{\text{no. of seminars attended}}{\text{total no. of seminars conducted}}$$

$$\delta_2 = \frac{\text{no. of First Aid exercises capable of performing}}{\text{total no. of first aid exercises}}$$

$$\delta_3 = \frac{\text{no. of available disaster supplies kit on hand}}{\text{Total no. of disaster supplies}}$$

$$\delta_4 = \frac{\text{no. of available food and water supply on hand}}{\text{Total no. of available food and water supply}}$$

$$\delta_5 = \frac{\text{no.ofdeclogging activities performed}}{\text{Total no. of declogging activities conducted}}$$

For efficiency (Eff), it is expressed using the standard formula in physics where efficiency = output/input to get work efficiency as a percentage. In this study, efficiency considered the actual utilization of resources. The formula used across different methods of measuring energy/work is as follow:

$$\text{efficiency} = \frac{\text{total number of residents utilizing the psychological resources}}{\text{Total population affected by disaster}}$$

The psychological resources in this study refer to the parameters stated in the readiness factors. These parameters are said to be factors that affect the psychological health conditions of residents in areas hit by disasters.

Results and Discussion

Psychological Profile of the Respondents

Lovibond and Lovibond's (1995) depression, anxiety and stress scale revealed that most of the respondents were on the normal scale in all three subscales. It showed that the psychological health conditions of those affected by disasters in terms of depression, anxiety, and stress were not very alarming. Based on the gathered data, residents manifested very high social connectedness, could find refuge in a safe place, and could engage in healthy eating even after a disaster. However, some individuals demonstrated psychological health conditions, which were scaled as mild, moderate, and severe in the three aspects. In contrast few individuals fell on the extreme conditions for the anxiety subscale (Table 1).WHO (2002) reported that children and elderly were vulnerable to adverse health effects of floods. In this study, only a few elderly persons participated.

According to Lovibond and Lovibond (1995), DASS is not directly applicable to the measurement of subjects' momentary emotional state (i.e., how they feel "right now"); hence the use of this self-report questionnaire is suitable in this study.

Among the three scales of negative emotional state, the anxiety scale is consistently higher than depression and stress scales (Table 1). Anxiety occurs when a person feels disproportionate levels of distress, worry, or fear over an emotional trigger (Felman, 2018). Natural disasters such as floods are known as environmental elements or factors that cause an individual's negative emotional states. Given that the respondents came from disaster-prone areas and were at risk of floods and landslides, the feeling of worry remained intense, especially during heavy rainfall. This situation explains a significant number of anxious individuals. According to Mason et

Table 1.
Summary of the Respondents' Psychological States

Dimensional Scale	Barangay														
	Aglayan			Batangan			Guihean			Kibawe			Palacapao		
	D	A	S	D	A	S	D	A	S	D	A	S	D	A	S
Normal	29	13	32	24	17	25	20	14	22	22	13	20	19	17	23
Mild	7	6	5	5	3	2	4	6	2	0	2	4	4	2	1
Moderate	2	14	3	2	7	3	3	4	3	3	5	2	3	5	2
Severe	3	7	1	0	3	1	2	4	2	2	6	1	1	0	1
Extremely Severe	0	1	0	0	1	0	0	1	0	0	1	0	0	3	0
Affected DAS	12	28	9	7	14	6	9	15	7	5	14	7	8	10	4
Total Respondents	41			31			29			27			27		

Legend: D-Depression; A- Anxiety; S-Stress

al. (2010), the fear of reoccurrence increases following repeated exposure hence increases anxiety. Such claim agrees with the World Health Organization (2002) report statingthat the psychological effects of floods may continue for months or even years, suggesting that anxiety remains high in populations in flood-prone areas due to the threat of future flooding. Results of the study show a high score on items "*I found myself in situations that made me so anxious, I was relieved when they ended"* under the anxiety among respondents in the five barangays. The statements "*I had a feeling of shakiness (e.g. legs going to give way)"* and "*I experienced trembling* (e.g., in the hands) *"*ranked next (Table 2).

Studies discussed that anxiety disorders would directly implicate emotion (Thayer & Lane, 2000; Amstadter, 2008). Depression is one of the negative emotions felt by individuals suffering from a stressful life event. Brown et al. (1986) claimed that patients with anxiety are most likely to develop significant depression after stressful life events occur. Long-term studies have shown that anxiety occurs more commonly before depression (Angst & Vollrath, 1991; Breslau et al. 1995 as cited in Schneiderman et al., 2005). The same trend surfaced in this study, where the scale on depression comes second to anxiety (Table 1). In all surveyed barangays except for Kibawe, the depression scale has the second highest score after anxiety. Stuart (2004) defined that depression is an illness that involves the body, mood, and thoughts. It is often referred to as the invisible disease, affecting how a person eats and sleeps, how one feels about oneself, and the way one thinks about things (Johari & Marzuki, 2013). This negative emotion is characterized by Lovibond and Lovibond (1995) as the sadness of mood. Further examining Table 2, the item on being "*sad and depressed"* gets the highest rank in the depression scale. The symptoms like "*downhearted and blue"* and "*difficult work-up initiative*" follow. Lovibond and Lovibond (1995) explained that depressed mood is a strong emotion, but never the most substantial element of the depression scale over their whole series of samples, both normal and clinical.

The stress scale has the lowest response among respondents (Table 1). According to Yang et al. (2003), stress symptoms tend to decrease over time after a disaster.In turn, nervousness and agitation were the most common symptoms among these respondents experiencing stress. Table 2 shows the top three items on the stress scale, and these are"*using a lot of nervous energy*," "*getting agitated*," and "*state of nervous tension*."

Table 2.
Frequency of Individuals Experiencing Symptoms of Depression, Anxiety, and Stress

DASS Scale	Barangay					
Item Summary	Aglayan	Batangan	Guihe-an	Kibawe	Palacapao	Total
Depression						
Couldn't experience positive	21	11	19	13	12	76
Couldn't get going	13	6	10	9	8	46
Nothing to look forward to	16	7	8	10	10	51
Sad and depressed	34	18	18	19	18	107
Lost interest in everything	18	6	8	9	6	47
Not worth much as a person	13	6	9	3	8	39
Life not worthwhile	11	6	5	5	9	36
Couldn't get enjoyment	14	13	13	15	11	66
Downhearted and blue	26	20	18	21	19	104
Unable to become enthusiastic	21	11	12	5	10	59
Felt worthless	16	8	10	9	6	49
Nothing future hopeful	14	11	17	8	11	61
Life meaningless	11	7	11	10	9	48
Difficult work up the initiative	29	15	16	15	15	90
Anxiety						
Dryness of mouth	23	19	15	15	11	83
Breathing difficulty	21	16	13	15	9	74
Shakiness	30	24	19	17	16	106
Situations made anxious	38	27	26	22	23	136
Feeling of faintness	26	12	8	13	13	72
Perspired noticeably	26	13	15	17	13	84
Scared for no good reason	17	10	7	8	10	52
Difficulty swallowing	18	13	8	11	6	56
Aware of the action of the heart	26	12	16	13	13	80
Felt close to panic	22	12	13	17	10	74
Feared would be "thrown."	25	13	17	15	11	81
Terrified	23	14	17	20	16	90
Worried about situations/ panic	15	7	14	6	3	45
Trembling	24	20	17	18	16	95
Stress						
Upset by trivial things	25	22	17	18	17	99
Over-react to situations	23	21	13	8	9	74
Difficult to relax	32	18	17	10	13	90
Upset easily	23	20	16	17	13	89
Using nervous energy	32	21	22	21	18	114
Impatient when delayed	29	20	15	16	13	93
Touchy	24	15	18	16	16	89
Hard to wind down	22	9	13	7	12	63
Irritable	24	18	13	15	10	80
Hard to calm down	24	16	21	15	9	85
Difficult to tolerate interruptions	22	14	17	14	14	81
State of nervous tension	23	19	22	18	17	99
Intolerant kept from going on	18	16	17	16	14	81
Agitated	26	17	20	21	17	101

Though some of the respondents showed symptoms of negative emotional states, the overall results showed that the residents living in these disaster-prone areas are in the normal scale of psychological health condition. The residents' adaptive capacity could have attributed to their normal psychological health condition. These psychological health conditions of the residents are determinants of the community's vulnerability to the risk factors it faces. Any psychological dysfunction is a possible hazard; if an individual cannot cope successfully, he/she cannot be mentally resilient against such threats (UNISDR, 2009a; Werner & Smith, 1992). Paranjothy et al. (2011) emphasized that flooding and its after-effects are now a growing public health challenge.

Risk Assessment

Flooding in Bukidnon has become a concern of the cities of Malaybalay and Valencia due to the enormous waters from the river systems draining to the floodplain areas of these cities. The risk assessment of the five barangays in Bukidnon is expressed in terms of hazard, exposure, and vulnerability. Among the barangays, Barangay Batangan has the highest hazard result at 100% (Table 3). Barangay Batangan is a riverside village situated just across the Pulangui River. Pulangi River is one of the twelve (12) river systems in Northern Mindanao. The Upper Pulangi River Basin traverses three municipalities and two cities of Bukidnon including the cities of Malaybalay and Valencia. Batangan is one of the affected barangays where Upper Pulangi River drains (Paringit & Puno, 2017).The DENR River Basin Control Office (RBCO) states that the Upper Pulangui River Basin has a drainage area of 6,772 km² with an estimated annual run-off of 7,862 cubic meters (MCM) (RBCO, 2015). In 2017, Barangay Batangan was one of the affected barangays of Valencia due to typhoon Vinta. Floodwaters from Pulangi River and nearby creeks entered the residents' houses, flooding them up waist-high and causing them to stay in evacuation centers (PTV News, 2018).

Table 3.
Computed Risks of Residents in Terms of Hazard, Exposure and Vulnerability

	Barangay				
	Aglayan	Batangan	Guihe-an	Kibawe	Palacapao
Hazard	0.71	1.00	0.80	0.80	0.80
Exposure	0.41	0.50	0.40	0.20	0.50
Vulnerability	0.39	0.29	0.36	0.32	0.39
Risk	0.114	0.145	0.115	0.051	0.156

The four other barangays have a disaster probability of more than 70% since geographically these are identified flood or landslide-prone areas.

As shown on Table 3, in terms of exposure, Barangays Batangan and Palacapao show the highest percentage of exposed elements (50%) (i.e., persons affected) to a particular hazard (i.e., flood/landslide). This is consistent with the hazard result. Barangay Palacapao of the Municipality of Quezon is both a flood and landslide-prone area. Results further show that 40-41% of the residents of Barangay Guihe-an, Malaybalay City, and Aglayan, Valencia City, might be exposed to these identified hazards. The area of Kibawe has the least percentage (20%) of exposed elements to such identified hazards. The municipality is mainly affected by landslide incidents.

Though results show a high hazard and exposure values for Barangay Batangan, susceptibility or vulnerability of these exposed elements was low in this barangay. The low susceptibility or vulnerability of this barangay is credited to the residents' high readiness factor (Table 4).

Overall, the risk assessment in the five barangays of Bukidnon is categorized as acceptable. This means that the risk of the five barangays affected by disaster is minimal. Additional measures to further reduce risk or mitigate hazards can be added in conjunction with other security and mitigation upgrades.

The Adaptive Capacity of Residents of Bukidnon

The residents' adaptive capacity in this study is a function of the community's readiness factor and efficiency. Findings revealed that Batangan manifested the highest readiness factor and efficiency (Table 4). This result can be attributed to the institutionalization of DRR in the barangay through a well-organized and functional DRR team, competent DRR personnel, a fully equipped DRR office, and proper documentation through the submission of Annual Barangay DRR accomplishment report. Barangay Batangan has been awarded recognition for its preparedness for disaster risk reduction. Ruzek (2020) asserted that individuals who have effective coping and stress management skills would be more successful managing their experiences and exposure to disaster and other climate-related stressors.

Table 4.
Adaptive Capacity of the Affected Population in the Disaster prone areas

Barangay	RF	Eff	AC
Aglayan	0.006	0.389	0.004
Batangan	0.267	0.550	0.147
Guihe-an	0.003	0.389	0.001
Kibawe	0.028	0.415	0.012
Palacapao	0.020	0.374	0.007

Legend: RF- readiness factor Eff - efficiency AC- adaptive capacity

Table 4 shows the adaptive capacity of the barangay under study. Among the five barangays, Barangay Batangan gets the highest adaptive capacity. This result could be attributed to its readiness factors where Batangan consistently scored higher in its DRR elements which were attendance to seminars, the ability to perform first aid exercises, availability of disaster supply kit, food, and water, and declogging activities that were all reflected in their Barangay Annual DRR Report. Thus, Barangay Batangan can adjust to moderately potential damages, and coping with consequences for future disasters. IPCC (2001) defined adaptive capacity as the actual ability of a system to adjust (adapt) to climate change, variability and extremes, moderately potential damage by taking advantage of the opportunities, coping with consequences, as well as expanding its coping range under existing climate variability or future climate conditions.

However, Barangay Guihean consistently had the lowest readiness factor, efficiency, and adaptive capacity. The availability of disaster supply kits, food, and water was not visible based on ocular inspection of their barangay hall. There was also no evidence of an evacuation area in the vicinity. The absence of these things might have contributed to their low readiness factor value, which eventually resulted to low adaptive capacity.

The Disaster Risk Reduction (DRR) of Bukidnon

The barangays DRR is a function of risk and adaptive capacity. As reflected in Table 5, Barangay Batangan had the lowest DRR value due to a greater adaptive capacity. This might suggest that risk reduction and the response to a disaster is functional as it implements disaster risk management. Institutionalization and capacity building for the DRR team at the barangay level is evidence of a functional DRR. Having an evacuation center is also a common disaster risk reduction structural measures (UNISDR, 2009b). The United Nations International Strategy for Disaster Reduction (2017) asserted that reducing risk is

Table 5.
Summary of Risk Assessment (Hazard, Exposure and Vulnerability), Adaptive Capacity and Disaster Risk Reduction (DRR) by Barangay

Barangay	Risk	Adaptive Capacity	DRR
Aglayan	0.114	0.004	0.110
Batangan	0.145	0.147	-0.002
Guihe-an	0.118	0.001	0.117
Kibawe	0.051	0.012	0.039
Palacapao	0.156	0.007	0.149

about managing the risk that includes activities related to preparedness, transfer, prevention, and mitigation. Structural DRR measures are some of the things that would fall under risk management, and these measures are true in Barangay Batangan of Valencia City, Bukidnon.

Recommendations on Psychological Resilience Program

Today, psychological resilience is emerging as an essential component of societal resilience to disasters. As climate hazards and disasters are likely to increase in the coming decades, strengthening society's capacity to withstand these shocks and recover quickly is vital (Rodriguez-Llanes et al., 2013). According to Twigg (2007), in everyday usage, the word 'capacity' and 'coping capacity' often mean the same as 'resilience.' In terms of disaster preparedness, Frieman et al. (2011) defined it as a state of readiness to deal with a disaster if and when it occurs.

Inclusion and strengthening of psychological resilience programs are highly recommended. Localization of the DRR program may be adopted from the Roadmap for Building Community Resilience by Chandra et al. (2011), as illustrated in Table 6.

Table 6.
A Localized Program for Disaster Mitigation on Psychological Resilience

Area	Activities
Wellness	Ensure access to health services before and after disaster occurrence. There should be an assurance of continuity of care to affected residents.
Access	Provide "psychological first aid" or other early psychological or behavioral health interventions after a disaster.
Education	Reinforce coping skills and psychological wellness by developing public health campaigns focused on these messages.
Engagement	Build the capacity of social and volunteer organizations (i.e., non-governmental organizations) to engage citizens in collective action to address an issue or problem (e.g., community development or service project
Self-Sufficiency	Develop programs that recognize the vital role citizens can and must play as "first responders" to help their own families and neighbors in the first hours and days of a major disaster.
Partnership	Engage established and local organizations (e.g., cultural, civic, and faith-based groups; schools; and businesses) and social networks to develop and disseminate preparedness information and supplies.
Quality	Ensure that all disaster plans have identified common data elements (e.g., benchmarks for disaster operations) to facilitate seamless monitoring and evaluation of health, behavioral health, and social services before, during, and after a disaster.
Efficiency	Develop policies for effective donation management and provide the public with clear guidance on donations.

Conclusion

Generally, the residents living in disaster (flood/landslide) prone areas' psychological health condition in terms of depression, anxiety, and stress is normal. Residents become more anxious than being depressed or stressed when exposed to floods or landslides.The residents' psychological health conditions determine the community's vulnerability to disaster, increasing or decreasing the risk. High readiness factors and efficiency leads to a greater adaptive capacity. A high adaptive capacity significantly reduces the risk of a disaster.

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