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Factors Influencing Accessibility and Actionability of Risk Reduction Measures in Last Mile Communities: Insights from the Northern Philippines

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Table of Contents

List of Figures

List of Tables

Abbreviations

ADB	Asian Development Bank
ACAPS	Assessment Capacities Project
CNES	Centre National d'Études Spatiales
DENR	Department of Environment and Natural Resources
EW	Early Warning
EWS	Early Warning System
NDRRMC	National Disaster Risk Reduction and Management Council
PDRRMO	Provincial Disaster Risk Reduction and Management Council
PMT	Protection Motivation Theory
SMS	Short Message Service
UNISDR	United Nations International Strategy for Disaster Reduction
UNDRR	United Nations Office for Disaster Risk Reduction
UNEP	United Nations Environment Programme
USDA	U.S. Department of Agriculture
USGS	United States Geological Survey
WMO	World Meteorological Organization

ABSTRACT

Despite the vast research on factors influencing protective behaviour during disaster events, little is known about factors that impact accessibility of EWS and the predictors of risk reduction behaviour in last-mile communities particularly in the context of the Philippines, a country considered most vulnerable to climate change. Using a mix of quantitative and qualitative methods, this study identifies the factors that affect access to EWS and using the Protection Motivation Theory (PMT) construct, determines the variables influencing risk reduction behaviour before and after the Super Typhoon Mangkhut in two last mile communities in Northern Philippines. Results show that limited connectivity to the grid and the internet negatively impact last mile communities' ability to access EW messages. Moreover, both threat appraisal (such as perceived vulnerability, severity, and fear) and coping appraisal (namely response efficacy and self-efficacy) components were predictors of risk reduction behaviors. Extending the application of PMT to other variables proved insightful since previous typhoon experience, trust level to local authorities and strength of social networks were all positively related to respondents' adoption of risk reduction measures. This study provide valuable insights in understanding the rationale behind adoption of mitigation actions, which informs disaster communication strategies and the design of of risk reduction plan to empower so-called last-mile communities.

Keywords: early warning system, last-mile communities, actionability, accessibility, extreme weather event, Protection Motivation Theory, vulnerability, coping capacity

1.0 INTRODUCTION

The adoption of the 1994 Yokohama Strategy (UN 1994) and the Sendai Framework for Disaster Risk Reduction 2015–2030[1] in 2015 (UNISDR 2015) reflects the international community's effort to reduce the loss of lives, livelihoods and properties that come with natural hazards and extreme weather events. The United Nations Secretary-General likewise launched the *Early Warnings for All* (EW4All) Initiative in 2022, to ensure the whole world is covered by Early Warning System (EWS) by the end of 2027 (UNDRR, 2023). Toeing the line, national governments likewise enacted disaster risk reduction legislations and established institutions to reduce impacts of natural hazards to society by developing risk reduction and management plans, designing and implementing early warning systems, and raising risk awareness in various fronts.

Despite these efforts, natural hazards, particularly in countries vulnerable to extreme weather events continue to cause devastation to lives and properties (Šakić Trogrlić, et al., 2022). The marginalised and vulnerable members of the society, particularly the so-called last-mile communities, are almost always the first to suffer the brunt of disasters. In fact, over the last five decades, disaster-related events increased five times and continues to accelerate in the coming years (UNDRR, 2023). The importance of early warning system to reducing loss of lives in disaster events cannot be underestimated. It has been demonstrated that casualties and losses can be minimised with the use of accessible and actionable early warning system (UNDRR, 2023, Sahana, et al., 2023; Šakić Trogrlić, et al., 2022). One of the seven targets in the Sendai Framework for Disaster Risk Reduction 2015–2030 is to "substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030." The UNEP (2015) considers the early warning information as a form of basic human right that governments must provide particularly considering the frequency of extreme weather events attributed to the changing climate. In the past twenty years, about 62 million people could have prepared and minimised disaster losses given an operational Early Warning System (UNDRR, 2023).

While putting up an operational and functional EWS infrastructures is essential, making the early warning information accessible and actionable is equally if not more important to avert damages and losses. It is one thing to

[1] The Sendai Framework for Disaster Risk Reduction 2015–2030 provides a roadmap for countries to reduce disaster losses by 2030.

establish EWS infrastructure, it is another thing to make them accessible and actionable particularly for the last mile communities in need of it. Last mile communities in the context of EWS as understood in this paper, refer to the communities who are typically positioned as the last receivers not only of early warning information in the EWS supply-chain but also of disaster responses and rehabilitation efforts, not only because of their geographical location but also because of their associated physical, cultural and social vulnerabilities. Hence, this vulnerability encompasses both geographical and social categories (Arvind, 2022; Shrestha, et al., 2021). Considering the nature of these communities, they needed to be effectively integrated in the design of EWS as they usually are the first to suffer the most impact of extreme weather events due to their high vulnerability but low coping capacity.

While a great number of studies have been published regarding the assessment of effectiveness of EWS (Sahana, et al, 2023; Fakhruddin and Schick (2022); Abu Syed, et al., 2022; Ahsan, et al, 2020) and factors influencing mitigation behaviour pertaining to various disaster-related events (Eusse-Villa, 2024; Poussin, et al., 2013; Kellens, et al., 2012; Botzen et al., 2009; Lindell and Hwang, 2008; Miceli et al., 2008; Neuwirth et al., 2000), majority of these studies are not necessarily focused on the so-called last mile communities where threats of disasters are actual ground realities. Much needs to be understood on how last mile communities access EWS, how EW information are acted upon and what factors trigger risk reduction measures before and after disasters. This study hopes to contribute to this yet evolving academic conversation on disaster risk studies.

How do last mile communities access EWS before the onset of disasters? What variables influence the accessibility of EWS? What explanatory factors trigger the implementation of risk reduction actions before and after an extreme weather event? Using a mixed of qualitative and quantitative research, this paper attempts to answer these intertwined questions in the context of two last mile communities namely the coastal village of Cabalitian in Sual and the mountain village of Mapita in Aguilar[2] (Figure 3) by examining their perceptions and lived experiences before, during and after the Super Typhoon Mangkhut (local name “Ompong”).

Mangkhut hit the Philippines on September 2018 as a Category 5 cyclone. Ranked as the third-strongest tropical cyclone worldwide in 2018, it was the strongest to hit Luzon since typhoon Megi in 2010 and the most destructive to make landfall in the Philippines since typhoon Meranti in 2016. Preemptive evacuations were conducted, especially in regions like Ilocos, Cagayan Valley, and Cordillera, which were severely affected. After leaving its trail, the typhoon caused an estimated PHP33.9 billion (US$626.8 million) in damages and 127 fatalities (NDRRMC, 2018).

[2] Both Sual and Mapita are municipalities of Pangasinan.

The aim of this paper is two-fold: firstly to identify the factors that affect the accessibility of EWS; secondly, to determine the factors that influence the actionability of EWS in the context of the supertyphoon Mangkhut in the Philippines using an expanded application of the Protection Motivation Theory (PMT). The insights drawn from this study is hoped to produce insights on the accessibility and actionability of EW information in the context of vulnerable last mile communities and to help inform policy by providing actionable items on improving the accessibility and actionability of information from EWS.

The remaining sections of this paper are structured logically as follows: the Literature Review section presents a brief backgrounder on the vulnerability of the Philippines to extreme weather events, accessibility and actionability of EWS and the Protection Motivation Theory. The Methods section details the project sites, research techniques used, the data collection tools and procedures employed and statistical treatments used. The Results and Findings section presents the data on socio-demographics, risk sources and EWS-related data, factors of accessibility, sentiment analysis data and the determinants of actionability of risk reduction measures before and after Mangkhut. The Discussion and Implications interpret the findings in the context of existing literature, discuss their theoretical and practical implications, and offer policy implications for policymakers and humanitarian organizations. Finally, the Conclusion summarizes the main insights of the study and suggests avenues for future research.

2.0 LITERATURE REVIEW

2.1 THE VULNERABILITY OF THE PHILIPPINES AND ITS LAST MILE COMMUNITIES

The Philippines consistently makes it to the list of most vulnerable countries in the world in terms of climate-related risks in the last fifteen years or so. In 2023, the Philippines was labeled as the most disaster-prone country in the world scoring 46.86 out of 100 (World Risk Index, 2023). Due to its geographical location in the Northwest Pacific Basin and the Pacific Ring of Fire, floods, typhoons, landslides, earthquakes, volcanoes, and droughts are common occurrences across its vast archipelago (ACAPS, 2014). Each year, this area is frequented by around 27 typhoons, and 7 of them almost always hit the Philippines in catastrophic ways (World Bank, 2020).

On a long-term average basis, it is estimated that the Philippines loses Php 177 billion annually in both public and private assets from typhoons and earthquakes. In the next 50 years, there is a 40% chance that losses will go over Php 1.73 trillion and a 20% chance for losses to exceed Php 2.74 trillion (World Bank, 2018). While direct causal relations between climate change and the frequency of typhoons remain hazy, intense storms might become more frequent and damages could increase by up to 35% by 2050 (Table 1; World Bank and the Asian Development Bank, 2021).

Table 1 Estimated Loss to Typhoons and Typhoons (in Millions-PHP)

Private Assets (Years)	Average Annual Loss	10	25	50	100	250	500
Current (1971–2005 Climate)	127,383	296,889	509,027	739,287	1,100,479	1,794,684	2,438,047
Future Climate (2036–2065 Max)	174,853	393,354	646,754	1,036,409	1,539,242	2,791,930	3,864,873
Future Climate (2036–2065 Min)	123,637	293,532	501,098	715,580	1,055,164	1,781,276	2,346,042
Government Plus Emergency							
Current (1971–2005 Climate)	21,700	45,999	83,315	132,897	205,087	344,753	459,957
Future Climate (2036–2065 Max)	29,786	60,945	105,858	186,308	286,856	536,321	729,139
Future Climate (2036–2065 Min)	21,062	45,479	82,018	128,635	196,642	342,178	442,600

(Source, World Bank and the Asian Development Bank, 2021)

Initial estimates suggest that climate change could raise the cost for emergency response for strong typhoons by over 50%. Figure 1 shows the predicted emergency response costs (in millions-PHP) for the Philippine government under future climate scenarios. It displays the expected costs for events with different return periods, like a 1-in-100-year event, which has a 1% chance of happening in any given year. As can be gleaned in Fig. 1, under a future scenario (2036-2065), the estimated maximum (orange line) Philippine government spending and emergency cost for a typhoon event that has a return period of 100-year is approximately Php 287 billion, whereas the estimated minimum cost (blue line) is around Php197 billion.

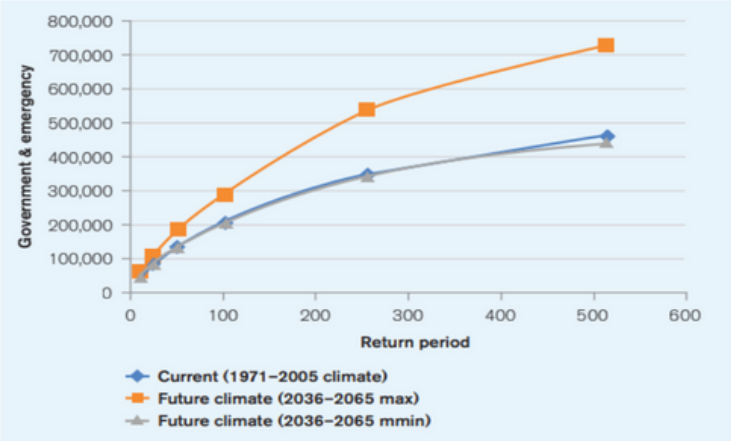


Fig.1 Emergency Response Costs (2036-2065) in Millions-PHP (Source: Asian Development Bank, 2021)

Due to its long history of struggles to natural hazards, the Philippines has developed a disaster experience, which is idiosyncratically reflective of its own cultural and social norms. Hazard events in the Philippines become even more intense and frequent due to the aggravating effects of climate change (UNDRR, 2023). In the last twelve years, the Philippines experienced three of the most destructive super typhoons in recorded history, namely Haiyan (Yolanda), Mangkhut (Ompong) and Rai (Odette) in 2013, 2018 and 2021 respectively (Del Rosario, 2014; Jalad, 2018; Gutierrez, 2021). These disasters have ripple effects that result not only to economic losses (Jiang, 2024; Botzen, et al., 2019) but also to loss of lives and livelihoods for vulnerable communities. The combination of the country's geographical location and frequency of natural hazards requires an urgent attention to enhance disaster preparedness and to implement mitigation measures particularly to the so-called last mile communities.

2.2 ACCESSIBILITY AND ACTIONABILITY OF EWS

A functional, operational, multi-hazard and people-centric EWS is crucial to last mile communities in developing countries. Despite some progress in improving the coverage of EWS worldwide, the World Meteorological Organisation (WMO) reported that from among 73 countries, about one-third are without EWS and merely 40% have multi-hazard EWS (WMO 2020; Šakić Trogrlić, et al., 2022). It was reported that in the last twenty years, about 62 million people affected by disasters live in countries without EWS. Without investing more in early-warning systems to build resilience, developing countries may see more people affected by natural hazards as their populations grow (UNDRR, 2023).

Accessibility and actionability of EWS are two important considerations in ensuring that last mile communities are not left behind in disaster preparedness. Accessibility is the ease with which individuals or communities can draw information from various channels and sources necessary for disaster preparedness and response. In the context of EWS, accessibility includes availability of early warning messages, the trustworthiness and reliability of communication channels, and the comprehensibility and multiplicity of sources of EW information (Basher, 2006).

Having an operational EWS is just one side of the disaster preparedness equation. Taking actions based on the Early Warning (EW) information completes it. The actionability of EW information is therefore pivotal to avert disaster losses. Actionability refers to the ability of individuals or communities

to take appropriate actions based on the information received from EWS. This includes having clear guidance on evacuation routes, emergency shelters, and other protective measures. This also includes being able to act upon perception of risks bearing in mind the circumstances (Wachinger et al., 2013). It is not enough for last mile communities to simply receive information about an impending disaster. These early warnings must be unambiguous, timely, and detailed enough to guide effective responses. Actionable information empowers vulnerable segments and communities to make informed decisions, undertake appropriate protective measures, and mobilize resources efficiently.

2.3 THE PROTECTION MOTIVATION THEORY (PMT)

In the past few years, a burgeoning literature on the use of Protection Motivation Theory in assessing the influence of a number of explanatory variables regarding protective measures on disaster-related events has emerged. Majority of these studies examined the components of the Protection Motivation Theory and their relation to actions relative to floods, earthquakes, wildfires, typhoons, landslides, cyclones, among other disaster events (Hu, et al., 2022; Sim, et al., 2018; Bubeck et al., 2013; Kreibich & Thieken, 2009; Siegrist & Gutscher, 2008; Grothmann & Reusswig, 2006).

Originally conceptualised by Rogers (1975), the Protection Motivation Theory describes the process through which individuals perceive information about hazards, assess the risks, and apprise the effectiveness of certain measures, leading to either adaptive or maladaptive behaviors (Eusse-Villa, 2024; Grothmann & Reusswig, 2006).

Rogers (1975) explains the theory succinctly in the following manner:

> *"...protection motivation is an intervening variable that has the typical characteristics of a motive: it arouses, sustains, and directs activity ... Therefore, a basic postulate is that protection motivation arises from the cognitive appraisal of a depicted event as noxious and likely to occur, along with the belief that a recommended coping response can effectively prevent the occurrence of the aversive event. If an event is not appraised as severe, as likely to occur, or if nothing can be done about the event, then no protection motivation would be aroused, and hence there would be no change in behavioral intentions...The proposed formulation asserts that attitude change is not mediated by or a result of an emotional state of fear, but rather is a function of the amount of protective motivation aroused by the cognitive appraisal processes (Rogers, 1975, pp. 98-100)."*

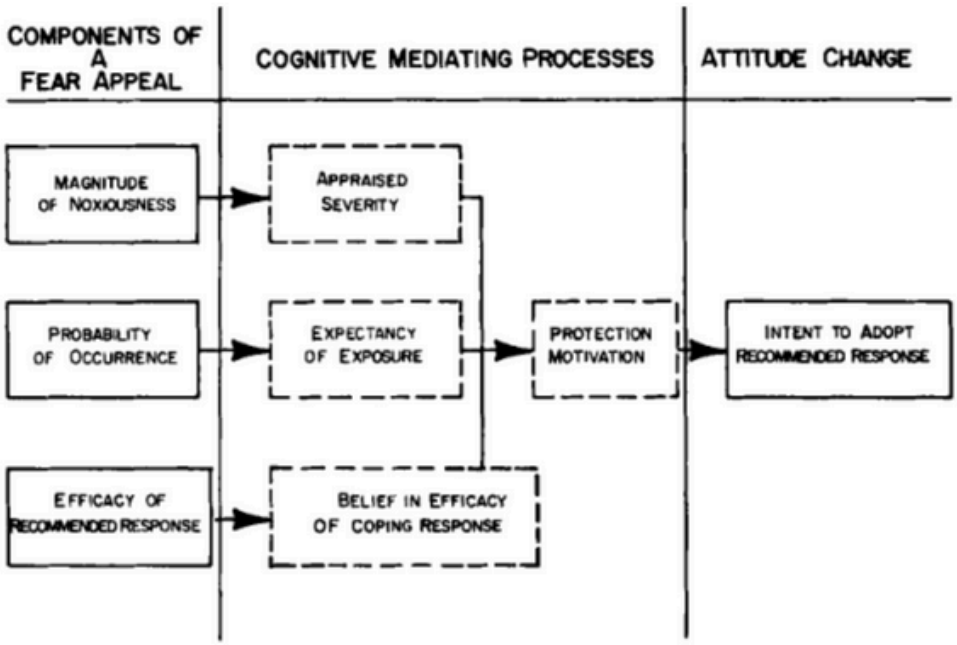


Fig.2. The schema of Protection Motivation Theory (Rogers, 1975, p. 99)

The theory posits that protection motivation arises from the cognitive appraisal of a threat and the evaluation of coping responses. Expressed differently, Protection Motivation Theory (PMT) explains how people decide to protect themselves from threats. Central to PMT are two analytical components: threat appraisal (composed of perceived vulnerability and perceived severity) and coping appraisal (response efficacy and self-efficacy).

(i) Perceived Severity: How individuals perceive the threat and how grave they think the threat is.

(ii) Perceived Vulnerability: How vulnerable do they feel in relation to the threat.

(iii) Response Efficacy: How effective they think the response measures to address the threat

(iv) Self-Efficacy: How confident they are in their capacity to take actions.

(v) Response cost: How do cost figure in as barrier in taking action

In the context of super typhoons (e.g., Mangkhut in this study), PMT provides a heuristic device to explain how and why villagers decide to take responses before and after extreme weather events. Before the onset of a super typhoon, local folks immediately consider how serious the super typhoon would be, how vulnerable they are and how they are likely to be affected. If they believe the threat is serious and that they are likely to be impacted, they are more predisposed to take steps to protect themselves, like evacuating or securing their homes. Their belief in the efficacy of these measures and their confidence

in implementing them are also at play. Understanding these factors can help inform disaster response strategies by understanding the underpinning cognitive and affective factors that nudged people to take necessary protective actions in times of disasters.

Past studies in PMT disclose mixed and varying results across examined variables occurring in different contexts. Some research indicates that perceived vulnerability drives individuals to adopt protective actions in preparing for natural hazards (Abunyewah et al., 2018; Babcicky and Seebauer, 2019). Other studies found perceived severity to have an independent effect on a person's decision to prepare for a natural hazard (Wirtz and Rohrbeck, 2018). Some studies analysed the components of coping appraisals such as response efficacy, self-efficacy, and response costs (Grothmann & Reusswig, 2006; Zaalberg et al., 73). While self-efficacy is considered a strong predictor of adaptive behavior, its operationalization remains a challenge; its effect is often conflated with response costs (Weinstein, 92). Research likewise shows the influence of previous flood experience in household perceptions and behaviors in flood damage mitigation (Bubeck et al., 2013; Kreibich & Thieken, 2009; Siegrist & Gutscher, 2008). For instance, Poussin et al. (2013) revealed that the reasons behind taking protective measures of flood-prone households go beyond incentives. Flood preparedness are also found to vary on account of regional differences and local peculiarities (Bubeck et al., 2012b; Kellens et al., 2012). Social networks and social norms also exert influence households' decision to adopt protective measures (Harries, 2008, 2012; Kunreuther et al., 1978). Socio-economic characteristics can also drive the adoption of mitigation measures, but the evidence regarding their effect on flood preparedness is inconsistent and varies across different contexts and studies (Bubeck et al., 2012; Kellens et al., 2012). Consequently, the PMT as a tool remains a viable analytical device that provides fertile space for improvisation and theorisation.

While several studies have been published using PMT as a tool in the context of disaster-related events such as floods, earthquakes, and typhoons, studies specifically examining factors of accessibility and actionability of early warning information in the context of last-mile communities during an extreme weather event (e.g., Super Typhoon Mangkhut) in a vulnerable country such as the Philippines appear to be limited.

Considering their high vulnerability and low coping capacity, how should last-mile communities navigate disaster losses? What factors hinder access to EWS of people in last mile communities in the context of an extreme weather event such as a super typhoon? What factors nudge people in last-mile communities to take action to protect themselves based on an EW information before and after super typhoon? This paper hopes to contribute in this yet emerging discourses in the field.

3.0 METHODOLOGY

3.1 PROJECT SITES

The study areas include the island village of Cabalitian in Sual and the mountain village of Mapita in Aguilar (Figure 3). Both are situated in the province of Pangasinan which is considered as one of the most vulnerable and disaster-prone provinces in the Philippines (Manila Observatory, 2009; Department of Environment and Natural Resources, 2009; World Bank, 2009). Pangasinan was one of the provinces severely affected by Super Typhoon Mangkhut in 2018 leading to the evacuation of 2,335 families and an estimated 9,507 individuals seeking shelter to the 104 evacuation centers spread across Pangasinan. Mangkhut destroyed 40,743 hectares of rice fields and 664 hectares of vegetable farms in various towns. The typhoon also caused economic losses in the province---an estimated Php 1.65 billion in agriculture and Php 52 million in infrastructure (PDRRMO, 2018; Austria, 2028).

Cabalitian is an island coastal village whereas Mapita is a mountain village. Due to their geographical remoteness and rugged terrains, inadequate transportation infrastructures, lack of access to critical resources during disasters, and social vulnerabilities, they aptly fit the description of “last mile communities.” Both villages have also experienced the onslaught of super typhoons such as Yolanda (Haiyan), Mangkhut (Ompomg) and Rai (Odette) in the past 12 years.

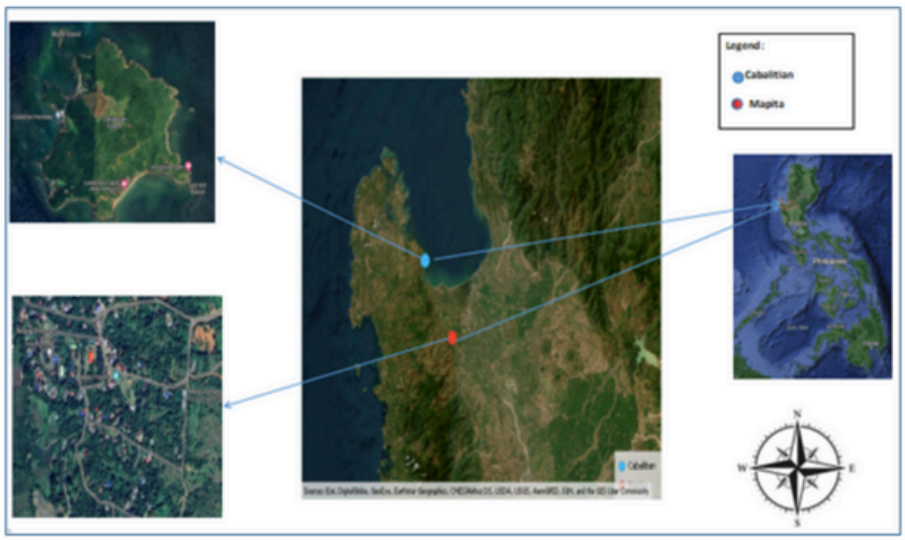


Fig. 3 Study areas include the Cabalitian and Mapita communities in Pangasinan, Philippines

The island village of Cabalitian (Figure 4) is situated about 10 kms away from the town of Sual, separated from the island of Luzon itself facing the South China Sea. With an estimated population of 1100, Cabalitian is one of the barangays of Sual, Pangasinan. People rely mainly on fishing and eco-tourism as their livelihoods. It is also situated near the Sual Power Plant which is the largest coal-fired power plant in the Philippines in terms of installed capacity. As the gateway of typhoons coming out of Luzon, Cabalitian island experiences annual typhoons, storm surge, saltwater intrusion and marine degradation due to the proliferation of fishing cage operations within its vicinity.

Figure 4. The island of Cabalitian in Sual, Pangasinan (Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community)

The mountain village of Mapita (Figure 5) is a sitio (part of a barangay) of Laoag, Aguilar, Pangasinan. The village is mostly populated by indigenous peoples belonging to the Kankanaey, Ibaloy and Bago who had settled in the 496-hectare rolling terrain of the Zambales mountain range in the 1960s. The village is situated approximately 12 kilometers from the town of Aguilar. Dependent of farming, hunting and vegetable gardening, the Mapita villagers cultivate an estimated 150 hectares of land producing corn, rice, vegetables and root crops. Considering the ruggedness of its terrain, Mapita villagers had experienced landslides, typhoons, among other disasters in the past.

Figure 5. The community of Mapita in Aguilar, Pangasinan (Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community)

3.2 RESEARCH DESIGN

A blend of qualitative and quantitative approaches were used in the study, including a comprehensive review of literature and secondary data sources, survey, regression analysis, sentiment analysis, key informant semi-structured interviews and risk mapping during site visits.

3.3 DATA COLLECTION

Secondary data collection begun as early as October 2023. Grey literature, previous studies conducted in the area and policy materials relevant to disaster risk reduction in both international and domestic scales were analysed and synthesized. Actual fieldwork (survey and semi-structured interviews, landscape mapping) commenced in November 2023 and concluded in January 2024.

The researcher was assisted by some local folks in Cabalitian; whereas a team consisted of some public elementary school teachers assisted the researcher in his fieldwork in Mapita.

Before distributing the questionnaires in Cabalitian and Mapita, a pilot test was conducted in a nearby barangay with similar characteristics. Fifteen (15) participants helped test the questionnaire, allowing the researcher to evaluate question validity, interview duration, and questionnaire flow. This process also familiarized him with the tools, potential flaws and necessary adjustments to be made. Debrief meetings helped refine the final data collection tools, which were then updated and reproduced by the researcher.

A total of seven (7) enumerators (3 in Cabalitian; 4 in Mapita) assisted the researcher to conduct field data collection in the targeted villages. The recruited enumerators were trained to go over the study objectives and outcomes of the study, study methodology, interviewing skills, techniques for facilitating, moderation, and recording of responses to enable the collection of quality data. Following the necessary coordination in the sites, informed consent for the interviews and survey administration were secured before data collection in compliance with ethical standards.

3.4 SURVEY AND SAMPLING

The survey questionnaire was design to draw information regarding socio-demographics (age, gender, education, etc), EWS-related information (e.g., sources of EW message, sources of risk) and data related to the various components of PMT. It was administered among randomly chosen target population of Mapita and Cabalitian in Pangasinan following a two-stage stratified random sampling. The estimated population for each village was first determined based on local sources (Mapita, about 980; and Cabalitian, approximately 1,098). Only adult populations[3] who have experienced the Super Typhoon Mangkhut for each village were included in the first initial sampling determination.

A random sampling was then conducted from these target adult populations resulting to a total of 108 and 121 respondents for Mapita and Cabalitian respectively (Table 3). In Cabalitian, 57 (47.11%) were male while 64 (52.89%) were female. In Mapita, 50 were male (46.30%) and 58 were female (53.70%) . In Cabalitian, most of the respondents are within the age range 26-40 (34.71%); in Mapita, 41-59 (31.48%). Regarding education, most respondents finished

[3] By adult population, I refer to individuals at least 18 year of age.

secondary school (Cabalitian, 43.52%; Mapita, 33.06%). In both villages, most respondents earn between Php 100,000-Php 300,000 annually. As to home ownership, a great majority of the respondents owned properties affected by Mangkhut (Mapita, 89.81%; Cabalitian, 74.23%). While both communities have good connection to the grid (Mapita, 76.85%; Cabalitian, 90.08), internet connectivity remains a communication hindrance during extreme weather events such as Mangkhut (Mapita, 55.56%; Cabalitian, 45.45%) (Table 2). Both villages were situated more than 7 kms away from the evacuation center or shelter (Table 2).

Table 2 Socio-Demographics of Mapita and Cabalitian

Variable	Category	Sample Distribution	
		Mapita (%) N=108	Cabalitian (%) N=121
Gender	Female	46.30	47.11
	Male	53.70	52.89
Age (years)	18-25	17.59	14.88
	26–40	29.63	34.71
	41–59	31.48	30.58
	> 60	21.30	19.83
Education	Higher Education (at least a Bachelor degree)	27.78	20.66
	Tertiary (non-graduate)	43.52	33.06
	Vocational	11.11	18.18
	Secondary	17.59	28.10
	Elementary	27.78	20.66
Ownership	Owner	89.81	74.23
	Tenant	10.19	8.42
Income (Php/year)	<100,000	26.85	24.79
	100,000-300,000	45.37	47.93
	301,000-400,000	13.89	11.57
	401,000-500,000	9.26	6.61
	>500,000	4.63	9.09
Power supply connectivity	Yes (1)	76.85	90.08
	No (0)	23.15	9.92
Internet Connectivity	Yes (1)	55.56	45.45
	No (0)	44.44	54.55
Proximity to Evacuation Center/ Shelter	> 1 km	0	0
	1-2 km	0	0
	>2-4 km	0	0
	>4-7 km	0	0
	>7 km	100	100

(Source: Fieldwork survey)

The PMT-related data section of the survey include (i) threat appraisal (perceived probability; perceived severity; perceived vulnerability); and (ii) coping appraisal (perceived self-efficacy, perceived response efficacy, perceived cost of the response) which were based on existing literatures on the Protection Motivation Theory (Reynauld et al, 2013; Poussin et al, 2014; Grotthman and Reuswigg, 2006; Milne, et al., 2001; Rogers, 1975). I expanded the application of PTM to include certain socio-demographic characteristics, prior typhoon experience, the strength of social networks and level of trust to the local authorities (Figure 6). The purpose of using the expanded PMT is to determine factors that influence decision to take risk reduction measures before and after Mangkhut.

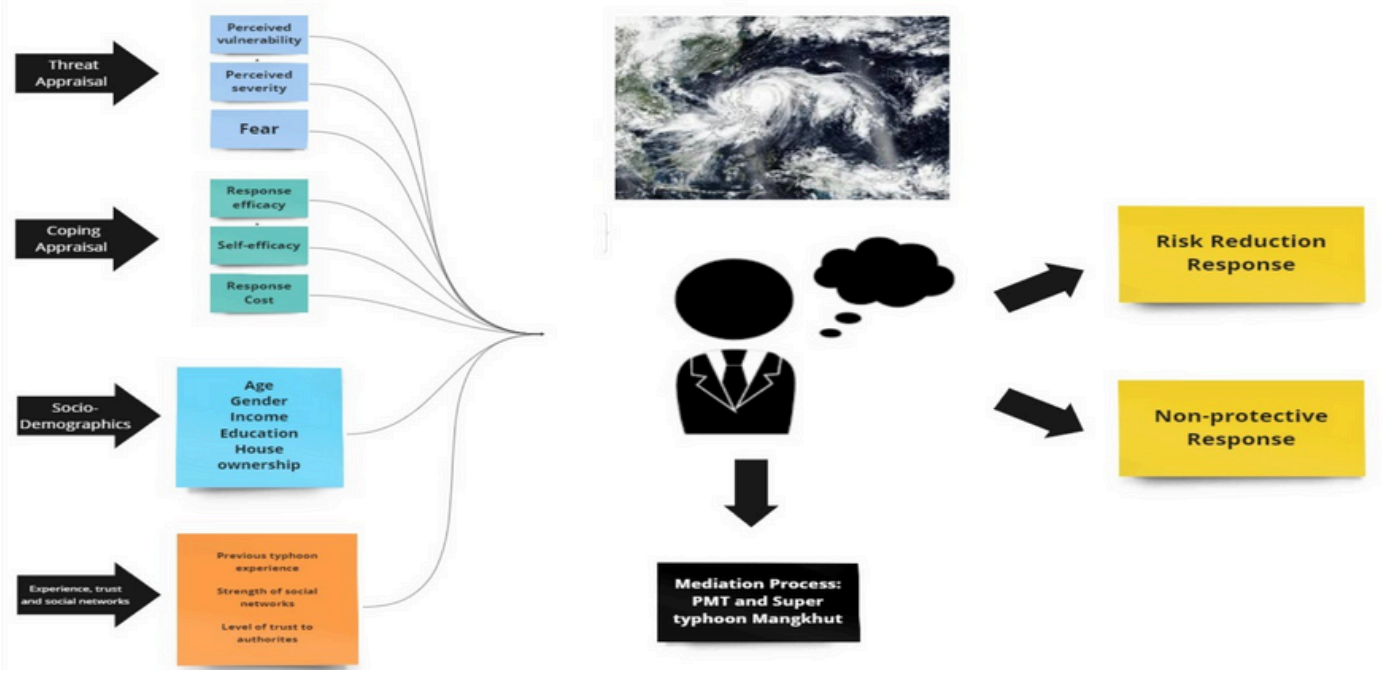
3.5 REGRESSION ANALYSIS

The researcher conducted an OLS regression analysis to identify whether the PMT variables in Figure 6 influence the decision of the respondents in both villages to implement or not to implement risk reduction measures before and after Mangkhut. The risk reduction measures implemented before and after Mangkhut are the study's dependent variables. The explanatory or predictor variables are the components of PMT, socio-demographics, prior typhoon experience, the strength of social networks and level of trust to the local authorities.

The dependent variables were represented by dummy variables (1 for having acted on at least 1 risk reduction measure, and 0 for no measure) (see further details, Appendix C). The explanatory variables were based on respondents' self-reported ratings (from 1-strongly disagree to 5-strongly agree). To address the issue of multicollinearity in the analysis, variables with a Pearson correlation coefficient above 0.70 were excluded in the final regressions to ensure the reliability and interpretability of the regression models.[4] Multicollinearity occurs when two or more independent variables in a regression model are highly correlated, meaning they contain similar information about the variance in the dependent variable. This makes it difficult to determine the individual effect of each independent variable on the dependent variable because their effects are not independent of each other. These exclusions help to prevent multicollinearity, which can lead to unstable estimates and reduced clarity in understanding the individual effects of the explanatory variables.

[4] Specifically, the researcher excluded perceived probability as it was highly correlated with perceived severity. Similarly, perceived flood damage was excluded due to its high correlation with fear, and time needed to implement the measure was excluded because of its high correlation with the perceived cost of implementing the measure.

Fig. 6. Modified PMT Schema as conceptualized in this paper based on Rogers (1975)



Source: Author's construction based on the Protection Motivation Theory (Rogers, 1975)

3.6 SEMI-STRUCTURED INTERVIEWS

Using snowball sampling, I interviewed a total of 25 key informants in both villages. Fifteen (15) key informants consisting of local leaders, fisher folks, professionals and entrepreneurs were interviewed in Cabalitian; whereas in Mapita, 20 key informants composed of local leaders, vegetable farmers and indigenous members of Kankanaey and Ibaloi were interviewed. The purpose of the semi-structured interview is to triangulate the data obtained from the survey analysis. Apart from their socio-demographics, livelihoods and impact of disasters, respondents were asked to further probe the "whys and hows" of accessibility and actionability of the EWS in the context of Super Typhoon Mangkhut. They were also asked how have their perceptions and their actions changed since the occurrence of super typhoon such as Haiyan (local name "Yolanda") in the country and to what extent has this influenced the measures they implemented in Mangkhut and possible actions in the future relative to super typhoons. The interviews were also opportunity to explore emotions and perspectives which were not otherwise apparent from the survey result.

3.7 SENTIMENT ANALYSIS

The researcher also performed a sentiment analysis of comments from the 6 Facebook posts of Pangasinan PDRRMO from September 11-15, 2018, with the highest recorded user reach prior to Mangkhut's onslaught in Pangasinan (Table 3; see also at Appendix D).

Table 3 Pangasinan PDRRMO Facebook Posts Used for Sentiment Analysis

Date	Early Warning Messages in PDRRMO Facebook Page Before Mangkhut	No. of Reactions	No. of Comments	No. of Shares
September 15, 2018	Storm surge warning 3 in coastal areas (Payong Kaligtasan Storm Surge)	661	165	1.3K
September 15, 2018	Typhoon Ompong (Mangkhut) typhoon signal warning	308	23	190
September 14, 2018	Storm Surges Warning	425	54	982
September 12, 2018	Weather Advisory 4	291	29	236
September 11, 2018	Weather Advisory 3, 2018	260	35	376
September 11, 2018	Weather Advisory 2, 2018	324	22	286

The goal is to explore the words and structures used in the comments to construct meaning (Crabtree and Miller, 1999). All these Facebook posts contains storm warning information, updates and whereabouts of Mangkhut and measures proposed to be taken in relation to storm surge and flashflood warning. These comments were extracted from the official Facebook page of the Provincial Disaster Risk Reduction and Management Council (PDRRMO)[5] using the software Facepager. Comments expressed in the vernacular were translated into English and then pre-processed before analysed and visualised. Quantitative sentiment analyses of the text-based comment dataset was done using the data-mining software Orange.

Sentiment analysis is a technique in natural language processing (NLP) used to assess the emotional tone or sentiment expressed in text by looking into the polarity of emotions or sentiments reflected within it (Hutto and Gilbert, 2014). For this study, sentiment analysis was employed to provide context for the general public sentiment before Super Typhoon Mangkhut. By examining social media posts and community discussions in the PDRRMO Facebook page, the analysis helped gauge the prevailing mood and attitudes. The researcher identified and categorized the user's emotions and and opinions before the occurrence of Mangkhut in Pangasinan into positive, neutral and negative. The average of these emotions were expressed numerically as

[5] The Provincial Disaster Risk Reduction and Management Council (PDRRMO) is considered the provincial-level administrative office in charge of disaster-related events in Pangasinan

compound. Results of the analysis were translated into descriptive statistics (mean, median, mode, etc.), heat map and a word cloud.

3.8 RISK VULNERABILITY MAPPING AND TRANSECT WALK

Accompanied by some local folks, the researcher also employed transect walks to survey both the Mapita and Cabalitian villages to identify the sections or spots in the villages which are prone to various disasters. During the transect walks, the researcher made notes of the terrain, infrastructure, and land use patterns in both villages. With the help of local villagers, these spots were first initially marked in a sketch map tool, georeferenced and digitized using the ope-access online software uMap for further analysis.

4.0 RESULTS AND FINDINGS

4.1 RISKS AND EWS-RELATED DATA

Residents of Mapita considered typhoons (100%), floods (62.04%), and landslides (51.85%) as their primary sources of risk. Cabalitian residents, on the other hand, identified typhoons (99.17%), floods (48.76%), storm surges (47.93%), and marine pollution (47.93%) as key sources of risk (Table 4; Figure 7).

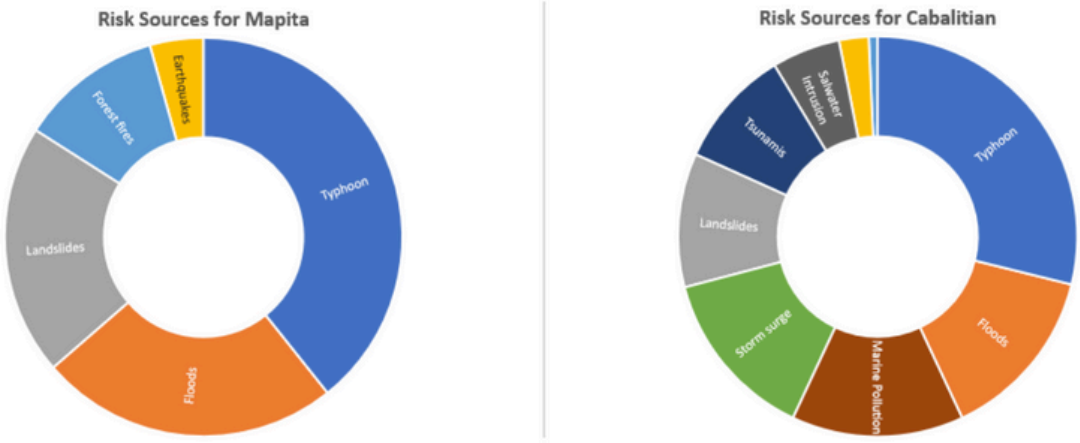


Figure 7. Sources of Risks for Mapita and Cabalitian (Source: Fieldwork survey)

Typhoons are overwhelmingly recognized as a primary source of risk by residents in both Mapita and Cabalitian. The survey result was affirmed by some respondents during the interviews. Highlighting the frequency of typhoons and its risk to agricultural livelihoods, a vegetable farmer from Mapita highlighted this concern:

> "Typhoons are really frequent here in Pangasinan. Everyone experiences typhoons, and not just once in a year but several times. Our crops which are near harvest get destroyed when flood water invades the field. We lose our income when a typhoon hits..." [6]

Discussing the threat of typhoons, a fisher folk from Cabalitian remarked:

> "Our location is right by the sea, so we cannot avoid experiencing typhoons and frequent heavy rains. Sometimes, there are storm surges caused by the typhoon , although infrequently. This has become a source of concerns to us because without adequate preparation, it can be devastating to our livelihood..." [7]

Table 4 Sources of Risk and EWM

Variable	Category	Sample Distribution	
		Mapita (%) N=108	Cabalitian (%) N=121
Perceived sources of risk	Typhoon	100.00	99.17
	Floods	62.04	48.76
	Landslides	51.85	37.19
	Earthquakes	11.11	8.26
	Forest fires	29.63	2.48
	Storm surge	0.00	47.93
	Tsunamis	0.00	33.06
	Marine Pollution	0.00	47.93
	Saltwater Intrusion	0.00	19.01
Sources of Early Warning Message	Social Media	50.93	37.19
	SMS from NDRRMC	53.70	36.36
	TV	80.56	80.17
	Radio	51.85	55.37
	Newspaper	7.41	4.96
	Barangay Mobile Car	13.89	9.92
	Village Siren	11.11	0.00
	Relatives	54.63	57.02
	Traditional indigenous knowledge	73.15	37.19

(Source: Fieldwork survey)

[6] Farmer 1, interviewed in Mapita on December 4, 2023.

[7] Fisher Folk 1, interviewed in Cabalitian on November 24, 2023.

Floods are also a significant concern for residents of both Mapita and Cabalitian. However, in both villages, floodwaters do not necessarily stay long; due to the nature of their landscapes, floodwaters subside rather immediately. Cabalitian, as an island village, benefits from its proximity to the sea. The floodwaters tend to flow towards the ocean, aided by the natural gradient of the land.

Mapita, being a mountain village, has steep terrains that facilitate the rapid runoff of water. When it rains heavily, the excess water quickly flows down the slopes and into the lower areas, preventing prolonged stagnation. This minimizes the duration of flooding but can also result in sudden and severe flash floods, posing a different kind of risk to the inhabitants. In Mapita, 51.85% of residents identified landslides as a major risk. Seemingly, the mountainous terrain of Mapita likely contribute to a higher susceptibility to landslides and flash floods. During the fieldwork, the researcher was accompanied some local villagers who took part in mapping the vulnerable areas of the village. Figure 8 shows the areas of Mapita village which were identified as vulnerable to floods and landslides. All those irregularly shaped polygons in blue are the identified spots/sections of the villages which were considered risk-prone. Blue polygons with brown dots were identified as areas prone to landslides (e.g., road sections); whereas those in green were identified as prone to floods (e.g., farms and vegetable gardens).

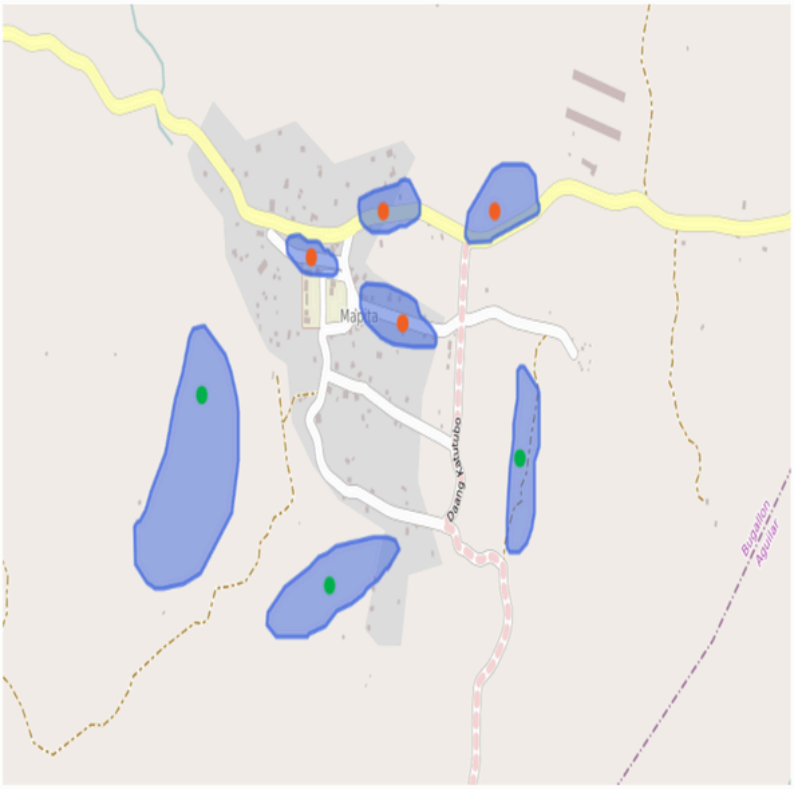


Figure 8 Digitized and georeferenced risk map of Mapita (Legend: green: flood-prone; brown: landslide-prone)

Cabalitian residents identified storm surges and marine pollution as major risks, with both factors being noted by 47.93% of respondents. The coastal landscape of Cabalitian increases its vulnerability to storm surge particularly during typhoons. Marine pollution was also identified as a risk due to the presence of fish cages in the environs of the island which is exacerbated by poor waste management. Accordingly, fish cages contribute to environmental degradation by accumulating uneaten feed and fish waste, which deteriorate water quality and harm marine life, indicating concerns about environmental health and its impacts on local livelihoods, especially for those dependent on fishing and marine resources.[8] Figure 9 shows the areas or spots in the island where some major risk are situated. Those yellow irregularly-shaped polygon with blue spots were identified as experiencing marine pollution and at times saltwater intrusion. The two largest of those yellow irregularly-shaped polygons are sites of commercial cages. Not too far from the island is the Sual Power Plant. Those with green spots are major areas where storm surges were reported to have been experienced. The brown spot in the middle (upland part of the island) was identified as a potential source of landslides during heavy rains.

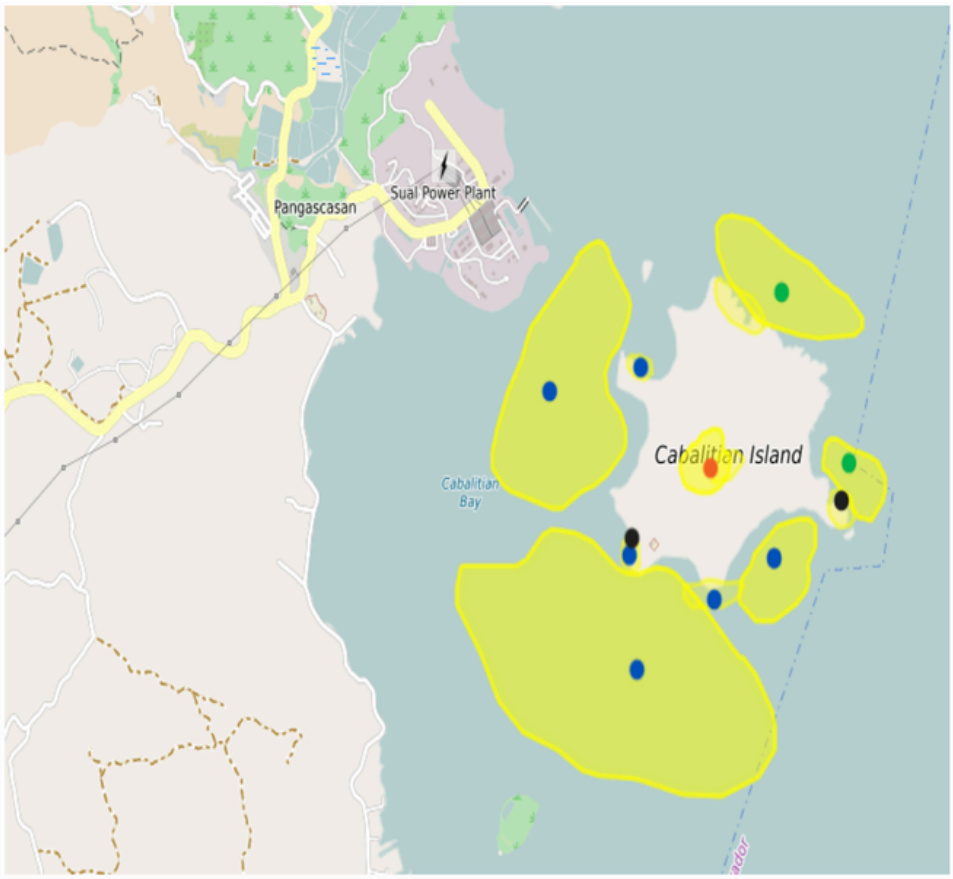


Figure 9 Digitized and georeferenced risk map of Cabalitian (Legend: blue: marine pollution/salwater intrusion; green: storm surges; brown: landslide)

[8] Entrepreneur 1, interviewed in Cabalitian on November 25, 2023

As to source of early warning messages during the super typhoon Mangkhut, both villagers of Mapita and Cabalitian relied mainly on TV (80.56% and 80.17 respectively) (Figure 10).

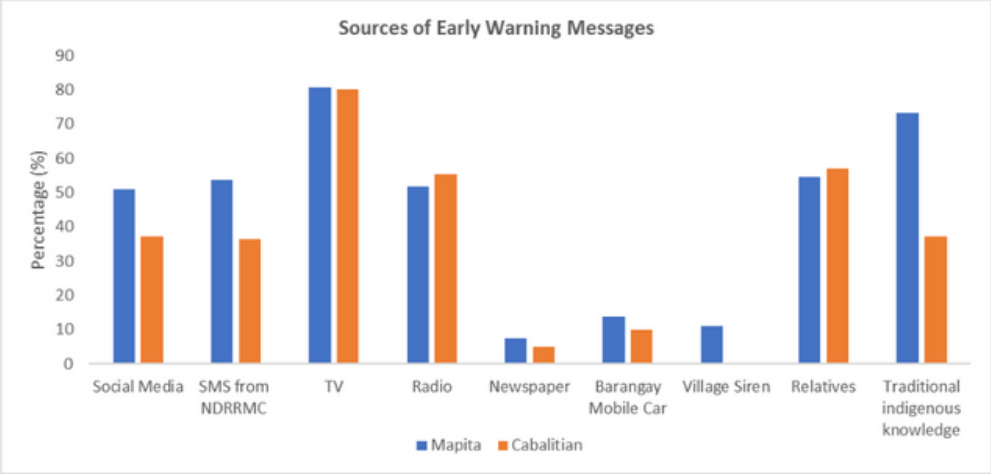


Figure 10 Sources of Early Warning Messages (Source: Fieldwork survey)

Both villages still use their indigenous knowledge as a tool of EWS, i.e., to determine whether a strong typhoon is approaching with Mapita residents relying more on traditional indigenous knowledge (73.15%) than Cabalitian (37.19%). This reliance on indigenous knowledge is expected, given that a majority of Mapita's residents are members of indigenous communities who used traditional indigenous practices to anticipate weather patterns.
In Mapita, the link between natural phenomena and indigenous knowledge has long played a role on how they navigate the forces of nature. One community member from Mapita explained:

> "We observe the behavior of insects and small animals. If the house lizard continues to produce unusual sounds which is done in repeated recurring patterns throughout the day, we know a strong typhoon is coming." [9]

Another community member shared:

> "Our forefathers taught us to read the signs in nature. When the ants start to surface from the ground as though looking for shelter as a group, that means they are preparing as a storm is not far away." [10]

[9] Indigenous leader 1, interviewed in Mapita on December 4, 2023.

[10] Indigenous leader 2, interviewed in Mapita on December 4, 2023.

These indigenous knowledge have been passed down through generations, ensuring that even in the absence of modern technology, local communities can discern signs from nature and prepare for it.

A local fisher folk in Cabalitian noted, “We get cues from the sea and the sky. When the birds fly in groups as though restless and when the waves get unusually bigger than its typical rhythm, that is a sign of a bagyo (typhoon)" [11] Another resident mentioned,

> "Old folks have peculiar ways to tell whether a storm is coming...the wind when restless accompanied by a howling sea that is louder than usual... you can also feel the breeze gives you a different feeling...we know it's time to secure our boats and homes." [12]

While both villages also receive EW message from the social media and NDRMMC SMS, it is interesting to note that residents in both villages still depend on traditional sources such as radio (51.85% for Mapita; 55.37 % for Cabalitian) and their relatives for information (54.63% for Mapita; 57.02% for Cabalitian) (Figure 8). The use of radio particularly during the typhoon itself can be partly explained by the fact that both TV and the internet may not be available because of frequent power outages and internet signal issues.

4.2 FACTORS INFLUENCING ACCESSIBILITY OF EWS

The researcher used the respondents’ self-reported ratings on the impact of language, social media information, internet connectivity, power supply connectivity and clarity of information from authorities.The ratings are expressed in a three-point Likert scale (3-positive; 2-neutral; and 1-negative). Table 5 indicates that respondents from both villages consider power and internet connectivity as exerting negative impact on their access to EW information, with a mean ranging from 1.52 to 1.64. The language used and the remoteness/geographical location of the village seems to have no effect in accessing early warning message as residents in both communities (Mapita, 1.88; Cabalitian, 1.76) reported it to have a neutral impact.

[11] Fisher Folk 2, interviewed in Cabalitian on November 24, 2023.

[12] Fisher Folk 3, interviewed in Cabalitian on November 24, 2023.

Table 5 Factors Influencing Access to EWS

Factors influencing access to EWS	Mapita (Mean, N=108)	Descriptive Equivalent	Cabalitian (Mean, N=121)	Descriptive Equivalent
The language used in the early warning message	1.888889	Neutral	1.768	Neutral
The amount of information from the social media pages of the local government	1.435185	Negative	2.214876	Neutral
Internet connection during Mangkhut	1.583333	Negative	1.619835	Negative
Power connection during Mangkhut	1.518519	Negative	1.644628	Negative
The remoteness/geographical location of the village	2.194444	Neutral	2.14876	Neutral

Legend: 1.00-1.66 (Negative); 1.67-2.33 (Neutral); 2.34-3.00 (Positive)
Source: Field survey, 2023.

Both communities struggle with unreliable or inadequate power and internet infrastructure, which hinder their ability to receive timely warnings and updates during super typhoons. A farmer from Mapita highlighted the challenges they face with power and internet connectivity during typhoon seasons:

> "It is not unusual that we experienced power outages during strong typhoons. Power goes out frequently , and internet signal becomes weak. It's frustrating because we rely on those for updates regarding the whereabouts of the typhoon ." [13]

"Sometimes, we missed important alerts before a typhoon comes because our power was out, and our phones couldn't connect to the internet. It's a real concern during typhoons when power becomes unreliable," says a local leader in Cabalitian.[14]

Language used in EW messages is not an issue for the residents in both Mapita and Cabalitian because while English is more frequently used in sending early warning messages, the Pangasinan PDRRMO also used Filipino language in some cases such as the Facebook post below (Figure 11)

[13] Farmer 2, interviewed in Mapita on December 6, 2023.

[14] Local leader1, interviewed in Cabalitian on November 25, 2023.

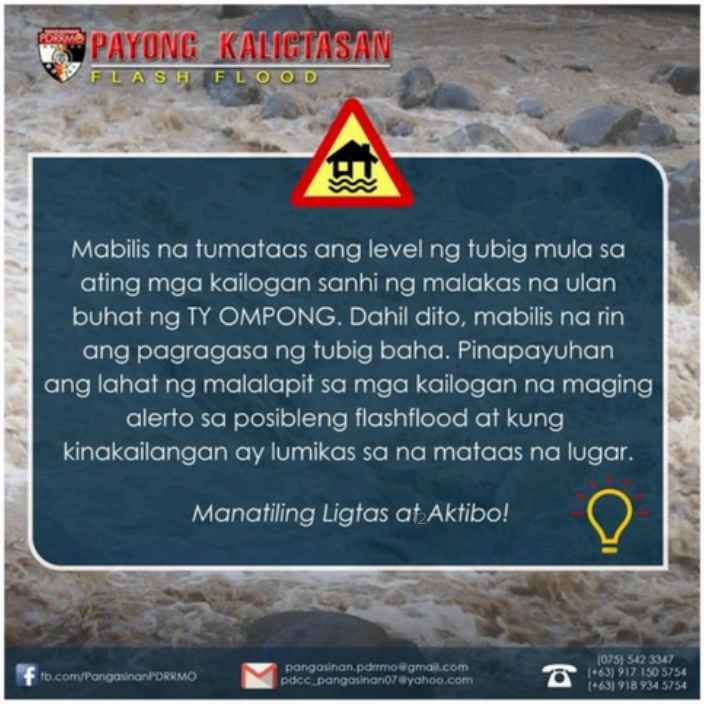


Fig. 11. FB post from Pangasinan PDRRMO website dated September 15, 2018
(Source: Pangasinan PDRRMO Facebook Page, 2018)

Moreover, even when English is used in sending EW information, most of the local folks understand English, it being the second language in the country. As one resident in Cabalitian remarked: "Even though I don't speak English well, I can still understand the warnings they send us. They're quite clear and easy to follow." [15]

While Mapita villagers consider the amount of information from social media pages of the government as negatively impacting their access to EWS (mean, 1.44), Cabalitian residents do not necessarily consider it a factor on their access to EW information (mean, 2.21). When asked how the amount of information from the social media page of Pangasinan PDRRMO is negatively impacting their access to EWS, a resident from Mapita highlighted that some of the information posted is generic, particularly regarding the Mangkhut typhoon.[16] Another interviewee suggested that the Pangasinan PDRRMO Facebook page should include more specific guidance, such as what actions to take when deciding to evacuate, where to take transportation, and where to seek government aid during emergencies. [17]

The researcher looked into the social media pages of the municipalities of Cabalitian and Mapita. Sual has an existing FB page for disaster-related events maintained by its local disaster risk reduction office; whereas Aguilar does not have one during the time Mangkhut occurs. Both villages also rely on the

[15] Fisher Folk 4, interviewed in Cabalitian on November 12, 2023.

[16] Household member 1, interviewed in Mapita on December 4, 2023/

[17] Household member 1, interviewed in Mapita on December 4, 2023.

province's Official Facebook Page, the Pangasinan PDDRMO for updates about Mangkhut.

In both villages, the remoteness of their location is neither an issue as shown by the mean value of 2.19 and 2.15 for Mapita and Cabalitian respectively. Because of multiplicity of sources of EWS, their remoteness is considered a non-issue in getting information about the Super Typhoon Mangkhut from local authorities. Moreover, while these villages are remote and distant from the towns and evacuation centers, they are reached by traditional sources of EWS such as radio and TV.

Some villagers also accessed information from their phones and social media pages without necessarily leaving their homes. "Even though we're far from town, we always get early warnings from SMS sent by the NDRMCC which alert us on time. Moreover, if the internet connection is good and there is no brownout during typhoon, we can always get updates from TV and the internet. Our barangay captain also makes sure we're informed" says one household member in Cabalitian.[18]

4.3 RISK REDUCTION ACTIONS/MEASURES TAKEN BEFORE AND AFTER MANGKHUT

Before the occurrence of Mangkhut, a large majority of respondents in both Mapita (86.11%) and Cabalitian (82.64%) implemented at least one risk reduction measure. These measures implemented before the typhoon struck, included preparing emergency supplies, reinforcing homes, securing loose objects, trimming trees, and arranging transportation or shelter in case of evacuation. However, the percentage of respondents who continued to implement risk reduction measures immediately after Mangkhut dropped to about 11-12% (Table 6).

These findings show an interesting trend in the communities' behavior towards risk reduction measures. Before the imminent threat of the Super Typhoon Mangkhut, residents demonstrated a high level of awareness and readiness, taking proactive steps to protect themselves and their property. The researcher sensed this pro-active motivation to prepare in the days leading to Mangkhut in his interviews with the local folks. One farmer in Mapita explained:

> "We've been through typhoons before, such as Yolanda, so we know how important it is to prepare. Before Mangkhut, we made sure to look on our crops first. If we know that they are going to be destroyed by flood

[18] Household member 1, interviewed in Cabalitian on November 13, 2023

> waters, we'll harvest them immediately. We also buy food in advance, reinforce our roof, and trim any branches that could destroy our house's roofings." [19]

In Cabalitian, one fisher folk shared that securing his boat from the storm is a must-do preparation:

> "..."Securing my boat before a storm is a must-do for me. It's about protecting my family's livelihood ....If the boat gets damaged or swept away, it's not just a financial loss , it's a loss of livelihood...it affects our ability to fish and earn a living. So, before Mangkhut hits, I made sure to double-check all the ropes and anchor it securely. I also checked on our home if there are weak roofings that need to be fixed or weak pillar that needs to be tied for strong anchor or support. It's a routine I never skip ..." [20]

In relation to this preparation, even then Pangasinan PDRRMO regularly post materials reminding residents to prepare a go-bag checklist in case of emergency as shown in Figure 12.

Figure 12. Go-Bag Emergency Kit by Pangasinan PDRRMO (Source: Pangasinan PDRRMO Facebook Page, 2018)

[19] Farmer 3, interviewed in Mapita on December 4, 2023.

[20] Fisher Folk 5, interviewed in Cabalitian on November 12, 2023.

However, immediately after Mangkhut, there was a drop in the percentage of respondents who continued to implement risk reduction measures. Residents may have perceived that the immediate threat of Mangkhut had passed and thus relaxed their vigilance, especially if their homes and communities were spared significant damage. The effort and resources required to sustain preparedness measures on an ongoing basis may outweigh the perceived benefits in the absence of an imminent threat such as this statement from one of the interviewees from Mapita:

> "After Mangkhut passed, we took down the plywood from our windows and cleaned up any fallen branches, but we didn't feel the need to keep reinforcing everything.We didn't see the need to keep on preparing for another storm so soon...." [21]

Table 6 Risk Reduction Measures Taken Pre and Post-Mangkhut

Risk Reduction Measures Taken	Mapita (N=108)		Cabalitian (N=121)	
	Count	%	Count	%
Before Mangkhut				
Preparing emergency supplies---food, medicine, water, battery, etc.	77	71.30	65	53.72
Reinforce homes, secure loose objects, boats, livelihoods, properties, and trim trees to reduce potential damage.	89	82.41	92	76.03
Access transportation or shelter if evacuation becomes necessary	23	21.30	35	28.93
No measures taken	**15**	**13.89**	**21**	**17.36**
With at least one measure taken	**93**	**86.11**	**100**	**82.64**
After Mangkhut				
Conduct safety checks of homes to identify hazards/damage	34	31.48	48	39.67
Rebuild livelihoods to be more resilient to future typhoons	37	34.26	47	38.84
Seek psychological support from support groups	3	2.78	2	1.65
Stock emergency kits for future disasters	24	22.22	26	21.49
Apply for flood/typhoon damage insurance	0	0.00	7	5.79
No measures taken	**38**	**35.19**	**34**	**28.10**
With at least one measure taken	**60**	**55.56**	**87**	**71.90**

Source: Fieldwork survey

4.4 SENTIMENT ANALYSIS

Table 7 presents the summarised results of the sentiment analysis of Facebook comments from six (6) relevant PDRRMO Facebook posts before Mangkhut occurred.

[21] Farmer 4, interviewed in Mapita on December 4, 2023.

Most comments were classified as neutral as evidenced by a mean score of 0.776747. Positive comments slightly outnumbered negative ones, with a mean score of 0.182637 compared to 0.0337603, respectively. Although fewer in number, negative comments showed a higher variability, with a dispersion of 2.56717, which indicates diverse intensities of negative sentiments.

Table 7 Descriptive Statistics for the Sentiment Analysis

Feature Statistics

	Name	Distribution	Mean	Mode	Median	Dispersion	Min.	Max.	Missing
N	positive		0.182637	0.00	0.098	1.2076	0.00	1	0 (0 %)
N	negative		0.0337603	0.00	0.00	2.56717	0.00	0.448	0 (0 %)
N	neutral		0.776747	1	0.8135	0.307699	0.00	1	0 (0 %)
N	compound		0.194969	0.00	0.00	1.69861	-0.9744	0.9186	0 (0 %)

Source: Results of the Sentiment Analysis using the data-mining software Orange

A supplementary heat map analysis in Figure 13 further supports the descriptive statistics presented in Table 7. The heat map visually presents the concentration of sentiments, where neutral (yellow clusters) and positive comments (green clusters) appeared to cluster in greater number than negative (yellow-green) ones. This is an indication of overall stable community outlook before the occurrence of Mangkhut. This stable outlook is somehow reflected in the words and expressions in the comments as shown in the word cloud results in Figure 14.

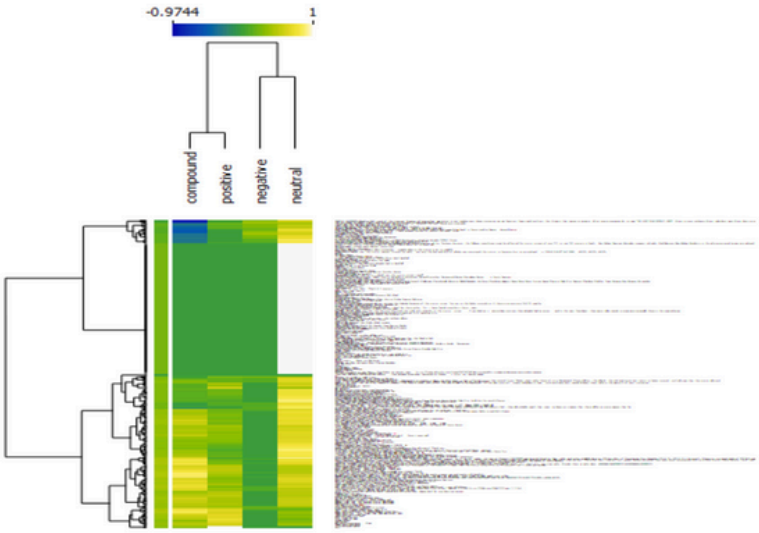


Figure 13. Heat map showing clustering and ordering of sentiments
(Source: Results of the Sentiment Analysis using the data-mining software Orange)

The word cloud result is shown in Figure 13. Words connoting positivity, such as "safe," "lord," "pray," "careful," "strong," "please," "god," and "hope," were dominant. These words seem to reflect the general public's sentiment---expressing faith, concern for safety, and generally a supportive attitude towards one another before the Super Typhoon Mangkhut struck the province of Pangasinan. Anthropologists who study human culture think that cultural factors shape how people behave when they face a hazard. For instance, traditions, religious beliefs, and community practices can influence how individuals prepare for, respond to, and recover from disasters (Oliver-Smith, 1996). The words used by the commenters somehow reflect the religiosity of the Filipinos in times of disaster. These narratives of religiosity in times of disasters is evident in the following relevant comments :

> Lord please save pàngasinan..." [22]

> "Lord spare your people from the storm..ingat mga kababayan..Keep praying" [23]

One Facebook user even posted the entire text of the Oratio Imperata. An excerpt appears below:

> "...Almighty God, Lord of the universe, Creator of everything, we come to you seeking your divine protection as we face our fears and confront the threats that cause us anxiety.
> After every invocation let us say
> "DELIVER YOUR PEOPLE LORD".
> From strong typhoons
> From relentless rains
> From destructive earthquakes
> From drought and pests
> From deadly floods and storm surges
> ...Divine Jesus, you calmed the storms and walked over the waters. Give us fine weather. Shield us from distress. Drive away from our land all calamities and disasters of nature. We entrust ourselves you now and forever.
>
> Our Lady of the Rosary of Manaoag, Pray for us ." [24]

[22] Facebook User1 (Baby Liz), September 15, 2018 Pangasinan PDRRMO FB post.
[23] Facebook User2 (Babylynvaldez84), September 15, 2018 Pangasinan PDRRMO FB post.
[24] Facebook User3 ((FB ID 100028466774627), September 15, 2018 Pangasinan PDRRMO FB post.

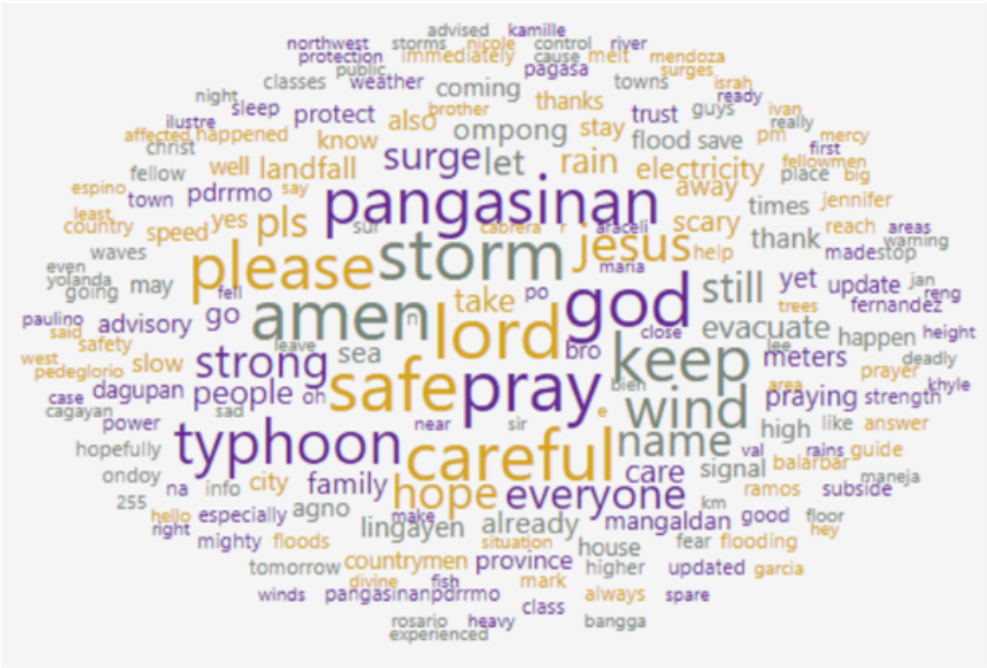


Figure 14. Word cloud showing the most dominant words used in the FB comments (Source: Word cloud result using the data-mining software Orange)

In contrast, words associated with negative emotions were less prominent in the word cloud. Words like "typhoon," "wind," "surge," and "evacuate" appeared, but their frequency was comparatively lower compared to the positive words already mentioned. Some of the relevant examples are as follows:

> (Please be detailed. Sabihin nyo po kung saan sila lilikas, saan ang provision ninyo ng emergency headquarters, rubbers boats pag baha, etc. Don't only say stay safe. Provide them a safe place.) [25]
>
> *(Please be detailed. Tell them where they will evacuate, where your provision of emergency headquarters is, rubber boats during flooding, etc. Don't only say stay safe. Provide them a safe place.)*

> Bat ngayon lng tong post na to?Ngayon sila lilikas sa ganitong sitwasyon ? [26]
>
> *("Why is this post only now? Are they evacuating now in this situation?")*

The result of the sentiment analysis in descriptive statistics (Table 7), the heat map and the word cloud are consistent with each other showing the general public sentiment to be dominantly neutral, more positive in tone than negative indicating that while there was awareness and discussion about the

[25] Facebook User 4 (Gladys), September 15, 2018 Pangasinan PDRRMO FB post.
[25] Facebook User 5 (FB ID 100003094959065), September 15, 2018 Pangasinan PDRRMO FB post.

potential threats of Mangkhut, the overall tone was generally optimistic and focused on safety and preparedness. This appears to reflect a community mindset geared towards resilience and mutual support.

4.5 FACTORS THAT MOVE LAST-MILE VILLAGES TO RISK REDUCTION ACTIONS

Table 5 presents the results of the Ordinary Least Squares (OLS) regression analysis conducted to determine the influence of various explanatory variables on the adoption of risk reduction measures before and after Super Typhoon Mangkhut in the villages of Cabalitian and Mapita.

The regression analyses revealed that both the threat and coping appraisal components of the PMT construct significantly influenced the adoption of risk reduction measures (Table 8). Threat appraisal showed a relatively stronger influence than coping appraisal, particularly for risk reduction measures implemented before Mangkhut.

Perceived vulnerability has significant positive influence on the implementation of risk reduction measures before and after Mangkhut in Cabalitian (before: $p = 0.0436$; after: $p = 0.0702$) and Mapita (before: $p = 0.0375$; after: $p = 0.0693$). Perceived severity was also positively related to risk reduction measures before Mangkhut for both Mapita ($p = 0.0464$) and Cabalitian ($p = 0.0304$). Before and after Mangkhut, fear is a predictor of risk reduction behaviour for Cabalitian (before: $p = 0.0279$; after: $p = 0.0497$). In Mapita, fear is significant only before but not after Mangkhut.

In terms of coping appraisal variables, response efficacy is significant before and after Mangkhut for Cabalitian (before: $p = 0.0473$; after: $p = 0.0526$) and Mapita (before: $p = 0.0354$; after: $p = 0.0418$). The same observation can be made regarding self-efficacy for Cabalitian (before: $p = 0.0495$; after: $p = 0.0418$) and Mapita (before: $p = 0.0354$; after: $p = 0.0418$). In both villages, response cost does not seem to influence implementation of risk reduction measures both before and after Mangkhut.

Regarding socio-demographics, gender is statistically significant both before and after Mangkhut in Mapita (before: $p = 0.0379$; after: $p = 0.0457$) but not in Cabalitian. While age is statistically significant both before and after Mangkhut in Cabalitian (before: $p = 0.0219$; after: $p = 0.4173$), the same cannot be argued in the case of Mapita. The remaining socio-demographic variables such as income, education and home ownership do not influence implementation of

risk reduction measures before and after Mangkhut.

Finally, previous typhoon experience, the strength of social networks and level of trust to authorities were significant predictors of risk reduction actions before and after Mangkhut in both villages.

Table 8 Results of OLS Regression

	Risk Reduction measures for Cabalitian		Risk Reduction measures for Mapita	
	Before Mangkhut	After Mangkhut	Before Mangkhut	After Mangkhut
R2	0.4600	0.4173	0.3210	0.4380
Intercept	0.2328	0.4649	0.1868	0.7661
Threat Appraisal				
Perceived vulnerability	0.0436**	0.0702*	0.0375**	0.0693*
Perceived severity	0.0304**	0.0448**	0.0464**	n.s.
Fear	0.0279**	0.0497**	0.0455**	n.s.
Coping Appraisal				
Response efficacy	0.0473	0.0526	0.0354	0.0418
Self-efficacy	0.0249	0.0498	0.0180	0.0434
Response costs	n.s.	n.s.	n.s.	n.s.
Socio-Demographics				
Gender	n.s.	n.s.	0.0379**	0.0457**
Age	0.0219**	0.4173**	n.s.	n.s.
Income	n.s.	n.s.	n.s	n.s.
Education	n.s.	n.s.	n.s.	n.s.
Home Ownership	n.s.	n.s.	n.s.	n.s.
Other Explanatory Variables				
Previous typhoon experience	0.0425**	0.0637*	0.0486**	0.0490**
Strength of social networks	0.0333	0.05002	0.0457	0.0502
Level of trust to authorities	0.03030**	0.05039*	0.0454**	0.0514*

**p < 0.1; **p < 0.05; ***p < 0.01, n.s. = not significant*

5.0 DISCUSSION

In this study, I examined the factors that influence accessibility and actionability of EW information before and after the Super Typhoon Mangkhut in the context of two last mile communities, Mapita and Cabalitian in Pangasinan, Philippines. In the course of the research, data on socio-demographics, EWS-related information, and PMT-related data were gathered and analysed.

Mapita and Cabalitian represent two geographical rationalities---one remote

mountainous terrain nestled in the upland of Aguilar Pangasinan, and another coastal island village facing the sea and separated from the town center of Sual, Pangasinan. Both are susceptible to typhoons. Mapita is more prone to landslides, whereas Cabalitian's is more prone to storm surges and marine pollution due to its proximity to fish cages and the coal power plant. Geographically, both can be considered as last mile communities needing attention particularly in disaster risk management. Both communities lack adequate communication and transportation infrastructures. Their rugged terrains and geographical isolation from evacuation centers and shelters pose logistical challenges especially during disaster events. However, it is not only from this physical or geographical perspective that these communities are considered vulnerable. Both villages also show social vulnerabilities. In both villages, the annual income are within the range of Php100,000-Php300,000. Most rely on traditional livelihood sources which can lead to precarity when adversely affected by disasters such as typhoons. Both take time to recover when disaster strikes.

Regarding sources of EW information, while most villagers tap on social media and SMS from NDRMMC for EWS, they still tap on traditional sources of information such as TV and radio. Both villages also depend on their relatives for disaster event information. Nor surprisingly, Mapita residents still largely rely on their traditional indigenous knowledge for information about incoming typhoons or storms by reading signs from nature. The use of indigenous knowledge among Mapita residents to predict natural hazard seems deeply embedded in their culture. They use this knowledge as a complementary tool apart from existing EWS already in place which enhances their capacity to navigate and respond to forces of nature. As one Mapita resident aptly puts it, "We trust the old ways because they have saved us many times. But we also listen to the radio and watch the news to be fully prepared." [27]

Regarding factors that impact accessibility of EWS, both face constraints in terms of power and internet connectivity during strong typhoons. This hampers effective communication and timely dissemination of early warning information. Power outage and internet connectivity issues during strong typhoons are a commonplace even in places near town centers. There is therefore a need to improve infrastructures to ensure uninterrupted access to EW information particularly before an extreme weather event such as Mangkhut to guide protective actions, or in worse cases, to anticipate mass evacuations whenever necessary.

In regard to factors that nudge risk reduction actions before and after Mangkhut, the findings suggest that most of the threat appraisal and coping appraisal variables from the PMT construct are significant predictors of risk reduction actions.

[27] Farmer 5, interviewed in Mapita on December 6, 2023.

Perceived vulnerability is a significant predictor of risk reduction behaviour for both Mapita and Cabalitian before and after Mangkhut. Their high perception of risk due to their geographical location as well as their socio-economic vulnerability to cope with disasters partly explains this. This finding aligns with the findings of past studies that have reported similar results with regards to the effect of perceived vulnerability in taking mitigation actions (Zaalberg et al., 2009, Defra, 2008, Brilly and Polic, 2005).

The perceived severity of Mangkhut also moves residents of both Mapita and Cabalitian to take risk reduction action before Mangkhut. This finding corroborates with the findings in past studies. For instance, Eusse-Villa (2024) found that individuals who perceive the potential of the 2018 Vaia storm in Northeast Italy to wreak havoc are more likely to initiate protective behaviours. This appears consistent as well to past studies which demonstrated that perceived severity significantly influences individual's intention to prepare for natural calamities in a vulnerable country (Gumasing and Sobrevilla, 2023) and that such perception of disaster severity has a direct and positive effect on disaster preparedness (McCourt, 2021). Interestingly however, in the case of Mapita perceived severity is significant only before Mangkhut suggesting that Mangkhut's impact may not be as severe as expected.

Fear is also a significant factor. This indicates that villagers fear for their safety and that of their family and properties and therefore triggered them to take risk reduction measures in the days leading to Mangkhut. This finding appears to be supported by the general sentiment expressed in the comments of most Facebook users in the PDRRMO website. While most comments are more neutral and positive, the emotional content of the words expresses narratives of safety. Words such as safe, pray, careful and God while not necessarily strictly conveying negative emotions are expressions of concerns. In previous studies fear is a significant factor in influencing protective behaviour (Eusse-Villa, 2024; Terpstra, 2011; Zhai et al., 2006). This evocation of fear is also more likely influenced by the news information they received from various sources depicting Mangkhut as one with similar destructive force as Haiyan (Super Typhoon Yolanda). Keller, Siegrist, and Gutscher (2006) conducted a study that heightened negative emotions by showing subjects images of flooded houses. They concluded that these emotionally-charged images led to an increased perception of flood risk among the subjects.

Response efficacy is also a predictor of risk reduction behaviour before and after Mangkhut. While this finding is contrary to the result found by Eusse-Villa, et al (2024) who found response efficacy to have exhibited a negative effect, it aligns with the findings of many studies done in the past. Gumasing et al (2023), for instance, found that response efficacy is indicative of an individual's intention to prepare significantly such as acquiring information, securing

property and following local government units which the respondents deemed as effective ways to respond to natural calamities. Botzen, et al, (2019) concluded that a perception of high response efficacy influences the taking of mitigation measures against flood damage. Similarly, Tang and Feng (2018) argued that the behavioural intention to prepare before a natural calamity strikes is correlated with response efficacy.

Self-efficacy is also a significant predictor suggesting that residents in both communities believe in their ability to implement risk reduction measures. This affirms the findings in existing literature, which shows a strong link between perceived self-efficacy and the implementation of mitigation measures (Poussin, 2014; Weiss et al., 2011; Grothmann and Reuswigg, 2006; Milne et al., 2000). For example, Poussin (2014) found that individuals with a high perception of ability to carry out mitigation measures also have a higher intention to do so. Similarly, Grothmann and Reuswigg (2006) demonstrated that taking protective actions reinforces individuals' belief in their ability to perform these actions effectively.

Quite interestingly, response cost is not a significant predictor suggesting that it is not necessarily a deterrence to implement risk reduction measures. The optimum assistance extended by local governments (e.g., the municipal and provincial government) and various organisations in vulnerable areas such as Cabalitian and Mapita in the days leading to the Super Typhoon Mangkhut (Flores, 2018; Austria, 2018; PDI, 2018; ACT, 2018) partly explains this. This finding aligns with the findings of Grothmann and Reusswig (2006) who argue that response cost does not play a significant role in driving protective actions when individuals have high levels of self-efficacy and response efficacy. Poussin et al. (2014) found a negative relationship between perceived response cost and the implementation of flood risk mitigation measures in France. Their study measured response cost solely in terms of monetary expenses, which contrasts with my findings and those of Grothmann and Reusswig. This discrepancy indicates that the way response cost is measured can significantly impact the results. Specifically, when response cost is quantified in purely monetary terms, it may deter individuals from taking protective actions. Conversely, a broader measurement that includes factors like time and effort may show that these considerations are less influential in decision-making. I suggest that future research should explore these nuances further.

In regard to the socio-demographic variables, only age and gender are found significant predictor of risk reduction actions but the results in the two villages are mixed. Gender is significant in Mapita both before and after Mangkhut but not in Cabalitian. On the other hand, age is significant in Cabalitian both before and after Mangkhut but not in Mapita. The finding of significance for gender in Mapita suggests potential gender-specific factors influencing risk reduction

behaviors such as the possibility of gender-differentiated role in preparing for natural hazards such as typhoon (e.g., traditional gender norms such as women ministering to home-related matters and child care; while men securing livelihoods and home safety); and the potential resource and structural constraints affecting the level of agency of Mapita women in deciding to take or not to take disaster risk reduction measures (Erman, et al., 2021). Studies have revealed that during natural hazards, particularly in the context of climate change, there are discernible differences between women's and men's responses. These distinctions manifest in their risk tolerance, use of coping mechanisms, capacity for adaptation, and approaches to seeking advice and information (Dankelman, 2008).

In Cabalitian, age appears as the significant factor, implying that experience or responsibilities within the community seem more influential in driving risk reduction actions, i.e., the older one gets, the more experienced one becomes of disaster-related events, which potentially drives risk reduction action. Eusse-Villa (2024) found age and gender to be significant factors in protective behavior before and after typhoons. Poussin (2014) also noted age as a predictor of mitigation behavior, suggesting that older individuals tend to take more measures. This aligns with past research as well (Miceli et al., 2008; Sattler et al., 2000).

Income, education and house ownership are not significant predictors of risk reduction actions. These findings seem to support the conclusions of Bubeck et al. (2012a) and Kellens et al. (2012) that evidence on the influence of socio-economic factors on flood preparedness varies across different situations. Income was not significant in this study which deviates from the findings of Laska (1990), Lindell and Hwang (2008), and Sattler et al. (2000), but consistent with the findings of Botzen et al. (2009), Kreibich et al. (2005), and Sims and Baumann (1987). As the results across studies are mixed, I also suggest further research examining the role of socio-economic variables in taking risk reduction actions.

The additional variables examined in this paper such as previous typhoon experience, strength of social network and level of trust to authorities are found to significantly influence the implementation of risk reduction measures both before and after Mangkhut for both villages. I argue that the country's experience of Super Typhoon Haiyan (Yolanda) still evokes a strong negative affect to both villages. Super Typhoon Haiyan was declared a public storm warning signal number 4 in November 7, 2013, the highest warning level which indicates winds over 185 km/h (115 mph). Haiyan was one of the world's most destructive and strongest tropical cyclones ever recorded which left 6, 300 people dead (NDRRMC, 2014). It also damaged 1.1 million houses, destroyed worth billions of major source of livelihoods and pushed approximately 2.3

million people into poverty (Redi, 2023). Past flooding experience motivates individuals to take adaptive actions against future natural calamities. It heightens awareness of one's vulnerability to its consequences, which in turn increases risk perceptions. Flood experience is particularly emphasized in studies on flood preparedness (Bubeck et al., 2013; Kreibich and Thieken, 2009; Siegrist and Gutscher, 2008; Grothmann and Reusswig).

In the same vein, the strength of social networks is a significant factor in influencing risk reduction action suggesting that the support system one receives from the community or relatives has positive influence to protective behaviour. This finding confirms previous studies' findings. For example, Poussin, et al (2014) found that social network exerts positive and significant influence in implementing preparedness measures. Similarly, Paul and Routray (2011) argue that social protection and informal risk sharing mechanisms influence the implementation of coping strategies at household level in Bangladesh in order to minimize the cyclone vulnerability.

Finally, this study affirms that people in both villages are more likely to act on EW information if they trust the local authorities. While not necessarily conclusive, the result of the sentiment analysis appear to affirm this. There were more neutral and positive comments than negative ones. Recent studies showed trust as a significant factor in the adoption of coping strategies. Eusse-Villa et al. (2024) showed that trust in authorities can influence household protective behaviors and enhance adaptive coping strategies in Italy during a strong typhoon. Similarly, Hu et al. (2024) found that trust significantly influences the willingness to prepare for disasters and serves as a crucial mediator between risk information and disaster preparedness decisions in Sichuan Province, China.

One limitation of this study is that it offers a snapshot of perceptions of the two last-mile communities in the Philippines, taken within a specific timeframe. Consequently, the findings may not be broadly applicable to all last-mile communities, as each possesses unique and idiosyncratic characteristics. Generalizing these results to other similar communities should be done cautiously, considering the diverse contexts and circumstances they face.

6.0 POLICY IMPLICATIONS

The findings of this study shed light regarding a number of aspects affecting disaster risk reduction strategies for last mile communities.

They were as follows:

6.1 FOR POLICYMAKERS

(i) Last mile communities as exemplified by Mapita and Cabalitian have "situated" and contextual vulnerabilities unique from each other. This therefore requires a tailored approach in the adoption of risk reduction strategies during extreme weather event such as a super typhoon.

(ii) Addressing gaps in internet connectivity, power supply reliability, and language clarity can contribute to a more equitable access to timely and accurate information, particularly for vulnerable populations with limited resources or technological proficiency. This is in line with the finding of the study that these factors negatively impact access to EWS of the two communities during the Super Typhoon Mangkhut

(iii) The multiplicity and redundancy of sources of EW information is encouraged particularly for last mile communities to make sure one receives early warning, particularly when one or several sources of EW information fail to work. Both Mapita and Cabalitian experience power outage and internet connectivity issues even before the super typhoon Mangkhut which negatively impact their ability to receive early warning messages.

(iv) Considering the existing geographical and socio-economic vulnerabilities of last-mile communities, the local government units should develop a program that will empower these communities such as capacity-building, technical and financial support---all these efforts will enhance the "coping capacity" of the residents and therefore encourage the taking of risk reduction behaviour during an extreme weather event. This is in line with the findings of the study that coping appraisal variables are significant predictor of risk reduction behaviour.

(v) Develop participatory risk reduction and education program that will engage diverse stakeholders from the local government, private sector and the last-mile communities in increasing accessibility and interpretability of EW information and the integration of local knowledge in designing local risk reduction program.

(vi) Devote attention to pro-active measures before the occurrence of super typhoon such as conducting constant community communication and coordination, including pre-emptive evacuation measures whenever necessary under the circumstances.

(vii) Develop a tailored and targeted risk communication communication strategies that address the specific socio-demographic factors influencing risk perception. As the findings of this study suggest, the last-mile communities' perception of their vulnerability, previous typhoon experience, severity of the typhoon and fear (threat appraisal) are factors that influence risk reduction measures. When properly handled and done, they can be subtly leveraged upon in disaster communication strategies.

(viii) Strengthen existing social networks through formation of community groups and networks that can support collective action and information dissemination before, during and after the disaster. Establish regular meetings to share preparedness information, involve every household, and assign local government liaison officers for communication support, while encouraging the use of various platforms such as Facebook, WhatsApp, or radio networks for real-time information sharing.

(ix) Create a transparent communication channel, such as a community bulletin board or a dedicated social media page, where authorities can share real-time information and updates about early warning systems and disaster management efforts. Hold quarterly public accountability sessions where local authorities report on their actions and progress related to disaster preparedness and response. All these efforts are designed to increase the trust to local authorities which the study suggests is a predictor of risk reduction behaviour.

6.2 FOR HUMANITARIAN WORK

Effective humanitarian work in last-mile communities requires practical, experience-based approaches tailored to local needs. There is a need to implement a localized targeted training sessions that aims to lessen the social vulnerability and strengthen the last-mile communities coping capacity. Providing emergency communication essentials such as solar-powered radios, portable power banks, and emergency kits remain a crucial aspect of preparation for last-mile communities. Building strong, trust-based relationships with local leaders and community members enhances the effectiveness of interventions, while regular feedback collection post-disaster ensures continuous improvement of strategies on the ground. Establishing community-led disaster response teams will foster local ownership and resilience, and tailored educational campaigns will further strengthen community preparedness and response capabilities.
When all is said and done, the last mile communities needed to thrive not merely to survive extreme weather events.

7.0 CONCLUSION

In this study, I looked into the accessibility and actionability of early warning (EW) information in two last mile communities before and after the super typhoon event Mangkhut. The analysis revealed that limited connectivity to the grid and the internet negatively impact last mile communities' ability to access EW messages.

Using the Protection Motivation Theory (PMT), this study also determined the various explanatory factors that influence risk reduction actions before and after the supertyphoon Mangkhut. Threat appraisal (such as perceived vulnerability, severity, and fear) and coping appraisal components (namely response efficacy and self-efficacy) were identified as predictors of risk reduction behaviors. Extending the application of PMT to other variables proved insightful since previous typhoon experience, trust level to local authorities and strength of social networks were all shown to influence decisions to implement risk reduction actions in the two communities both before and after Mangkhut. In regard to the socio-economic variables, the results are mixed. While gender (for Mapita) and age (for Cabalitian) were identified as factors that influence risk reduction behaviour, income, education and house ownership are not.

The results provide valuable insights in understanding why certain groups decide or not decide in acting upon early warning information when confronted with a catastrophic event, which in turn, informs the design and development of risk reduction strategies in empowering vulnerable communities. This paper suggest further research on socio-demographic variables such as income, house ownership and educational attainment, and response cost to risk reduction behaviour as the results in this study are mixed. Moreover, cross-comparative studies in other last-mile communities with different contexts are also encouraged to further understand the interplay of high vulnerability and low coping capacity in the adoption of risk reduction measures.

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APPENDICES

APPENDIX A: QUESTIONNAIRE (ENGLISH VERSION)

Part 1: Socio-Demographic Profile

1.1. Personal Information:

Name (optional): _____

Age: _____

_____18-25 _____ 26-40 _____41-59

_____60 pataas

Gender:

_____Lalaki _____Babae _____ prefer not to disclose

Educational attainment:

____ Elementary

____ Secondary

____ Vocational

____ College (Not completed)

____ Bachelor, Master, Doctorate

Home ownership:

____ Owner

____ Renter

Annual Income

____ < Ph 100,000 ____ Ph 100, 000-Ph 300,000

____ Ph 301, 000-Ph 400,000 ____ Ph 401, 000-Ph 500,000

____ > Ph 500,000

Connected to power supply?

____ Yes

____ No

Connected to internet?

____ Yes

____ No

Part 2: Sources of Risks and Access to Early Warning Systems

2.1. In your opinion, which of the following are potential or actual sources of risk or disaster in your community?

_____typhoon _____flood

_____storm surge _____ earthquake

_____ tsunami _____forest fire

_____landslides _____ marine pollution

_____ saltwater intrusion _____ others

2.2. How far is your house to nearest "evacuation center" or shelter?

_____< 1 km _____> 2-4 km

_____ > 4-7 km _____ > 7km

3.1. In what ways do you receive early warning messages regarding typhoons, etc? Check as many as may be applicable

_____Social Media (e.g., Facebook, etc.) _____SMS from NDRMMC

_____Television _____Siren

_____Radio _____Barangay Mobile car

_____ Relatives _____Traditional indigenous knowledge

_____Others

Part 3: Previous disaster/typhoon experience

5.1. Have you or your community ever experienced any natural calamity or disaster similar to Ompong (Mangkhut)?

____ Yes ____ No

Part 4: Factors Affecting Access to Early Warning Messages during the Height of Typhoon Mangkhut

Instructions: How do the following factors affect your access to early warning messages during the height of Typhoon Mangkhut? Check the appropriate box for your response/opinion.

Factors	Positive	Negative	Neutral
The language used in the early warning message			
The amount of information from the social media pages of the local government			
Iinternet connection during Mangkhut			
Power connection during Mangkhut			
The remoteness/geographical location of the village			

Part 5: Risk Reduction Measures Implemented Before and After Mangkhut

Instructions: Which of the following measures have you undertaken based on the received early warning message as a response before and after Typhoon Mangkhut? Check all the measures that apply to you.

Before Mangkhut:

_____ Preparing emergency supplies---food, medicine, water, battery, etc.
_____Reinforce homes, secure loose objects, boats, livelihoods, properties, and trim trees to reduce potential damage.
_____ Access transportation or shelter if evacuation becomes necessary
_____ No measures taken

After Mangkhut:

_____Conduct safety checks of homes to identify hazards/damage
_____Rebuild livelihoods to be more resilient to future typhoons
_____Seek psychological support from support groups
_____ Stock emergency kits for future disasters
_____ Apply for flood/typhoon damage insurance
_____ No measures taken

Part 6: Threat Appraisal Relative to Supertyphoon Mangkhut

Directions: In your perception, how vulnerable are you in relation to the Super Typhoon Mangkhut and how severe do you think the typhoon's impact was. Place a check mark on the appropriate response that suits your perception/opinion based on each given statement

Statements	1 Strongly Disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree
I feel exposed and at risk during Supertyphoon Mangkhut					
I feel vulnerable to Mangkhut's impact.					
I have limited access to support and resources if Mangkhut destroys our livelihood					
The danger posed by Mangkhut is grave and serious.					
I think Mangkhut is as serious if not more serious than the supertyphoon Yolanda					
Should Mangkhut occurs, I will be tough for us to quickly recover.					
I fear for my own and my family's safety.					
I worry about the potential destruction Mangkhut could bring to my home and community					

Part 7: Appraisal of Coping Capacity vis-avis Mangkhut

Directions: Assess how effective the recommended measures are in relation to the typhoon Mangkhut and how capable are you to implement them. Place a check mark on the appropriate response that suits your perception/opinion.

Statements	1 Strongly Disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree
The Early Warning System enables us to prepare for Mangkhut beforehand.					
Securing our homes before Mangkhut make us feel more secured.					
The presence of coast guards/civil protection officers and local risk reduction personnel instills confidence in us					
Preparing emergency kits and supplies is useful in any eventuality.					
Evacuating before Mangkhut gives us assurance of our safety					
I feel capable of dealing with extreme typhoons such as Mangkhut. I feel confident that I can overcome the crisis that Mangkhut brings					
I trust that our preparation before Mangkhut can reduce impacts to our safety and livelihoods					
Risk prevention measures before Mangkhut is worth the investment The preparation costs before Mangkhut are necessary for protecting lives and property					

Part 8: Trust to Local Authorities

Directions: To what extent to you trust the local authorities in relation to preparations for the typhoon Mangkhut. Place a check mark on the appropriate response that suits your perception/opinion.

Statements	1 Strongly Disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree
I trust that local authorities are well-prepared and capable of effectively managing natural hazards in our community.					
I have confidence in the competence and responsiveness of local authorities to provide timely assistance and support during disasters.					

Part 9: Social Network and Support

Directions: To what extent do you receive support from your community and/or relatives in relation to the typhoon Mangkhut. Place a check mark on the appropriate response that suits your perception/opinion.

Statements	Yes	No
Are you able to receive resistance from your neighbours or community?		
Are you able receive assistance from your kin/relatives before or after a strong typhoon?		

Part 10: Need Priorities to Empower Communities

10.1 Which of the following do you think your community really need to enhance its disaster preparedness Check all that apply:

____Disaster preparedness training to educate the community on the appropriate steps during disasters.
____Accessible information such as issuing warnings and disaster information in language and formats the community understands.
____Providing basic necessities and supplies such as food, water, medicine, and other essentials during times of disaster..
____Improving infrastructure such as public buildings and roads to be more resilient to disasters.
____Assistance, both technical and financial.
____Programs that promote collaboration and cooperation between the government and the community to be more prepared and resilient to disasters.

10.2. Resilience Barriers: Choose three primary barriers that you think affect the community's ability to respond effectively in times of calamity:

____Financial constraints
____Lack of access to reliable and trustworthy disaster and risk information
____ Lack of capacity and awareness
____ Infrastructural and connectivity issues
____ Governance issues on the part of the local government
____Others

Bahagi 5: Mga Paghahandang Isinagawa Bago at Pagkatapos ang Bagyong Mangkhut Base sa Maagang Babala
Direksiyon: Alin-alin sa mga sumusunod ang mga paghahandang iyong isinagawa base sa natanggap na maagang babala (early warning message) bilang tugon bago at pagkatapos ng bagyong Mangkhut. Lagyan ng tsek ang lahat ng paghahandang isinagawa.

Bago Mangkhut:

_____ Paghahanda ng mga pang-emergency na suplay---pagkain, gamot, tubig, baterya, atbp.
_____Palakasin ang mga bahay, siguruhing ligtas ang mga maluwag na bagay, bangka, kabuhayan, ari-arian, at putulin ang mga sanga ng puno upang mabawasan ang posibleng pinsala.
_____ Maghanap ng transportasyon o silungan kung kinakailangang lumikas.
_____ Walang paghahandang isinagawa.

Pagkatapos ng Mangkhut:

_____Magsagawa ng mga pagsusuri sa kaligtasan ng mga bahay upang matukoy ang mga panganib/pinsala
_____Muling itayo ang mga kabuhayan upang maging mas matatag sa mga susunod na bagyo
_____Humingi ng suportang sikolohikal mula sa mga support group Mag-imbak ng mga emergency kit para sa mga darating na sakuna
_____Mag-apply para sa insurance laban sa pinsala dulot ng baha/bagyo
_____ Walang paghahandang isinagawa.

Bahagi 6: Pananaw Ukol sa Pinsala at Panganib na Dulot ni Mangkhut
Direksiyon: Basahing maigi ang mga sumusunod na pahayag tungkol sa pinsala at pangani na dulot ni Mangkhut. Markahan ito ayon sa iyong sariling pagtatantiya at pananaw. Lagyan ng tsek ang akma sa iyong persepyon o tugon.

Mga Pahayag	1 Lubos na Hindi Sumasang-ayon	2 Hindi Sumasang-ayon	3 Hindi Tiyak	4 Sumasang-ayon	5 Lubos na Sumasang-ayon
1. Ramdam ko ang panganib bago pa dumating si Supertyphoon Mangkhut					
2. Pakiramdam ko'y madali akong mapahamak sa posibleng epekto ni Mangkhut					
3. Limitado ang suporta at mga mapagkukunan ko ng tulong kung sisirain ng Mangkhut ang aming kabuhayan 4. Malubha at seryoso ang panganib na dulot ng Mangkhut					
5. Sa tingin ko, kasing-lakas o mas malakas pa ang Mangkhut kaysa sa supertyphoon Yolanda					
6. Kung magiging mapinsala si Mangkhut, magiging mahirap para sa amin ang agarang pagbangon 7. Natatakot ako para sa kaligtasan ko at ng aking pamilya					
8. Nag-aalala ako sa posibleng pagkawasak na dulot ng Mangkhut sa aking bahay at aming komunidad					

Bahagi 7: Pananaw Ukol sa Kakayahang Isagawa ang Nararapat na Paghahanda Para Maibsan ang Pinsala Bago at Pagkatapos ng Bagyong Katulad ni Mangkhut
Direksiyon: Basahing maigi ang mga sumusunod na pahayag tungkol sa iyong kakayahan na isagawa ang mga nararapat na paghahanda upang maibsan ang mga pinsala na pwedeng dulot tulad ng bagyong Mangkhut. Markahan ito ayon sa iyong sariling pagtatantiya at pananaw. Lagyan ng tsek ang akma sa iyong persepyon o tugon.

Mga Pahayag	1 Lubos na Hindi Sumasang-ayon	2 Hindi Sumasang-ayon	3 Hindi Tiyak	4 Sumasang-ayon	5 Lubos na Sumasang-ayon
1. Nagbigay daan ang maagang babala na natanggap namin upang lubos na makapaghanda bago ang Mangkhut					
2. Ang pagpapatibay ng aming tahanan bago dumating si Mangkhut ay nagbibigay sa amin ng higit na seguridad. 3. Ang presensya ng mga coast guard/opisyal ng proteksyon sibil at mga tauhan ng lokal na pamahalaan ay nakakapagdagdag sa amin ng kumpiyansa.					

Bahagi 5: Mga Paghahandang Isinagawa Bago at Pagkatapos ang Bagyong Mangkhut Base sa Maagang Babala
Direksiyon: Alin-alin sa mga sumusunod ang mga paghahandang iyong isinagawa base sa natanggap na maagang babala (early warning message) bilang tugon bago at pagkatapos ng bagyong Mangkhut. Lagyan ng tsek ang lahat ng paghahandang isinagawa.

Bago Mangkhut:

_____Paghahanda ng mga pang-emergency na suplay---pagkain, gamot, tubig, baterya, atbp.
_____Palakasin ang mga bahay, siguruhing ligtas ang mga maluwag na bagay, bangka, kabuhayan, ari-arian, at putulin ang mga sanga ng puno upang mabawasan ang posibleng pinsala.
_____ Maghanap ng transportasyon o silungan kung kinakailangang lumikas.
_____ Walang paghahandang isinagawa.

Pagkatapos ng Mangkhut:

_____Magsagawa ng mga pagsusuri sa kaligtasan ng mga bahay upang matukoy ang mga panganib/pinsala
_____Muling itayo ang mga kabuhayan upang maging mas matatag sa mga susunod na bagyo
_____Humingi ng suportang sikolohikal mula sa mga support group Mag-imbak ng mga emergency kit para sa mga darating na sakuna
_____Mag-apply para sa insurance laban sa pinsala dulot ng baha/bagyo
_____ Walang paghahandang isinagawa.

Bahagi 6: Pananaw Ukol sa Pinsala at Panganib na Dulot ni Mangkhut
Direksiyon: Basahing maigi ang mga sumusunod na pahayag tungkol sa pinsala at pangani na dulot ni Mangkhut. Markahan ito ayon sa iyong sariling pagtatantiya at pananaw. Lagyan ng tsek ang akma sa iyong persepyon o tugon.

Mga Pahayag	1 Lubos na Hindi Sumasang-ayon	2 Hindi Sumasang-ayon	3 Hindi Tiyak	4 Sumasang-ayon	5 Lubos na Sumasang-ayon
1. Ramdam ko ang panganib bago pa dumating si Supertyphoon Mangkhut					
2. Pakiramdam ko'y madali akong mapahamak sa posibleng epekto ni Mangkhut					
3. Limitado ang suporta at mga mapagkukunan ko ng tulong kung sisirain ng Mangkhut ang aming kabuhayan 4. Malubha at seryoso ang panganib na dulot ng Mangkhut					
5. Sa tingin ko, kasing-lakas o mas malakas pa ang Mangkhut kaysa sa supertyphoon Yolanda					
6. Kung magiging mapinsala si Mangkhut, magiging mahirap para sa amin ang agarang pagbangon 7. Natatakot ako para sa kaligtasan ko at ng aking pamilya					
8. Nag-aalala ako sa posibleng pagkawasak na dulot ng Mangkhut sa aking bahay at aming komunidad					

Bahagi 7: Pananaw Ukol sa Kakayahang Isagawa ang Nararapat na Paghahanda Para Maibsan ang Pinsala Bago at Pagkatapos ng Bagyong Katulad ni Mangkhut
Direksiyon: Basahing maigi ang mga sumusunod na pahayag tungkol sa iyong kakayahan na isagawa ang mga nararapat na paghahanda upang maibsan ang mga pinsala na pwedeng dulot tulad ng bagyong Mangkhut. Markahan ito ayon sa iyong sariling pagtatantiya at pananaw. Lagyan ng tsek ang akma sa iyong persepyon o tugon.

Mga Pahayag	1 Lubos na Hindi Sumasang-ayon	2 Hindi Sumasang-ayon	3 Hindi Tiyak	4 Sumasang-ayon	5 Lubos na Sumasang-ayon
1. Nagbigay daan ang maagang babala na natanggap namin upang lubos na makapaghanda bago ang Mangkhut					
2. Ang pagpapatibay ng aming tahanan bago dumating si Mangkhut ay nagbibigay sa amin ng higit na seguridad. 3. Ang presensya ng mga coast guard/opisyal ng proteksyon sibil at mga tauhan ng lokal na pamahalaan ay nakakapagdagdag sa amin ng kumpiyansa.					

1. Ang paghahanda ng mga emergency kit at suplay ay kapaki-pakinabang sa anumang pagkakataon.					
2. Ang paglikas bago dumating si Mangkhut ay nagbibigay sa amin ng kasiguraduhan sa aming kaligtasan.					
3. Pakiramdam ko'y kaya kong harapin ang mga matitinding bagyo tulad ni Mangkhut.					
4. Kumpiyansa ako na malalampasan ko ang krisis na dulot ng Mangkhut.					
5. Naniniwala ako na ang aming paghahanda bago dumating si Mangkhut ay makakabawas sa pinsalang pwedeng idulot ng bagyo sa aming kaligtasan at kabuhayan.					
6. Maituturing na magandang "investment" ang mga paghahandang isinasagawa bago dumating si Mangkhut.					
7. Ang mga gastos sa paghahanda bago dumating si Mangkhut ay kinakailangan para sa kaligtasan, proteksyon ng kabuhayan at ari-arian.					

Bahagi 8: Kredibilidad o Tiwala ng Pamayanan sa Lokal na Pamahalaan

Mga Pahayag	1 Lubos na Hindi Sumasang-ayon	2 Hindi Sumasang-ayon	3 Hindi Tiyak	4 Sumasang-ayon	5 Lubos na Sumasang-ayon
1. Tiwala ako na ang mga lokal na awtoridad ay handa at may kakayahan na epektibong pamahalaan ang mga likas na sakuna sa aming komunidad. 2. May tiwala ako sa kakayahan at kapasidad ng mga lokal na awtoridad na magbigay ng agarang tulong at suporta sa panahon ng mga likas na sakuna.					

Bahagi 9: Suporta Mula sa Pamilya at Pamayanan sa Panahon ng Sakuna

Mga Pahayag	Oo	Hindi
1. Kayo po ba ay may natatanggap na tulong mula sa inyong mga kapitbahay o komunidad bago o pagkatapos ng isang sakuna? 2. Kayo po ba ay may natatanggap na tulong mula sa inyong mga kamag-anak bago o pagkatapos ng isang sakuna?.		

Bahagi 10: Mga Prayoridad na Kailangan Upang Mapatatag ang Kahandaan ng Komunidad

10.1 Markahan ng tsek ang lahat ng akmang tugon:

____Pagsasanay sa paghahanda para sa kalamidad upang matutunan ng komunidad ang tamang hakbang sa panahon ng sakuna.

____Mga impormasyon na madaling maunawaan tulad ng paglalabas ng babala at impormasyon sa kalamidad sa wika at format na nauunawaan nila.

____Pagbibigay ng mga pangunahing kagamitan at suplay tulad ng pagkain, tubig, gamot, at iba pang kailangan sa oras ng kalamidad.

____Pagpapaunlad ng imprastruktura tulad ng mga pampublikong gusali at kalsada upang maging mas matatag sa mga kalamidad.

____Tulong-dunong, teknikal at pinansyal

____Programang nagtataguyod palakasin at pagtibayin ang ugnayan ng pamahalaan at komunidad, pagtutulungan, at kooperasyon upang mas maging handa at matatag sa mga kalamidad.

10.2. Hadlang sa Kakayahan ng Komunidad: Pumili ng tatlong pangunahing hadlang na sa tingin moy nakakaapekto sa kakayahan ng komunidad na kumilos ng maayos sa oras ng kalamidad:

____Pinansiyal na balakid
____Kakulangan ng access sa impormasyon
____ Kakulangan sa pagsasanay at edukasyon
____Kakulangan ng imprastraktura katulad ng maaayos na kalsada
____Kakulangan ng sapat na pasilidad
____Iba (kung meron, ilagay sa patlang): _____

APPENDIX B: INTERVIEW PROTOCOL (SEMI-STRUCTURED INTERVIEW)

Overview
This Interview protocol is prepared to serve as guide for the conduct of the interviews of the key informants of the study and therefore need not be applied to the letter. As such, it can be modified and use with a little flexibility whenever the circumstances and conditions of the interview call for it to allow new insights and perspectives to emerge. For further information on the purpose of the interviews, see further explanation on the Methodology section of this study.

Section I. Interview Introduction

First of all, thank you for taking the time to speak to me today.

Allow me to introduce myself. I am Rhomir Yanquiling, a researcher on disaster risk reduction management in Pangasinan, Philippines. I am currently conducting a study on the factors that influence the accessibility and actionability of early warning messages in the context of the Super Typhoon Mangkhut.

I am here to talk to you about your perspectives and opinions as one who experienced the Super Typhoon Mangkhut. Let me briefly inform you of what is to take place in this interview. I am going to ask series of questions and engage in a conversation with you to understand from your perspective.

Rest assured that this conversation will be treated with utmost confidentiality, that your responses will be used only for purposes of the research and that you have the option to have your name and responses anonymized for the interview.
If you are comfortable, would it be OK with you for us to record this session for our note taking? If at any point, you want to take a break or stop the interview please just let me know and we can work around it. Any questions before we begin? Let's get started! (RECORD…)

Section II. Context

(1) Let us start off by learning a bit of yourself. Can you please tell us a bit of what you do professionally/academically?

Section III. Guide Questions

1. How do you access early warning information in the community?
2. Can you describe your experience with accessing early warning information during Super Typhoon Mangkhut (Ompong)?
3. How effective do you think the early warning systems (EWS) were in preparing your community for Super Typhoon Mangkhut?
4. What challenges did you face in accessing and understanding the early warning information before Super Typhoon Mangkhut?
5. Have you noticed any improvements or changes in the accessibility and actionability of the EWS since Super Typhoon Haiyan (Yolanda)?
6. How did your perceptions of disaster risk and preparedness change after experiencing Super Typhoon Haiyan?
7. What actions did you take to prepare for Super Typhoon Mangkhut, considering your experiences with previous typhoons like Haiyan? What were the risk reduction measures did you implement? Have you implemented some risk reduction measures even after Mangkhut? Why and why not?
8. Did you feel adequately informed and prepared to respond to the threats posed by Super Typhoon Mangkhut?
9. How did factors like internet connectivity and power supply affect your ability to access and act on early warning information for Super Typhoon Mangkhut?
10. In your opinion, what measures could be taken to improve the accessibility and effectiveness of early warning systems in last-mile communities?
11. Looking ahead, what do you think are the most important actions that should be taken to better prepare for future super typhoons in your community?

Section V. Interview Wrap-up

1. Do you have something to add or final comments to make?
2. Should have I asked any question which I have not been able to ask?
3. Do you have any professional colleagues, acquaintances or contact you can recommend for further interviewing?

I wish to say that we greatly cherish the time and assistance you extended us.
Thank you so much for gracing our invitation for this interview.
Have a nice day! Bye

APPENDIX C: SUPPLEMENTARY MATERIALS

Supplementary Table 1 | Risk Reduction Measures Before and After Mangkhut

Item	Type of variable	Question
Risk reduction measures before Mangkhut	Dummy. At least one measure (1), no measure (0)	Preparing emergency supplies
		Reinforce homes, secure loose objects, and trim trees to reduce potential damage.
		Access transportation or shelter if evacuation becomes necessary
		Evacuate
Risk Reduction measures after Mangkhut	Dummy. At least one measure (1), no measure (0)	Conduct safety checks of homes to identify hazards/damage
		Rebuild livelihoods to be more resilient to future typhoons
		Seek psychological support from support groups
		Stock emergency kits for future disasters
		Apply for flood damage insurance

Supplementary Table 2 | Explanation of the PMT Constructs

Components	Description/Definition
Threat Appraisal	
Perceived vulnerability	The individual's belief about their own susceptibility to the threat. For example, how likely they think it is that they will be affected by the super typhoon.
Perceived severeity	The extent to which an individual believes that a threat, such as the impact of a super typhoon like Mangkhut, will have serious consequences for them personally.
Fear	Fear is an emotional response to a perceived threat, such as the potential danger and harm caused by a super typhoon like Mangkhut. It encompasses feelings of anxiety, worry, and apprehension about the consequences of the threat. In the context of PMT, fear motivates individuals to take protective actions to reduce the threat and alleviate their feelings of fear.
Coping Appraisal	
Response Efficacy	The individual's belief in the effectiveness of the recommended protective actions in reducing the threat. For instance, whether they believe that preparing emergency supplies or reinforcing their home will actually help protect them during a super typhoon.
Self-Efficacy	The individual's confidence in their own ability to perform the recommended protective actions.
Response Cost	In the context of a super typhoon like Mangkhut, response cost may include the financial expenses, time, effort, or inconvenience required to prepare for the storm, such as purchasing emergency supplies, reinforcing homes, or evacuating to safer locations. Individuals weigh the perceived costs against the perceived benefits of these protective actions when deciding whether to engage in them. If the perceived costs outweigh the perceived benefits, individuals may be less motivated to take protective measures.

Supplementary Table 3 | Explanatory Variables used in the OLS regression

Item	Component	Type of variable	Variable	Question
Threat Appraisal	Perceived vulnerability	Continuous variable. Mean score of three statements	TA1	I feel exposed and at risk during Supertyphoon Mangkhut
			TA2	I feel vulnerable to Mangkhut's impact.
			TA3	I have limited access to support and resources if Mangkhut destroys our livelihood
	Perceived severity	Continuous variable. Mean score of three statements	TA4	The danger posed by Mangkhut is grave and serious.
			TA5	I think Mangkhut is as serious if not more serious than the supertyphoon Yolanda
			TA6	Should Mangkhut occurs, I will be tough for us to quickly recover.
	Fear	Continuous variable. Mean score of two statements	TA7	I fear for my own and my family's safety.
			TA8	I worry about the potential destruction Mangkhut could bring to my home and community
Coping Appraisal	Response efficacy	Continuous variable. Mean score of five statements	CA1	The Early Warning System enables us to prepare for Mangkhut beforehand.
			CA2	Securing our homes before Mangkhut make us feel more secured.
			CA3	The presence of coast guards/civil protection officers and local risk reduction personnel instills confidence in us
			CA4	Preparing emergency kits and supplies is useful in any eventuality.
			CA5	Evacuating before Mangkhut gives us assurance of our safety
	Self-efficacy	Continuous variable. Mean score of three statements	CA6	I feel capable of dealing with extreme typhoons such as Mangkhut.
			CA7	I feel confident that I can overcome the crisis that Mangkhut brings
			CA8	I trust that our preparation before Mangkhut can reduce impacts to our safety and livelihoods
	Response cost	Continuous variable. Mean score of two statements	CA9	Risk prevention measures before Mangkhut is worth the investment
			CA10	The preparation costs before Mangkhut are necessary for protecting lives and property
Previous typhoon experience	---	Dummy. Yes (1), No (0)	PE1	Have you experienced similar typhoon before
Strength of social networks	Assistance from the community	Dummy. Yes (1), No (0)	SS1	Are you able to receive resistance from your neighbours or community?
	Help from kin/ relatives	Dummy. Yes (1), No (0)	SS2	Are you able receive assistance from your kin/relatives before or after a strong typhoon?
Level of trust	trust	Continuous variable. Mean score of two statements	T1	I trust that local authorities are well-prepared and capable of effectively managing disasters in our community.
			T2	I have confidence in the competence and responsiveness of local authorities to provide timely assistance and support during disasters.
Socio-demographic characteristics	Gender	Dummy. Female (1), Male (0)	SD1	Gender
	Age	Continuous variable	SD2	Year of birth
	Education	Dummy. University diploma (1), otherwise (0)	SD3	Education level
	Income	Dummy. Above 500,000	SD4	Annual household income

APPENDIX D: FACEBOOK POSTS ANALYSED (SEPTEMBER 11-15, 2018)

Date	Early Warning Messages in PDRRMO Facebook Page Before Mangkhut	No. of Reactions	No. of Comments	No. of Shares
September 15, 2018	Storm surge warning 3 in coastal areas (Payong Kaligtasan Storm Surge) PAYONG KALIGTASAN STORM SURGE Ayon sa Storm Surge Warning #3 ng PAGASA para sa Bagyong Ompong, ang mga sumusunod na bayan/lungsod ay maaaring maapektuhan ng daluyong-bagyo na abot isa (1) hanggang dalawang (2) metro ang taas: …	661	155	1.3K
September 15, 2018	WEATHER ADVISORY #13 as of SEPTEMBER 14, 2018 | 11:00PM TYPHOON "OMPONG" Location: At 10:00 PM today, the eye of Typhoon "OMPONG" was located based on Daet radar and other available data at 190 km East of Tuguegarao City, Cagayan (17.6 °N, 123.5 °E)	308	23	190
September 15, 2018	Flashflood Warning PAYONG KALIGTASAN As of September 15,2018|1:00PM Mabilis na tumataas ang level ng tubig mula sa ating mga kailogan sanhi ng malakas na ulan buhat ng TY OMPONG. Dahil dito, mabilis na rin ang pagragasa ng tubig baha. Pinapayuhan ang lahat ng malalapit sa mga kailogan na maging alerto sa posibleng flashflood at kung kinakailangan ay lumikas na sa mataas na lugar. Manatiling Ligtas at Aktibo!	101	12	107
September 14, 2018	Request for Implementation of Pre-Emptive Evacuation for Typhoon "Ompong" Request for Implementation of Pre-Emptive Evacuation for Typhoon "Ompong" Hinihikayat po ang mga naninirahan malapit sa coastal areas na makipagugnayan sa gagawing pre-emptive evacuation. Ito po ay para matiyak ang kaligtasan ng lahat.	90	0	39
September 14, 2018	TYPHOON OMPONG (MANGKHUT) may cause storm surges in coastal areas starting Saturday, September 15, 2018 and may be enhanced by the tide level with the height of 2.5ft.	425	54	982
September 12, 2018	WEATHER ADVISORY #4 as of September 12, 2018 | 12:00 NN Location: The eye of Typhoon "MANGKHUT" was estimated on all available data at 1,190 km East Northeast of Guiuan, Eastern Samar (OUTSIDE PAR)(13.8°N,136.3°E)…	291	29	236
September 11, 2018	Weather Advisory 3, 2018 TYPHOON "MANGKHUT" The eye of Typhoon "MANGKHUT" was located, based on all available data, at 1,650 km East of Southern Luzon (OUTSIDE PAR)(13.8°N,139.5°E)…	260	35	376
September 11, 2018	WEATHER ADVISORY #2 as of September 11, 2018 | 12:00 NN Location: The eye of Typhoon "MANGKHUT" was located, based on all available data, at 1,845 km East of Southern Luzon (OUTSIDE PAR) (13.9°N,141.3°E) …	324	22	286

APPENDIX E: WORKFLOW INFORMATION FOR THE SENTIMENT ANALYSIS USING ORANGE