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Filipinos'Views on theDisaster Informationfor the 2013 Super Typhoon Haiyan in the Philippines

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Abstract

Super Typhoon Haiyan (Yolanda) struck Visayas, the central region of the Philippines, in November 2013 and caused approximately 6,300 deaths. Despite a typhoon warning announcement, many people did not evacuate to safer places. This study focuses on the reasons behind the events that took place from the warning until the evacuation period, with the research objective of understanding how people view disaster warnings. After conducting a pretest and a pilot test, a questionnaire was distributed in both the English and Filipino languages. The survey was conducted in the affected areas in the Philippines in December 2013, which was less than 2 months after the disaster. All of the respondents experienced this typhoon because they remained in Tacloban, Cebu, Tagbilaran, and Talalora during the impact period. The results shed light on issues related to preferred disaster information, source, message, problems in receiving warnings and responses to the warnings. The findings improve the current understanding of warning systems and provide some suggestions for enhancing warnings and people's responses to warnings.

Keywords: *Philippines; Survey; Typhoon Haiyan; Typhoon Yolanda; Warning System*.

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1. Introduction

"Can sustainable development, along with the international strategies and instruments aiming at poverty reduction and environmental protection, be successful without taking into account the risk of natural hazards and their impacts? Can the planet afford the increasing costs and losses due to so-called natural disasters? The short answer is, no." [1].

Sustainable development is defined as "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [2], and resilience to natural hazards refers to "the ability to protect lives, livelihoods and infrastructure from destruction, and to the capability to restore areas after natural hazards has occurred" [3]. Disaster risk reduction can be explained in terms of "[t]he systematic development and application of policies, strategies and practices to minimize vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) adverse impact of hazards, within the broad context of sustainable development" [1]. Looking into the framework of disaster risk reduction, it can be seen that there are "risk awareness and assessment", "knowledge development", "public commitment and institutional frameworks", "application of measures", and "early warning systems" [1]. This study would like to address the issue of resilience in disaster risk reduction or prevention.

A resilience framework consists of "agents", "systems", and "institutions [4]". Agents, which are individuals, households, communities, or organizations, require the characteristics of responsiveness, resourcefulness, and capacity to learn; meanwhile, one of the characteristics of institutions is information flows (i.e., providing access to correct and meaningful information for private households or other organizations) [4].Paton and Johnson studied vulnerability, resilience, and disaster preparedness in communities [5]. They also suggested that risk management should promote resilience and preparedness through a mix of strategies involving communication, managing vulnerability, and facilitating resilience and growth [5].

Following on the abovementioned statements, early warning systems, as one of the important parts of resilience in disaster risk reduction [1], are the focus of this study. Although there is an existing warning system, the number of deaths is still high in many disasters in many countries. This study seeks to investigate not only the technical system but also, and especially, the information and communication issues because early warning systems are considered a socio-technical problem that requires understanding both technical and human artifacts.

Many countries in the Asia-Pacific region have encountered major natural disasters (e.g., the 2004 Indian Ocean tsunami, the 2008 Cyclone Nargis in Myanmar, the 2008 Sichua Earthquake, the 2011 Great East Japan Earthquake and Tsunami, the 2011 Great Flood in Thailand,

and the 2013 Super Typhoon Haiyan in the Philippines). This paper pays attention to the last example, the 2013 Super Typhoon Haiyan.

From November 6to 8, 2013, Visayas, the central region of the Philippines, was hit by Super Typhoon Haiyan (Filipino name: Yolanda), with a wind speed placed by the Joint Typhoon Warning Center at approximately 315 km/h maximum 1-minute sustained winds [6, 7, 8]. The typhoon primarily impacted Leyte and Samar in the Philippines and also the coastal areas of Vietnam and China [6]. It began as a relatively low air pressure system on November 3, developed into a tropical storm within a day, followed by further development into a typhoon of the highest category, category 5 (i.e., a super typhoon) by November 6, with a peak on November 7 [6].

The typhoon reached landfall in Eastern Samar, Leyte, Cebu, Iloilo, and Palawan [7]. The track of the typhoon is shown in Figure 1. Figures 2and 3 show the areas affected by Super Typhoon Haiyan. Figure 2 shows the storm surge that carried the M/V Eva Jocelyn, a small coastal freighter, over to the seaside residential area of Anibong in Tacloban City, Leyte, and Figure 3 shows a typical residential village in Tacloban City 6 weeks after the typhoon with electric posts and street lamps still unrepaired. As a result, this typhoon made a large impact on the economy, society, and environment (i.e., a triple bottom line [10]). The typhoon had an economic impact of USD 9-17 billion and resulted in approximately 6,300 deaths, as officially recorded [6, 7]. The Philippines ranks as the 3rd most vulnerable country [11]. Paciente states "Typhoon Yolanda [Haiyan] is just a repeat of what happened in the past…", but the damage was the most severe because more people had moved to the risk areas [12].

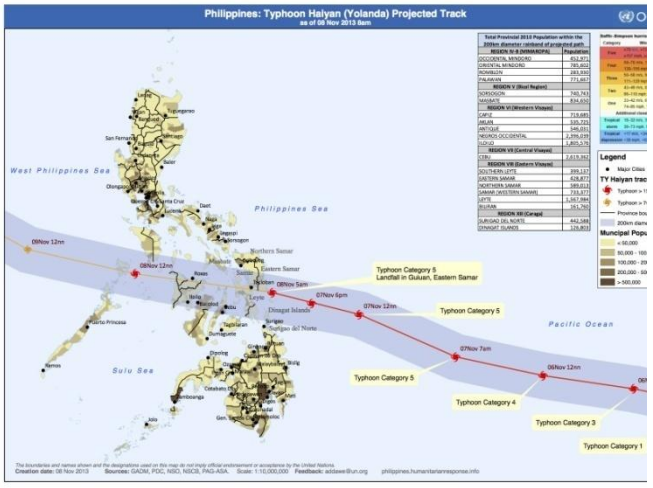

Figure 1 Track of Super Typhoon Haiyan (Source: [9]. Reprinted with permission)

Figure 2M/V Eva Jocelyn amidst the debris of what used to be a residential area in Barangay Anibong, Tacloban, Leyte (6 weeks after Super Typhoon Haiyan)

Although there were Super Typhoon Haiyan warnings, many people did not evacuate to safe places (based on this study's survey and [13]). Both early warning systems and evacuation are considered measures and functions for reducing disaster risk [14].This study focuses on the reasons behind these events, from the typhoon warning to the evacuation period, with the research objective of examining how people view disaster warnings and address evacuation information, including their ultimate responses (i.e., decision to evacuate or not). The survey was conducted in the areas that were affected by Super Typhoon Haiyan in the Philippines. The results found some issues related to preferred disaster information, sources, messages, problems in receiving warnings and responses to the warnings, etc., which are important factors in building community resilience against future disasters.

Figure 3 The affected area in Tacloban, Leyte (6 weeks after Super Typhoon Haiyan)

The rest of the paper is structured as follows. The next section reviews previous research and practice in disaster warning systems, especially in the Philippines. Section 3 explains our research framework and the methodology of this study. Section 4 provides our results. Lastly, Section 5offers a discussion and conclusions.

2. Disaster Warning System Background

2.1 Overall Background

"Identify, assess and monitor disaster risks and enhance early warning" is one of the five priority actions stated in the Hyogo Framework for Action (HFA) 2005-2015 [15]. Currently, information and communication technology (ICT)is considered one of "the major challenges for community disaster preparedness, survival, and recovery" [16] in terms of humanitarian action, particularly how ICT can assist disaster-related international and national actors more effectively during aftermaths, responses, recovery and reconstruction [17].The main three elements of the early warnings are "forecasting and prediction of impending events", "processing and dissemination of warning to political authorities and population", and "undertaking appropriate reaction to warnings" [1].

Mileti identified the following warning factors that can influence public response: "warning source", "message consistency", "message accuracy", "warning clarity", "certainty of the message", "sufficient information", "guidance", "warning frequency", "risk location information", and "channel of communication" [18]. Riad et al. conducted a study to discover the factors that influenced the evacuation of the survivors from Hurricane Hugo (1989) and Hurricane Andrew (1992) [19]. They classified the reasons survivors did not evacuate despite the warning into 5 categories: "Hurricane [is] not a serious threat", "Confident in safety", "Avoidance/non-rational thinking", "Inadequate social/economic resources", and "Territorial/home protection" [19].Some studies focus on process management inside the warning organization in developed country[20].

2.2 Asia-Pacific

According to the report of the 6th Asian Ministerial Conference on Disaster Risk Reduction, the Asia-Pacific region "is devastated by 45 percent of the global disasters, 42 percent of the economic losses, 83 percent of overall deaths and 86 percent of people affected by disasters" [21]. It is the region that has the highest number of reported disasters and the highest fatality percentage [21]. This area has encountered many major natural disasters such as the 2004 Indian Ocean Tsunami, the 2008 Cyclone Nargis (Myanmar), the 2011 Great East Japan Earthquake and Tsunami, the 2011 Thailand Floods, and the 2013 Super Typhoon Haiyan (the Philippines).

Through the HFA monitoring process in the Asia-Pacific area, "The geographical coverage of regional multi-hazard early warning systems has increased", especially for the tsunami, cyclone and other hydro-meteorological early warning systems at the national level [22]. However, "[m]ore work is still needed to address extensive risks and trans-boundary risks. Other tools, such as multi-hazard risk assessments and cost-benefit analysis are gaining momentum. Capacity and information is needed to guide these activities, with many countries noting that generating, sharing, managing and using data remains a complex task" [22]. Chang studied the storm hazards in Southeast Asia and found that most of the selected cities (Hanoi, Jakarta, Kuala Lumpur, Manila, Singapore, and Vientiane) recorded a higher proportion of months in which rainfall exceeded the 90th percentile over a 30-year period in 2003 to 2007 compared with 1998 to 2002; this "increasing frequency and intensity of extreme events translate into potential hazards" [23] in this region.

Some organizations do provide forecasts and warning information to this area, such as the Regional Integrated Multi-Hazards Early Warning System for Africa and Asia (RIMES). In the lower Mekong Basin, the riparian countries (i.e., Cambodia, China, Laos, Thailand, and Vietnam) cooperate in terms of data collection from their hydro-meteorological stations in order to record and provide the early warning system in the area [24]. In Southeast Asia, the Regional Specialized Meteorological Center (RSMC), a center under the World Meteorological Organization's World Weather Watch (WWW) is based in Tokyo, Japan [25]. The RSMC provides "a range of diagnostic and

prognostic products such as short, medium and long-term weather predictions" [25].

Most countries in Southeast Asia have established their own meteorological agencies to monitor storm events. For example, Cambodia's Department of Meteorology (DOM) monitors 24 hours a day with typhoon analyses of weather maps and weather reports from surrounding countries including the Royal Observatory of Hong Kong [26]. DOM directly reports warning messages to the public through TV, radio, and newspapers [26].Indonesia has the Indonesian Agency for Meteorological, Climatology and Geophysics as the national agency that provides 24-hour forecasts, 3-day weather advisories, weekly weather advisories, and warning services, which are provided by the Jakarta Tropical Cyclone Warning Centre, Marine Meteorology Service, Severe Weather Monitoring and Meteorological Information subdivisions and supported by other units [27]. Laos' Department of Meteorology and Hydrology (DMH) forecasts tropical cyclones based on the analysis of weather maps and numerical weather predictions issued by regional organizations such as the European Centre for Medium-Range Weather Forecasting (ECMWF), RSMC Tokyo, the Korean Meteorological Agency (KMA), the Royal Observatory of Hong Kong, the Vietnam National Hydro-Meteorological Service, RIMES, and other online sources [28]. The DMH provides the weather forecasts and warnings through radio, TV, Internet services, local authorities, and newspapers [28].The Thai Methodological Department (TMD) is an agency that monitors and forecasts the weather in Thailand, and the National Disaster Warning Center (NDWC) is an official focal point for multi-hazard warnings [29, 30]. The channels used to broadcast to the public include TV, website, warning towers, warning boxes at city halls, village leader radio devices, etc. [30]. Vietnam separated the areas of responsibility into 12 coastal areas [31]. Vietnam's National Hydro-Meteorological Service (NHMS) issues the weather forecasts and warnings via the government and local government agencies, the Central Committee for Flood and Storm Control (CCFSC), the Sub-Committee on Navigation, Communications and Search and Rescue (NCSR), and the media (by telephone and fax), and it issues forecasts to the fishing boats via Global Telecommunication System (GTS), coastal broadcasting radio, and internal hydro-meteorological radio [31].

2.3 The Philippines

Abon et al. studied community-based monitoring for flood early warning system in the Central Bicol River Basin and found that the inclusion of the communities as part of the system can impact the level of understanding of the disaster [32]. A study on Filipino online users' perceptions about flood disaster warning systems found that the existing warning systems do not efficiently reach the public [33]. Many of the respondents did not receive any early warning, whereas most of those who received the warning actually received the notice during the flood [33]. Because the Philippines is located in the "typhoon belt of the Pacific", which frequently encounters heavy precipitation [33], it is a fitting subject for a study on the effects of disaster warning. This study takes the opportunity to gather data from residents of the large-scale disaster, Super Typhoon Haiyan.

The Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) is an official and national institution who provides disaster information. For the disaster information transfer system, the information from PAGASA is transferred to the National Disaster Risk Reduction and Management Council (NDRRMC), a working group administered by the Office of Civil Defense to be responsible for the people during disasters or emergency; national media, Internet, and concerned departments (i.e., National Power Corporation, National Irrigation Administration, Department of Public Works and Highways, and National Water Resources Board); and PAGASA Regional Offices. Next, the NDRRMC transfers the received information to the Regional, Provincial, Municipality, and Barangay (i.e., village) level through the Regional Disaster Risk Reduction and Management Council (RDRRMC), the Provincial Disaster Risk Reduction and Management Council (PDRRMC), the Municipality Disaster Risk Reduction and Management Council (MDRRMC), and the Barangay Disaster Risk Reduction and Management Council (BDRRMC), respectively [34, 35].

In the Philippines, public storm warnings are categorized into 4 levels [36], as shown in Table 1. The maximum is level 4, which indicates a situation in which all people should have completely evacuated.

On November 4, 2013, at 8:00 a.m. PHT, Weather Advisory No. 1 was announced by PAGASA, followed by PAGASA's Severe Weather Bulletin No. 1 at 11:00 a.m. PHT on November 6. At 11:00 a.m. PHT on November 7, PAGASA declared Severe Weather Bulletin No. 3 which warned of 7-meter wave heights in the coastal areas for 18 hours before the first landing in Guinuan, which was an appropriate estimation based on the survey [34].

Super Typhoon Haiyan caused massive damage in the Philippines. The total number of deaths was 6,300, the number of injured was 28,689, and the number of missing was1,061 (as of April 17, 2014) [7, 37]. Table 2 shows the effects from Super Typhoon Haiyan in terms of deaths and injuries. Figure 4 shows satellite images of Anibong in Tacloban before and after the typhoon hit.

Table 1 Public Storm Warning Signals [36]

Signal	Expected Conditions	Precautionary Measures
1	"A tropical cyclone will affect an area"; Winds: 30-60 km/h Intermittent rains: in at least 36 h	"People are advised to listen to the latest severe weather bulletin issued by the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) every six hours"
2	"A tropical cyclone will affect an area"; Winds: > 60 km/h and > 100 km/h in at least 24 h	People are cautioned not to travel by sea and air; "Disaster preparedness agencies/organizations are in action to alert their communities"
3	"A tropical cyclone will affect an area"; Winds: > 100 km/h and > 185 km/h in at least 18 h	"Travel is very risky especially by air and sea"; "People are advised to seek shelter in strong buildings, evacuate low-lying areas, and stay away from the coasts and riverbanks"; "Disaster preparedness and response agencies/organizations are in action with appropriate response to the emergency"
4	"A very intense typhoon will affect the area"; Winds: >185 km/h in at least 12 h	"All travel and outdoor activities should be cancelled"; "Evacuation to safer shelters should have been completed"; "The disaster coordinating councils concerned and other disaster response organizations are now fully responding to emergencies"

Table 2 Effects from Super Typhoon Haiyan[7, 37]

Region	Number of Deaths	Percentage of Deaths	Number of Injured	Percentage of Injured
Region IV-A	3	0.05	4	0.01
Region IV-B	19	0.30	61	0.21
Region V	6	0.10	21	0.07
Region VI	294	4.69	2068	7.21
Region VII				
Cebu	73	1.16	348	1.21
Bohol	1	0.02	0	0.00
Region VIII:				
Eastern	267	4.26	8,018	27.95
Samar	5402	86.18	15,672	54.63
Leyte	225	3.59	2378	8.29
Samar	8	0.13	118	0.41
Biliran	1	0.02	1	0.00
Region IX	1	0.02	0	0.00
Region XIII				

Note. Percentage calculations rounded off to two decimal points

Figure 4 Pre- and post-event satellite images of the Anibong area in Tacloban (Source: [38]. Reprinted with permission)

3. Research Framework and Methodology

This study is a quantitative research design usinga questionnaire survey. Subsection 3.1 explains the content of the questionnaire, and subsection 3.2 describes the data collection process.

3.1 Questionnaire Content

The first part of the questionnaire asks for the demographic profile of the respondents, the second part focuses on the warning system and the third part focuses on the evacuation of the respondents. The explanation of questions in the second part of the questionnaire is available in the appendix.

The pretest was conducted with 10 Ph.D. students at the Tokyo Institute of Technology, Japan, in order to ensure that the survey design was necessary, sufficient, and appropriate; the pilot test was conducted with 6 Filipino students at the Tokyo Institute of Technology in order to identify the practical problems with implementation before developing the final version of the questionnaire based on the results, comments and feedback from the pretest and pilot test. After each test, the questionnaire was revised by removing unnecessary components and modifying the choices to make them suitable for Filipinos (e.g., level of income, method of receiving information) as well as revising the language to make it clear and easy to understand. The survey not only provided an English version; the questions were translated into the Filipino language, and a back-translation was conducted to ensure translation adequacy before conducting the final survey. In the survey, both English and Filipino questionnaires were distributed.

3.2 Data Collection

The survey was conducted as a paper-based survey in December 2013 because the authors wanted to collect the data when the memories and experiences were as fresh as possible in the affected areas of the Philippines, specifically in Tacloban, Cebu, Tagbilaran, and Talalora, among others. This timing was still during the late emergency response phase, during which most people were busy with clean-up and home repairs. Thus, it was quite difficult to persuade a large number of people to participate in the survey. The study respondents were limited to residents in some barangays such as Barangay 77, Barangay 64 Sagkahan (Tacloban City) because of the difficulties in finding cooperative respondents. Questionnaires were delivered to selected residents, prioritizing those who lived in low-income households. As a result, a total of 37 responses were received,which was a 100 percent response rate. Although it is a rather small number, it was a representative sample of the actualsurvivors who experienced the disaster in the damaged areas.

All of the respondents were Filipino. Their demographic profiles are provided in Table 3.There were more female respondents (62.2 percent) than males (37.8 percent). Most of the respondents had monthly incomes lower than PHP 10,000 (or USD 228) (75.7 percent). It also can be seen that everyone had previously experienced typhoons, and most of them had experienced a Signal 3 (78.4 percent) (see the definition of signal levels in Table 1). It also can be observed that most of the respondents remained in Tacloban in Leyte (81.1 percent), a city that was severely damaged by the typhoon.

Table 3 Demographic Profiles

Characteristic	Percent
Gender	
Female	62.2
Male	37.8
Age	
0–20 years old	32.4
21–30 years old	19.0
31–40 years old	16.2
41–50 years old	16.2
51–60 years old	0.0
More than 60 years old	16.2
Marital status	
Single	51.4
Married	37.8
Divorced	8.1
Widowed	2.7
Have child(ren) under 18 years old	
Yes	18.9
No	78.2
Average monthly household income	
<PHP 10,000 (<USD 228)	75.7
PHP 10,000–29,999 (USD 228–684)	2.7
PHP 30,000–69,999 (USD 685–1,597)	5.4
PHP 70,000–139,999 (USD 1,587–3,196)	0.0
PHP 140,000–249,999 (USD 3,197–5,707)	2.7
PHP 250,000–499,999 (USD 5,708–11,417)	0.0
>PHP 500,000 (>USD 11,418)	2.7
Own house	
Yes	75.7
No	24.3
Own house was destroyed	
Yes	73.0
No	27.0
Previous experience of Typhoon	
Yes, signal 1	2.7
Yes, signal 2	8.1
Yes, signal 3	78.4
Yes, signal 4	10.8
No	0.0
Occupation	
Public servant	2.7
Business owner/vendor	8.1
Service provider	43.2
Researcher	2.7
Student	29.7
Housewife	2.7
Retired	10.8
Location when typhoon hit	
Tacloban in Leyte	81.1
Cebu in Cebu	8.1
Tagbilaran in Bohol	5.4
Talalora in Samar	5.4

4. Results

As shown in Figure 5, the most frequently selected type of information for important disaster-related decisions (e.g., evacuation) is that pertaining to the safety of family and friends, followed by availability of food and water for the period before and during the typhoon; the availability of food and water became the most important type of information needed for the period after the typhoon. Hospital/medical center information was ranked third during and after the typhoon period.

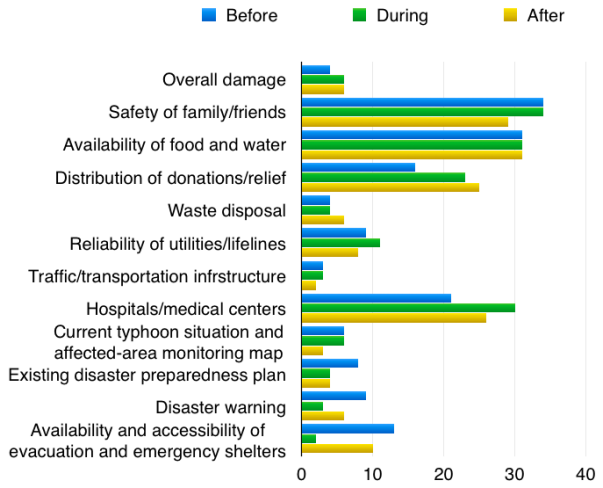

Figure 5 Information considered to be important for all disaster-related decisions before, during, and after the Super Typhoon Haiyan (unit: number of responses)

Figure 6 shows the most-trusted sources of information. PAGASA is the most-trusted source, followed by NDRRMC, the Government of the Philippines, the Philippines' news media, the local government, and local leaders.

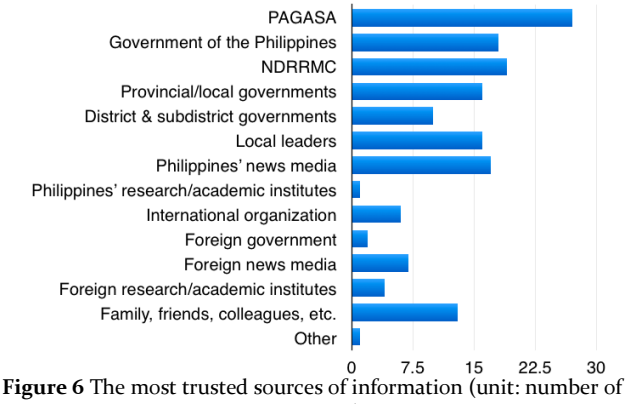

Figure 6 The most trusted sources of information (unit: number of responses)

Figure 7indicates the preferred methods for officials to issue typhoon warnings. Television was the most frequently selected for all times (i.e., 1 week before, a few days before, and just before impact). However, the score for television decreased as the typhoon approached (i.e., television's score for a few days before the typhoon approached was lower than the score for 1 week before, and the score for just before the typhoon approached was lower than the score for a few days before the typhoon approached). Unlike television,for which the preference decreased over the period, the preference for radio increased as the typhoon's impact approached. However, it is necessary to consider the limitation of this question. Because the study aimed to emphasize the official website of PAGASA, the website choice was listed as the PAGASA website, which could have led to different results from other choices because of the organization-specific name.

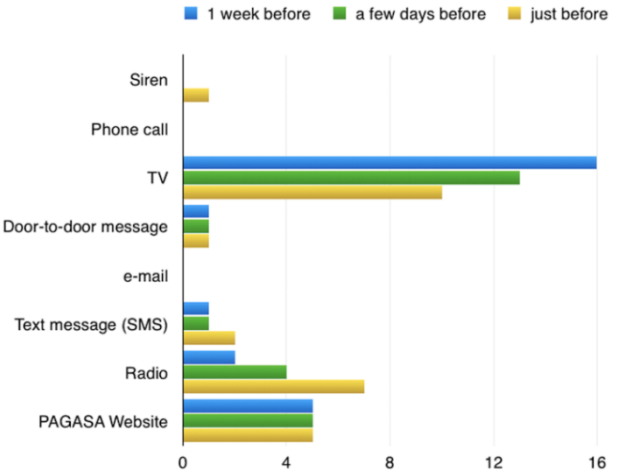

Figure 7 The preferred methods for officials to issue typho on warnings (unit: number of responses)

In the survey, only 1 respondent did not receive a typhoon warning for Super Typhoon Haiyan. According to Figure 8, those who received the warning found that the existing warning contained information on locations that were expected to be affected by the typhoon (30percent), estimated time before the typhoon (30 percent), estimated severity level (22 percent), and accessible evacuation centers (18 percent).

When considering the type of information respondents actually wanted to receive (see Figure 9), the most preferred types were the estimated time before the typhoon's arrival (28 percent), the locations to be affected by the typhoon (26 percent), its estimated severity level (25 percent), and accessible evacuation centers (21 percent).

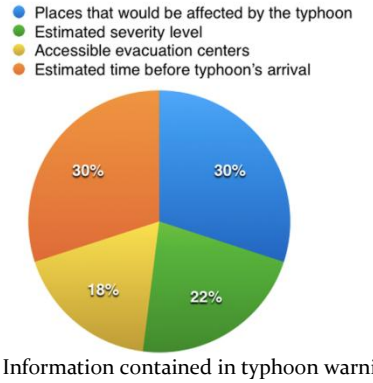

Figure 8 Information contained in typhoon warnings

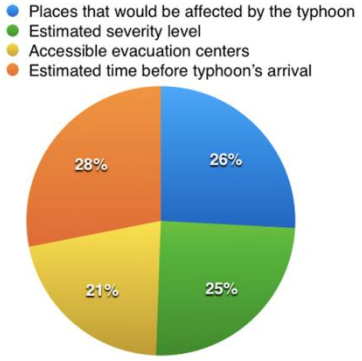

Figure 9 Preferred typhoon warning information

The respondents' most frequently raised problem regarding information acquisition was difficulty searching for the necessary information or locating the necessary information (27 percent), followed by inability to access information owing to mobile congestion, power outages, etc. (24 percent), as shown in Figure 10.

As shown in Figure 11, although most of the respondents received the typhoon warning, 47 percent did not evacuate to shelters. Moreover, combined with the portion that did not evacuate until after the typhoon passed (6 percent), then more than half (53 percent) did not evacuate before or during the typhoon.

According to Figure 12, most did not evacuate because they were worried about the safety of their family members, followed by believing that it was more dangerous to go outside their residences.

Figure 13 shows the evacuation decisions for future typhoon warnings. Only 16 percent believe that evacuation centers are secure and safe and are therefore planning to evacuate to them; the majority (68 percent) will only evacuate once they have made sure that the evacuation centers are secure and safe.

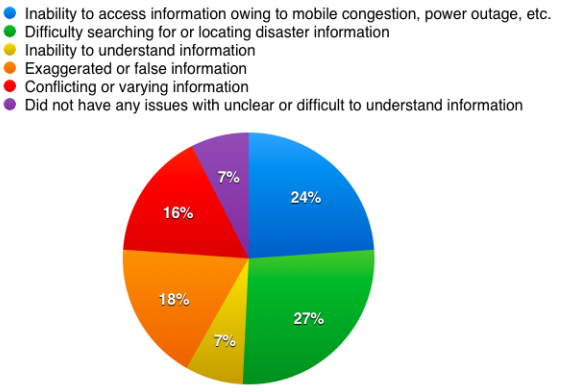

Figure 10 Problems related to disaster information acquisition

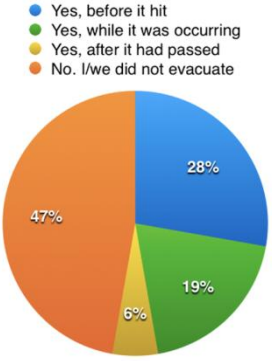

Figure 11 Evacuation execution

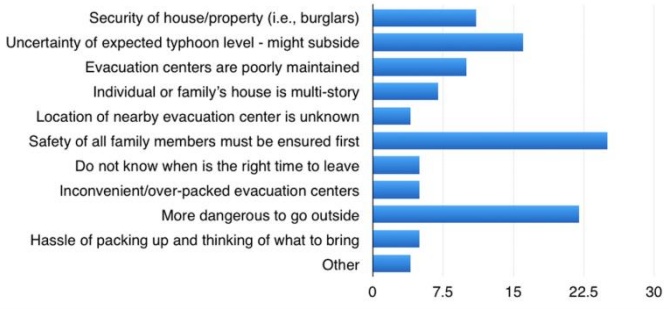

Figure 12 Reasons for not evacuating (unit: number of responses)

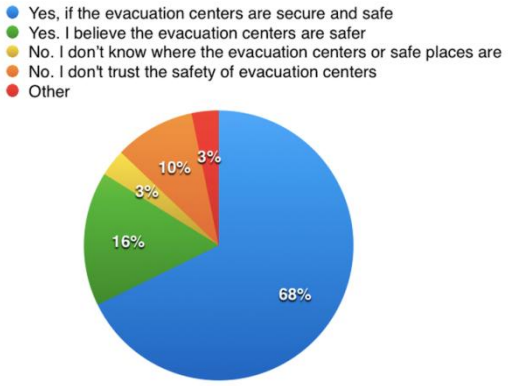

Figure 13 Evacuation decisions for future typhoons

5. Discussion and Conclusions

Having shown the results of the survey in the previous section, the findings are discussed in this section along with some suggestions.

There are many interesting issues raised by the findings. First, it can be seen that the safety of family and friends is considered to be the most important information to have during a disaster. Filipinos are similar to other Southeast Asian cultures that consider the family to be a vital unit [46, 47, 48]. Thus, it is not surprising that people consider the safety of their loved ones to be the most important information. Food is one of the four basic requirements for living, so in an emergency, it is also reasonable to consider food and water supply to be important information, particularly because they may not be available post-disaster because of logistical problems. According to some survivors, during the first few days after Haiyan struck, money was not considered valuable, and most people had to pay with food such as rice and canned goods for other goods and services. Furthermore, information related to hospital and medical centers is also important, especially during and after impact because the number of deaths and injuries would dramatically increase during that period from direct and indirect causes [7, 34, 37].

It can be said that as an official national organization for providing flood and typhoon warnings, PAGASA has been very successful in establishing itself as a source that people follow and trust, along with NDRRMC, the Government of the Philippines, the country's news media, local governments, and local leaders. Therefore, it is necessary to focus on information sharing among these trusted organizations in order to give residents the same necessary and correct information regardless of the organization from which they tend to access their information.

The issues regarding communication medium are quite interesting. Based on the results, television tends to be the best method for officials to warn citizens regarding typhoons. In the Philippines, television-broadcasting programs generally consist of national and local programs allocated by timeslot, especially for news. Therefore, viewers are provided with an overall country view and the local view on situations. However, radio is another alternative for following warnings. Radio is a localized broadcasting medium and is broadcasted in the local language. The Philippines is an island country, and the people use not only the English and Filipino languages but also regional languages and dialects. For example, the Visaya language is typically used in Cebu and Tagbilaran, and the Waray language is used in Tacloban and Talalora. In addition, the radio has dedicated stations for news and current affairs. Normally, FM stations in the Philippines provide musical entertainment, whereas AM stations are for news or drama. In the case of Super Typhoon Haiyan, the primary reason for choosing radio was likely its mobility (i.e., radios are battery-operated, and hence, can be used in an emergency). In Tacloban City, a power blackout often ensues after a relatively strong typhoon (i.e., Category 3) [49]. Thus, battery-operated radios are reliable sources of information for the locals. However, Typhoon Haiyan was so strong that it disabled all forms of communication in many areas of Leyte, especially in Tacloban City. During the first few days of the aftermath, the locals had no reliable source of information. In Tacloban City, the most reliable means of communicating with nearby areas was via satellite phones [49]. Because of the failure of the existing communication lines, local new reporters transmitted information via satellite broadcast [50], and some had to travel to nearby islands such as Cebu City to deliver video telecasts [51]. This was one significant cause of the difficulties in efficiently distributing relief goods and medical assistance during the first few days after the typhoon.

Therefore, one lesson learned is this: The communication infrastructure must be carefully considered, especially in disaster-prone areas.

Apart from the source and the medium, as Mileti observed, sufficient information in the warning message is another important factor that influences the public's response [18]. It appears that most people wanted to know the typhoon's estimated arrival time and location. The estimated severity level and information regarding evacuation also cannot be omitted either.

The problems experienced in information acquisition are primarily the difficulty in searching for or locating disaster information and the inability to access information because of mobile congestion, power outages, etc. It is necessary for everyone to prepare themselves for emergency situations. A method for accessing information should be at hand, especially for critical cases when all forms of communication are possibly disabled.

Although most of the respondents received a warning, more than half of them did not evacuate before the typhoon hit their areas. The primary reason was their concern about

the safety of family and friends, followed by a belief that outside would be more dangerous than within their residences and uncertainty regarding the typhoon's severity level. Another suggestion would be to specify clearly that staying in one's own residence is not as safe as is believed in an event such as a super typhoon. Then, people could evacuate immediately. One example is the latest warning classification in Japan by the Japan Meteorological Agency (JMA), which established 'emergency warning' (with clear statements such as "Emergency Warnings are intended for extraordinary phenomena expected to be a scale that will far exceed the warning criteria", "Residents should not let down their guard even if no Emergency Warning is currently in effect in the area…", "The possibility of a catastrophe is high even if the area has not experienced a disaster for several decades…" [52]) as a critical level that requires everyone to evacuate to shelters or safe places.

Last but not least, the survey found that people intended to evacuate in the event of future typhoon warnings as long as their evacuation centers were secure and safe. There was evidence that some temporary shelters were not safe during the typhoon [34, 50].A total of 16 percent of respondents already believed that the centers were secure and safe and therefore planned to evacuate. In order to increase people's responses to the evacuation process, local governments should ensure that their evacuation centers are secure and safe, and related organizations must be responsible for communicating their security and safety to citizens.

Better understanding of people's views regarding warning systems would be helpful for supporting and shaping warning system development and improvement. Based on the funding and individual preferences, it is possible to propose solutions for those issues. When a warning system serves as an accessible and accurate way of communication, citizens can receive notifications and alerts. Then, they can realize the potential impact of a natural disaster and response according to the appropriate instructions. This will help to build individual resilience for disaster prevention and disaster risk reduction. When residents respond, such as by evacuating, the potential impact in terms of casualties will be reduced.

This study discussed the findings from a questionnaire survey with respondents who had experienced Super Typhoon Haiyan in the Philippines; it provided some understanding and suggestions based on the findings. However, it is important to understand the limitations of the results of this study. Because the study collected data during the early period of disaster recovery and reconstruction, only a small number of respondents were available. Nevertheless, all respondents had experienced this severe disaster, and all provided with useful information based on their recent experience—the survey was conducted only 2 months after the event. Future studies may conduct a survey when the situation has improved and more people are available to engage in the survey. In addition, conducting a survey online is another alternative to expand the number of respondents. Moreover, this study provided the preliminary results of the findings; there is still the need for posttests (e.g., interviews with the survivors) in order to link these results to social phenomena and gain more understanding with validation. The study of authorities' perceptions is also important and warrants further research.

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Appendix: Explanation of Questionnaire Content

The questionnaire comprised two parts: the first asked the respondents to select the top five types of information they thought would help them to make important disaster-related decisions (e.g., evacuation). Timely and accurate information can save lives in disasters. Residents may require different information at different periods of time or in different situations. Three periods of time were asked about (i.e., before Super Typhoon Haiyan landed in the Philippines, during the time that Super Typhoon Haiyan was in the Philippines, and after Super Typhoon Haiyan had passed through the Philippines) in order to identify the differences and similarities in preferences from the temporal perspective, which is one of the perspectives in research on communication and information systems [39]. The items used in this question were adapted or developed according to [40, 41, 42, 43], for example, "Safety of family, friend, etc." and "Food & water supply" from [41]; "Safety of family and friends", "Food and water information", "Electricity, gas, water recovery information", and "Traffic information" from [43], etc. The meaning of "safety of family/friends" in our study was the status or conditions of family members and/or friends.

Question: *Which information do you think could have helped you make important disaster-related decisions before Super Typhoon Yolanda (Haiyan) landed in the Philippines?*

Question: *Which information do you think could have helped you make important disaster-related decisions during the time Super Typhoon Yolanda (Haiyan) was in the Philippines?*

Question: *Which information do you think could have helped you make important disaster-related decisions after Super Typhoon Yolanda (Haiyan) landed in the Philippines?*

- Overall damage
- Safety of family/friends
- Availability of food/water
- Distribution of donation/relief
- Waste disposal
- Reliability of utilities/lifelines (e.g., electricity, water, gas, fuel)
- Traffic/transportation infrastructure
- Hospitals/medical centers
- Current typhoon situation and affected-area monitoring map
- Existing disaster preparedness plan
- Disaster warning
- Availability and accessibility of evacuation and emergency shelters

Next, because Mileti identified the information source as a warning factor [18], one question sought to identify the five most-trusted sources of information. The items used in this question were adapted or developed according to [33].

Question: *Which are the five most-trusted sources of information?*

- PAGASA (Philippines Atmospheric, Geophysical & Astronomical Services Administration)
- Government of the Philippines
- National Disaster Risk Reduction and Management Council (NDRRMC)
- Provincial or local government
- District &sub district governments
- Local leader
- Philippines' news media
- Philippines' research/academic institutes
- International organization
- Foreign government
- Foreign news media
- Foreign research/academic institute
- Family, friends, colleagues, etc.
- Other (....)

The next set of questions required the respondent to choose the best way for officials to warn them about a typhoon in 3 situations (i.e., 1 week before impact, a few days before impact, and just before impact). Items used in this question were adapted or developed based on [44]. Some items were added to address the specific situation of Super Typhoon Haiyan and the Philippines.

Question: *What is the best way for officials to warn you about a typhoon for 1 week before its impact?*

Question: *What is the best way for officials to warn you about a typhoon a few days before its impact?*

Question: *What is the best way for officials to warn you about a typhoon just before impact?*

- Siren
- Phone call
- Television
- Door-to-door message
- E-mail
- Text message (SMS)
- Radio
- PAGASA website
- Other (….)

The next question asked the respondents to choose multiple answers for the types of information that the typhoon warning contained and another question asked for the types of information that the typhoon warning should include. The items used in these two questions were adapted and developed based on [33].

Question: *What kind of information did the typhoon warning contain?*

- Places that would be affected by the typhoon
- Estimated severity level
- Accessible evacuation centers
- Estimated time before typhoon's arrival
- Other (….)

The respondent then was asked whether he/she believed that the typhoon information was sufficiently accessible. Because this study was interested in identifying the problems related to information acquisition, the next question asked the respondents to choose multiple answers for the types of problems they experienced related to acquiring disaster information. The items used in this question were adapted or developed based on [40, 41].

Question: *Did you encounter any problem related to disaster information acquisition?*

- Unable to access information because of mobile congestion, power outages, etc.
- Difficulty searching for or locating disaster information
- Could not understand information because of lack of language comprehension
- Was misled or confused by rumors and/or exaggerated or false information
- Was confused by conflicting or varying information
- Did not have any issues with unclear or difficult to understand information
- Other (….)

The next part of the questionnaire focused on evacuation. The first question asked the respondents whether they had evacuated their homes when Super Typhoon Haiyan hit their local areas. The items were developed and adapted based on [45].

Question: *Did you evacuate your house or apartment when Super Typhoon Yolanda (Haiyan) hit your local area at any time? When did you evacuate?*

- Yes, before it hit.
- Yes, while it was occurring.
- Yes, after it had passed.
- No. I/we did not evacuate.

For those persons who did not evacuate, the next question asked for the top five reasons that they did not evacuate before or during the typhoon. The items used in this question were adapted or developed according to [33].

Question: *Why did you not evacuate your house before or during Super Typhoon Yolanda (Haiyan)?*

- Security of house/property (i.e., burglars)
- Uncertainty regarding expected typhoon level – might subside
- Evacuation centers are poorly maintained
- Individual or family's house is multi-story
- Location of nearby evacuation center is unknown
- Safety of all family members must be ensured first
- Do not know the right time to leave
- Inconvenient/over-packed evacuation centers
- More dangerous to go outside
- Hassle of packing up and thinking what to bring
- Other (….)

The last question asked the respondents to select a single answer for their future evacuation decision if a typhoon were forecasted to hit their hometown in the future: will they and their family evacuate to a nearby evacuation center or not.

Question: *In the future, if a typhoon is forecasted to hit your hometown, would you and your family evacuate to a nearby evacuation center?*

- Yes, if the evacuation centers are secure and safe.
- Yes. I believe the evacuation centers are safer.
- No. I don't know where the evacuation centers or safe places are.
- No. I don't trust the safety of evacuation centers.
- Other (….)