Innovations

Seeking consensus: determining the storm surge perception of students and its context paradigms

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Received: 06.08. 2022 **Accepted:** 28.08. 2022 **Published:** 30.08. 2022

Abstract

Eight years after Typhoon Yolanda (also known as Typhoon Haiyan) devastated the southern region of the country, the lingering quest for consensus on the local translation of storm surge has been a subject of debate even today. Scholars of disasters argue that there is a need to trouble the assumed uniformity of disaster meanings in the same manner that scholars argue for an intersectional analysis of vulnerabilities as shaped by the lack of disaster planning, disaster response and disaster recovery. This research inquires: How can the consensus of storm surge in local language can create shared meaning in the Philippines? How can the collection of cultural contexts can help improve its shared meanings in the local translation? How does the understanding of the local meaning of what the storm surge evokes can affect the public's risk perception? Conducted via online interviews and analyzed through thematic analysis, this research analyzed the CLSU-CASS students storm surge perception and inquired about their existing knowledge on the local translation and risk perception on the said phenomena. The research result show that respondents locally understood storm surge as 'awiwit' (converging/diverging waves) and 'daluyong' (long amplitudes of waves driven by wind) with a heavy reference to 'Tromba Marina'. Further, most of the themes emerged from understanding the risk of storm surge lacks shared meaning, is generalized and vague. Most of the description of the risk of storm surge provided leans more toward storm's wind velocity and rainfall rather than the storm surges capacity to drown and obliterate. This said, most of the action made by the respondents and their observation in their communities do not match the disaster response on how to avoid the risk of storm surge. The key insight from the study is that alignment, consistency, and uniform local definition of storm surge is needed. Further, veering away from the outdated paradigm of a top-down kind of information dissemination from weather agencies to the public is also equally important. Serious consideration on differences and gaps in language, literacy, and access on information of the population must also be addressed.

Keywords: *1.storm surge, 2.risk perception, 3.risk communication; 4.extended theory of planned behavior; 5.scientific information*

Introduction

On the eight day of November 2013, the Philippines is lashed by the strongest tropical cyclone to make landfall on recorded history – Super Typhoon Yolanda. Internationally named Typhoon Haiyan, it spawned storm surges that left a trail of death and destruction leaving thousands dead.

One of the heavily devastated districts during its landfall is Tacloban City, Leyte. Laying right on typhoons path, Tacloban City exhibits a confluence of social and physical vulnerability. Apart from its shallow coastal bathymetry, poverty and makeshift substandard housing, the area of Tacloban became conducive to storm surge. (Lejano et al 2016)

On the relayed forecasts and warning from the satellite data, Typhoon Yolanda maintains a maximum 1-min sustained wind speed of 315 kph and generates a height of 7-m storm surge. Comparing the said forecasts in post-event field measurements in Leyte, the same inundation height of storm surge is approximately 6 m, proving the surge model prediction to be reasonably accurate.

According to Salaverria (2013), the people and officials of Tacloban should have been ready, yet even the mayor of Tacloban and his family nearly perished in their beachfront homes caused by storm surge. Misinterpretation regarding the storm surge warning also caused the national agency's weather monitoring team to lose a team member after being caught by the storm surge in their seaside office. If one wonders then, why the reasonably accurate forecasting would not lead to effective prevention on the ground. Post evaluations suggested that several factors contributed to the devastating impact of Typhoon Haiyan, but one theme stood out in particular: the way risks of storm surge were communicated.

Storm surge, defined by National Ocean Service (2021), is the abnormal rise in seawater level during a storm. It is primarily caused by a storm's winds pushing water onshore. Its amplitude depends on the orientation of the coastline with the storm track, intensity, size and speed of the storm and local bathymetry.

Storm surge in the Philippine local languages have no definite equivalent words for these types of hazards, however, the following proposed local translations from different region in the country exists, such as: ***Daluyong***(long amplitude of waves) that is said to come from the word 'Mandaluyong' when waves from ancient Pasig River was swept into Mandaluyong. ***Humbak***(cavity between waves) from Mindoro. ***Karak-an*** (seawater surge) from Leyte and Samar. ***Silakbô*** (surge) refers to emotions; something like a wave. ***Tacloban*** (Taclob - "to cover") from Leyte. ***Sapao***(inundation due to seismic events) from Old Batangas Tagalog. ***Alum/Basaw*** (disruptive flooding) from Cagayan, Valley. ***Nortada*** (surge of amihan) from Aparri, Cagayan and lastly ***Tsu-alon/ Tsu-Balod*** (Tsu-harbor, alon/balod - wave) as a portmanteau developed by academic scholars.

The numbers of proposed local translations mirror the reality of many languages present in the Philippines and their implications in risk communication. Scholars debate the suggestion whether the 'storm surge' in the English terms to be retained or to be given vernacular meanings instead, however, posed situations where, communities with low or even non-existent English facility exist. Since decisions regarding consensus of what terms to be used cannot be imposed by experts in Manila, participation and collective knowledge by people is required to come up with thought collectivity with similar standards of understanding.(Vallejo, 2013)

According to Lejano et al. (2016), Philippines second to China receives more tropical storms than any other country, implying that there is a great awareness regarding to typhoons among Filipinos. But with the failure of the way how the risk of storm surge was communicated during Typhoon Yolanda, anecdotal reports of risk communication surrounding the event is worthy of inquiry.

Consistent with the study of Lejano et al. (2016), one of the managers in the national weather service reports that "It's more on the signals and in delivering forecasts and warning distributed to the public. But the storm surge wasn't explained there." Supported by the findings of Mori et al. (2014)The failure to communicate the meaning of the warnings, particularly storm surges, caused 94% of the deaths in Tacloban, Palo and Tanauen, totaling over 4,500 lives that could have been saved had they been provided and convinced to evacuate.

According to Button (2010), ineffective risk communication produces uncertainty. And the failure of the risk communication to compel the public to take the actions intended by the source of the message is a communication problem. Since factors such as the uncertainty over the meaning of the term 'storm surge' was an issue in Typhoon Yolanda, this research will highlight the need to critically reflect the role of having a consensus understanding and local language translation of 'storm surge' in communicating its risk to different regions in the country. In this paper, online interviews, and thematic analysis of the storm surge perception of the College of Arts and Social Sciences students in CLSU will be determined. By understanding their perception, the researcher will also investigate the local meaningsand context of storm surge in their communities and how it affects their disaster response.

Objective of the Study

1. Determine if CLSU-CASS students can recall any perceived local meanings of storm surge from their communities;
2. Determine the contexts and varying sensibilities in which the perceived local meanings of storm surge came about;
3. Determine if the perceived local meanings of storm surge can affect the disaster response of CLSU-CASS students.

Review of Related Literature

Risk Communication for Storm Surge

On the study of Lejano et al. (2016), it critically re-examined the overly simplistic model – the 'source-receiver' model' - that weather agencies used during Typhoon Haiyan to avoid unnecessary losses experienced. Highlighted by the study, part of the problem in risk communication during the said storm stems from the discrepancies on how various stakeholders understand technical terms and concepts such as "storm surge". In his study, Lejano et al. (2016)notes the absence or nonactivation of feedback loop on the "source-receiver model" which is the communication model used by the weather agencies in the country. The problem with the said model is that it does not allow informal communication from lower to higher level agencies and between citizens and local agencies.

According to the said analysis, hierarchical, formal, and unidirectional transmission of information from weather agencies to the public fails to translate risk signals into meaningful and actionable knowledge – which feedback loops which might have been used to query message senders about meaningful and

actionable knowledge. Apart from this, official and residents resorted to "common sense" (drawing from personal experience) in understanding the storm surge hazard during andafter the weather bulletin was relayed. Most of the local agency stated that 'nothing prepared them for what will hit, they cannot visualize nor predict what the storm surge means, so they resorted to common sense'. In short, there was no communication about the inadequacy of conventional procedures, and, for all those involved, this was a singular event for which there was no personal or institutional memory to draw from. (Lejano et al. 2016) Other investigators implicated the lack of familiarity with the term 'storm surge' (Chen et al. 2013).

On the notion of collective "common sense," a few of the interviewees talked about possibly improved communication if PAGASA had used the term "tsunami" instead of "storm surge" but then quickly added that to modify language in this way would be out of bounds for them professionally. According to Bostrom (2013), it is evident that the problem lies not just in the terminologies used, but in the organizational cultures that could not function outside routinized pro forma communications. Tracing the communication pathway, from PAGASA, the national weather bureau, down to National Disaster Risk Reduction and Management Council (NDRRMC) the second level, and onward on regional, provincial, city/municipal, and local district (barangay) in sequential order–analysis showed that "copy paste" weather forecast message was passed along or retransmitted on the said organizational structure and there was little to no interpretation of the weather warnings into descriptive, contextual, or explanatory text.

The absence of interpretation as to what the forecasts meant in real, concrete terms became an evident critical gap in communication during Typhoon Haiyan arousing inadequate concern and insufficient action on the threat of storm surge – a fragment of text that was located at the bottom of the bulletin but was never understood. According to Lyotard (1984), risk communication should involve multiple policy actors, each telling the story in their own ways. Effective process of the said communication should be contextualized, personalized, and more vividly should describe the message coursed to local recipients. According to Lejanoet al. (2016), unidirectional lines of communication and organizational rigidities need to change, allowing flexible, contingent responses when circumstance are beyond the norm.

Challenges in communicating scientific information in the Philippines

During Typhoon Haiyan in 2013, two communities from Palo, Leyte responded differently when issued warnings from the local government. Residents along the coast responded to orders from the local government, leading to generally successful evacuations. On the other hand, those in the población closer to the town center was largely unresponsive due to tension between the community and local authorities. (Liwag, 2020)

The difference in responses is attributed in what is called 'disaster (sub)cultures', ways in which communities and societies adapt to accommodate hazards through risk mitigating strategies. It implies differences in community response and reaction even if they're given the same information. Understanding the process of these social dimensions is but a small portion of understanding science communication which is loosely defined as a scientific dialogue between science practitioners, mediators, and the general public. According to Liwag(2020), slow progress in science communication is a product of cultural and structural barriers rooted in the country's science and journalism training.

In the broader context of considering how risk communication may somewhat was affected by the current situation of science communication in the country, Navarro and McKinnon (2020), raised the following

challenges that Filipino scientists and science communicators encounter when communicating science in the Philippines.

First are the language considerations. A government science officer explained, “The Philippines is an archipelago, so the medium of teaching would vary from one island to another. There are places that we would have to communicate in the mother tongue, meaning that could be in Bisaya or Bicolano. There are areas where we need to speak in English, or in Filipino.” One science advocate stated, “We have to live with the fact that this is our history and culture and it’s been affected a lot by the States. It’s not really purely Tagalog. It’s a mixture of all these different languages.” According to Navarro and McKinnon (2020), it is important to be able to communicate science in the language Filipinos speak every day. They added that it is a problem since we are educated in English,but we also have our own language we speak of at home. According to them, it poses a problem in the country compared to those who don’t.

Second is the local science culture. According to Navarro and McKinnon (2020) scientists and science communicators believe that Philippine society generally perceived science as boring and unimportant, resulting in disinterested audiences. One of the industry scientists remarked, “the difference is that abroad, they’ve been exposed to stronger science, and they don’t have to think about their daily survival. You have to think of other pursuits.” Another science museum explainer attributed it to the state of science education, saying, “I could say the way science has been taught in the classroom and the way science is communicated outside the classroom, it’s really communicated in a way that science holds absolute truths, which is wrong.” Other interviewees also blamed the discouraging attitudes of Filipino parents towards science. A mathematics professor said, “Parents should not talk about how difficult math is. A lot of the fear of mathematics is really reproduced in homes, in media, in school sometimes.” (Navarro and McKinnon, 2020)

Third is the scarcity of science communicators. Most of the science communicators reiterate that financial constraints are another major barrier to their public science communication activities. The said constraints were in the form of either limited budgets or low salaries. Science communicators mentioned that their budgets were rarely enough, limiting the extent of their activities and sometimes causing them to release mediocre output.One science museum explainer said, “It constrains us. We can’t do many things that we’d like to do but it also forces us to be creative, to find ways to make do with what we have, which is also great. That sometimes makes us end up achieving mediocre things, but it also makes us achieve amazing things with very little.” Two science communicators simply attributed their meager salaries to the economic situation of the Philippines, with one saying, “It’s just how people are paid in the Philippines and it’s not great. I don’t blame the company, it’s just how the developing world kind of functions.” (Navarro and McKinnon, 2020)

Methodology

In obtaining answers for research question, the researcher made use of the qualitative research design through convenience sampling, a non-probability sampling wherein members of the target population that meet certain practical criteria such as: having access to certain platforms as well as having the time and willingness to participate, can participate in the study. (Etikan et al. 2016)

The researcher conducted its units of analysis within Central Luzon State University, specifically from College of Arts and Social Sciences. The said college is composed of five departments such as: Department of Communication and Development Studies, Department of English, and Humanities, Department of Filipino, Department of Psychology, and Department of Social Sciences.

Conducting the saidconvenience sampling, the researcher administered a survey questionnaire that requires a criterion for the participants to qualify. Participants must be with 3-5 years’ experience living near coastal

area; CLSU-CASS student enrolled in the current semester; Any year level and willing to be a respondent. After satisfying the said criteria, the participants then are allowed to answer the survey questionnaire that examines and inquires their initial perception of 'storm surge' and its surrounding context. 30 CLSU-CASS students qualified to answer the initial survey questionnaire administered but only 10 from the said number agreed to be interviewed.

In the procedure of thematic analysis, the researcher made use of Interpretivism paradigm which addresses the understanding of the worlds as others experience it. (Cresswell et al. 2009) The data gathered from the participants has been thematically analyzed wherein codes were assigned to them. The codes were then categorized using tables and presented per themes. The researcher further categorized the said meta-themes in order to develop researcher-generated theoretical constructs and to gain understanding from the participants perception. Served as a guide for the discussion of results and findings, the researcher also gathered related studies to support the analysis of the results of the study.

To achieve the objectives of the study, the researcher crafted the interview questions into following sub-points such as:

1. Perceived local meaning for storm surge
2. Context of where the local meaning came from
3. Adopted response on the local meaning

Results

1. Perceived local meaning for storm surge

Most of the participants sees the storm surge as big, rapid waves that causes flood.Although the said details illustrate the idea of storm surge meaning and movement, the researcher notices the lack of inclination whether the storm surge poses a threat on life. During the duration of its mention, the researcher recounts three descriptions where storm surge is known to: 'poses a risk', gives fear , and 'devastates' . The said three descriptions, although acknowledges that storm surge can cause damage, the researcher finds the description as lacking in clarity, generalized and vague. No mention of specific damage it can inflict, its capacity to obliterate, and deadly impact on life are mentioned. Apart from its descriptions, the researcher also noticed the participants heavy emphasis of its similarity on Tsunami, which according to Brittanica.com (2022) is a catastrophic ocean wave caused by submarine earthquake.

Interpreting this result, the researcher finds the description from the participants as the same with how storm surge means. However, the participants inability to specifically pinpoint its risk and whatcauses it-mayresult to inappropriate decision in terms of preparedness. According to Ponce De Leon, a science communicator and assistant professor in Ateneo de Manila says that the "outdated paradigm, of a top-down kind of information dissemination excludes the public from participating in scientific matters, especially those that affect daily life. On the other hand, BA Racoma, a PhD student at UP Diliman – state that media coverage and how trusted government officials are changed routinely contributes to the different risk perceptions in regard to storm surge. (Liwag, 2020) According to Leung Ng (2016), identifying and understanding the factors that distort risk perception and lead to inappropriate decisions for disaster

preparedness behavior needs to be done. Supported by Lazo et al. (2015), only when people realize the risks associated with typhoons, they become motivated to prepare accordingly.

2. Context of where the local meaning came from

In connection to threading the understanding of how participants perceive the storm surge, the researcher investigates how the participants understand and coin the said risk in local language. One participant from the study, for example, recounts their perspective where storm surge means the 'pullback of the sea' – in their own words:*"For me, it's like a pullback of the sea where it bides it's time to come up and awash itself in the shore"*The said observation both reflects to the behavior of low tides and tsunami - which is earlier discussed to be of different cause and phenomena. Another is 'daluyong' which is assumed to be of local equivalent to storm surge by majority, was detailed by another participant as "big waves ". And lastly as "abnormal wave" which gives a rhetorical narrative that mysterious phenomena happen about the waves during typhoons. Althroughout the interview, most of the participants weren't able to provide a local translation of storm surge except for the earlier mentioned descriptions. This scenario has a high resemblance to what happened to Typhoon Yolanda during 2013. According to Lazo etal.(2015), days before Typhoon Yolanda will make its landfall, the residents relied from their common sense which meant drawing from their store of personal experiences. But since disasters can be sudden and not a matter of daily life, residents may not have a stable recall or develop a solid understanding towards a phenomenon. (Glasmanet al. 2006)

Further, the researcher traced that two of the participants have their own community understanding and historical reference with the term 'storm surge'.One of the two participants detail that their local community in Aurora coins storm surge as *'Awiwit'*. In their own words, the participant detail '*Awiwit*' as 'converging/diverging waves'. Participants discusses:*"In our near coastal area community, if there's any warning like 'there's storm surge!' the first thing that comes to mind is 'awiwit'. Awiwit (Figure 1) is like a makeshift term made and understood only in our community. It's like a chaotic movement in the ocean, where the two waves converge on the other and after diverges on its opposite. That's the main idea of our understanding, that's why when we hear warnings of storm surge, it's a common hear-say in our community to no longer sail in the seas"*

While the other participant details that storm surge is translated in their local language as 'daluyong' which has heavy reference to 'Tromba Marina'. Participant discusses *"…the history of Tromba Marina (Figure 2) statue where there are seven people who survived the big waves that was brought by an ancient typhoon. The said seven people is also believed to be the ancestors of our community here at Baler, Aurora."*

According to Lejano (2008), communicating risk needs linguistic turn that needs to depend on the context within which they are communicating. Supported by De Leon (2020) which stated that it is a pitfall when one assumes that just because something is in someone's native language, it can already be understood by the people. He states, "terms in native language does not always translates to someone's reality – relational and contextualized exchange that vividly describes risks is needed to help compel the public to act." Relating the said findings to the theory of planned behavior, paying attention to contexts where the perception and beliefs of the community are formed must not be neglected. It must be the foremost priority in creation of conventional initiatives when promoting preparedness to target an individual's decision. (Becker et al. 2012)

Adopted response on the local meaning

Most of the participants detail that whenever they would hear warnings of storm surge or as majority of the participants answered as translated to be'daluyong', they would have the intention to prepare and evacuate, however, the researcher observes that this intention does not always translate into action. Interviewed participants reasoned *"it's really rare for us to evacuate since we're scared of looting" while another* reasoned, *"we will never leave our homes despite any disaster might happen."* Other factors such as limited knowledge were noted as another participant explains *"I can't really remember that there's any disaster preparedness that was adopted in our community, maybe because of the limited knowledge that we have."*

In trying to understand what type of response should be adopted when warnings of storm surge are present, the National Oceanic and Atmospheric Administration (2022), shares that the most effective way in avoiding the risk of storm surge and that is to evacuate and to seek higher ground, since it rises quickly in minutes and can knock everything that stands on its way.

Furthering the discussion of how participants share their past adopted response for storm surge, most of them recounts how they would prepare emergency kit and supplies, stocking food and charging communication devices. Some also answered that they would hear weather advisories from the news, would tie the roofs of their homes and how they would transfer their boats where the destructive waves could not break them. The researcher observes that most of the response given by the participants are more directed on the storm's wind velocity and rainfall risk rather than acknowledging the storm surge ability to drown and knock down the everything on its way. This observation is reflected on how national weather agency play on the situation.

According to Fredenburg(2003), organizational factors in weather agencies have been implicated in risk communication failures in the past, one example of this is when during Typhoon Yolanda hit, one of the managers in their local weather agency says that "It's more on the signals and in delivering forecasts and warning distributed to the public. But the storm surge wasn't explained there." Consistent with what Lejano (2016) found in his study, "source-receiver model" as a simplistic model adopted by the current national weather agencies should be re-structured to allow two-way dialogue. Through re-structuring, clarification if uncertainty over a warning exists can be clarified by those who are at the bottom – most of which are local or barangay leaders. (Flores, 2013)

Additionally, themes emerged from the participants detailing that confusion on the risk of storm surge is still present in the participant communities. One of the remaining participant details*"Each of us respond differently because we have different perceptions regarding storm surge."* Some however notes that their community sees storm surge as unthreatening, believing that it'll only cause slight damage and will pass away quickly. While others assumes that there is no need to evacuate as they are already safe in their homes. As some participants acknowledges that confusion exist surrounding its risk, another participant adds that the residents in their community are already unthreatened by its risk due to familiarity*"…since we already live here for a long time, I think we already have this belief that there will just be strong storm that will occur, without understanding that it really is risky."*

According to PAG-ASA.gov (2022), more than 20 typhoons enter Philippine Area of Responsibility (PAR) every year and is expected to grow more progressively and more destructive as human activities (greenhouse-gas emissions)continues to affect climate crisis – with the said findings, most of the communities

in the coastal area that already withdraw on their familiarity with the risk of storm surge and sees it as unthreatening is disturbing.

In discussing how participants would respond if local translation for storm surge is adopted, emerged themes states that most of the participants want a translation that would be agreed upon and understood across all regions where the said translation would mirror its risk and easily deciphered by Filipinos. One of the participants shares that the said consensus translation should be with onomatopoeic element which according to Mirriam-Webster (2022), is the naming of a thing or action by a vocal imitation of the sound associated with it. *"It should have an impression of intensity – which reflects the phenomenon. In my experience, it's like a thundering sound or a destructive-like wave. So I hope that impression is reflected if there will be any consensus of translation that will be done."*

The researcher observes that most of the respondents showed no difference of response even if the said 'storm surge' term is in their local language, they again reiterate that understanding of the said phenomena and how they are explained by the weather agencies is what determines their response.

Conclusion

1. Most of the participants were able to describe what storm surge means, yet evident confusion and inability to specifically pinpoint its risk are observed. Most of the participants we're not able to recount what damage the storm surge can inflict, how it can obliterate infrastructure and how deadly it can drown– hence the participants' perception is observed to be lacking in clarity, generalized and vague. Most of the participants also heavily associate the storm surge to Tsunami, which are also to be inaccurate and of different causes.
2. Majority of the participants, although gave their answer that the local equivalent of storm surge in Filipino is 'daluyong', it is observed that their pre-determined disaster response is isn't focused on the local translation but all drawn up and depends via previous experiences, observations or common sense.
3. Majority of the participants implies positive support in regard to having a definite local translation for storm surge, participants reiterates that the consensus regarding the said translation should mirror its risk and must possess onomatopoeic element where storm surge ability to devastate are felt and present.

Recommendations

1. There should be more intensive collection and understanding of how Filipinos understand and perceive the threat of storm surge as a risk during typhoons. Developing a certain and shared meaning of a storm surge, a specific explanation how it devastates, and its posed risk should be popularized in helping Filipino, across all regions to devise and adapt a clear response in regard to the said risk.Since uncertainty, accuracy and sometimes threat concerning storm surge is still an issue, academe and the field of research are called upon to continually investigate explain and come up with measures how to come up with a specific explanation that distinguishes storm surge to Tsunami.

2. Risk communicators must be able to investigate what context and realities does the stakeholders or community live by regarding to storm surge. Being able to understand how people sees the risk of storm surge in their lenses is the first step in engaging the people and help them to execute necessary disaster response. Since risk perception does not only lies to terminologies used in a community, risk communicators are also called upon to tap the flow of information to the media where the said perceptions can be framed for people to conceptualize and be familiarized with the threat it poses.
3. The need to encourage and facilitate dialogue between national weather agencies and the public must happen frequently – not only when nearing typhoons are to happen. Media campaigns from the science experts from the weather agencies must be engaged in helping the public to understand the risk of storm surge and how it has the capacity to wipe out a community.

References

1. *Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. Journal of Applied Social Psychology 32(4): 665–683.*
2. *Bankooff, G. (2017). Living with Hazard: Disaster Subcultures, Disaster Cultures and Risk-Mitigating Strategies. Springer Link. link.springer.com*
3. *Becker, J.S., D. Paton, D.M. Johnston, and K.R. Ronan. (2012). A model of household preparedness for earthquakes: How individuals make meaning of earthquake information and how this influences preparedness. Natural Hazards 64(1): 107–137.*
4. *Bhanumurthy, V., G.J. Shankar, K.R.M. Rao, and P.V. Nagamani. (2015). Defining a framework for integration of geospatial technologies for emergency management. Geocarto International 30(9): 963–983.*
5. *Birkmann, J., and K. von Teichman, (2010). Integrating disaster risk reduction and climate change adaptation: Key challenges—Scales, knowledge, and norms. Sustainability Sci., 5, 171–184*
6. *Bostrom (2013) Chen, T.-P., J. Areddy, and J. Hookway (2013) Typhoon Haiyan: How a catastrophe unfolded. Wall Street Journal, 26 November. [Available online at www.wsj.com*
7. *Bovens and Hart (1996), Bovens, M., and P. Hart (1996) Understanding Policy Fiascoes. Transaction, 173 pp.*
8. *Brewer, N., G. Chapman, F.X. Gibbons, M. Gerrard, K. McCaul, and N. Weinstein. (2007). Meta-analysis of the relationship between risk perception and health behavior: The example of vaccination. Health Psychology 26(2): 136–145.*
9. *Button, G. (2010). Disaster Culture: Knowledge and Uncertainty in the Wake of Human and Environmental Catastrophe. Routledge, London. Kindle Edition. Catastrophe. Routledge, London. Kindle Edition. Retrieved from: www.routledge.com*
10. *Chan, E., J. Yue, P. Lee, and S. Wang. (2016). Socio-demographic predictors for urban community disaster health risk perception and household based preparedness in a Chinese urban city. PLoS Currents Disasters.*
11. *Chiu, Y.-T. (2013). Typhoon Haiyan: Philippines faces long road to recovery. The Lancet, 382(9906), 1691-1692. www.thelancet.com*
12. *Comfort, L. K., K. Ko, and A. Zagorecki (2004). Coordination in rapidly evolving disaster response systems: The role of information. Amer. Behav. Sci., 48, 295–313*
13. *Creswell et al. (2009). Interpretivists/constructivist paradigm. Nelson Young Instructional Tcehnology Blog. sites.pc.gsu.edu*

14. *Daellenbach, K., J. Parkinson, and J. Krisjanous. (2018). Just how prepared are you? An application of marketing segmentation and theory of planned behavior for disaster preparation. Journal of Nonprofit & Public Sector Marketing 30(4): 413–443.*
15. *Drabek, T. et. al. (1971). When Disaster Strikes. The National Academics of Science Engineering Medicine. www.nap.edu*
16. *Eagly, A.H., and S. Chaiken. (2007). The advantages of an inclusive definition of attitude. Social Cognition 25(5): 582–602.for Typhoon Haiyan/Yolanda. Deutsche Gesellschaft fürInternationaleZusammenarbeit Rep., 64 pp.*
17. *Fischhoff, B., and A. L. Davis (2014). Communicating scientific uncertainty. Proc. Natl. Acad. Sci. USA, 111, 13 664–13 671*
18. *Freudenburg, W. R., (2003). Institutional failure and the organizational amplification of risks: The need for a closer look. The*
19. *Fung, O.W.M., and A.Y. Loke. (2010). Disaster preparedness of families with young children in Hong Kong. Scandinavian Journal of Public Health 38(8): 880–888.*
20. *Glasman et al. (2006), Glasman, L.R., and D. Albarracín. (2006). Forming attitudes that predict future behavior: A meta-analysis of the attitude-behavior relation. Psychological Bulletin 132(5): 778–822.*
21. *Iedema, R., and R. Wodak. (1999). Introduction: Organizational Johnson, K., Y. Depietri, and M. Breil. 2016. Multi-hazard risk assessment of two Hong Kong districts. International Journal of Disaster Risk Reduction 19: 311–323.*
22. *Juanzon, J. B., &Oreta, A.W. (2017). An assessment on the effective preparedness and disaster response: The case of Santa Rosa City, Laguna. Peer-review under responsibility of the scientific committee of the 7th International Conference on Building Resilience, 1877-7058. www.sciencedirect.com*
23. *Khalil, T., K. Atieh, A.U. Mohammad, and F. Bagdadlian. (2014). Examining the social and technical factors influencing school teachers knowledge sharing intentions in a teachers online professional community. Electronic Journal of Knowledge Management 12(3): 157–165.*
24. *Lazo, J.K., A. Bostrom, R.E. Morss, J.L. Demuth, and H. Lazrus. 2015. Factors affecting hurricane evacuation intentions. Risk Analysis 35(10): 1837–1857.*
25. *Lejano, P. et al. (2016). A Textual Processing Model of Risk Communication: Lessons from Typhoon Haiyan. American Meteorological Society.*
26. *Lejano, R., (2008). The phenomenon of collective action: Modeling institutions as structures of care. Public Adm. Rev., 68, 491–504*
27. *Leung Ng (2022), S.L. Effects of Risk Perception on Disaster Preparedness Toward Typhoons: An Application of the Extended Theory of Planned Behavior. Int J Disaster Risk Sci 13, 100–113 (2022).*
28. *Liu-Lastres, B., A. Schroeder, and L. Pennington-Gray. (2019). Cruise line customers' responses to risk and crisis communication messages: An application of the risk perception attitude framework. Journal of Travel Research 58(5): 849–865.*
29. *Liwag, J. (2020). The challenges of communicating scientific information to the public. CNN. cnnphilippines.com*
30. *Loewenstein, G.F., E.U. Weber, C.K. Hse, and N. Welch. (2001). Risk as feelings. Psychological Bulletin 127(2): 267–286.*
31. *Loke, A.Y., C.K.Y. Lai, and O.W.M. Fung. (2010). At-home disaster preparedness of elderly people in Hong Kong. Geriatrics & Gerontology International 12(3): 524–531.*
32. *Lyotard, J. F., (1984). The Postmodern Condition: A Report on Knowledge. Vol. 10, Theory and History of Literature, University of Minnesota Press, 144 pp.*
33. *McIvor, D., and D. Paton. (2007). Preparing for natural hazards: Normative and attitudinal influences. Disaster Prevention and Management 16(1): 79–88.*

34. *Miceli, R., I. Sotgiu, and M. Settanni. (2008). Disaster preparedness and perception of flood risk: A study in an alpine valley in Italy. Journal of Environmental Psychology 28(2): 164–173.*
35. *Mori, N., Kato, M., Kim, S., Mase, H., Shibutani, Y., Takemi, T., ... & Yasuda, T. (2014). Local amplification of storm surge by Super Typhoon Haiyan in Leyte Gulf. Geophysical research letters, 41(14), 5106-5113. Retrieved from: www.ncbi.nlm.nih.gov*
36. *Mukhtar, Rabiya. (2018). Review of National Multi-Hazard Early Warning System Plan of Pakistan in context with Sendai Framework for Disaster Risk Reduction. Peer review under responsibility of the scientific committee of the 7th International Conference on Building Resilience, 1877-7058. www.sciencedirect.com*
37. *National Geographic Encyclopedia (2022), Storm Surge. Dunn, Margery G. (Editor). (1989, 1993). "Exploring Your World: The Adventure of Geography." Washington, D.C.: National Geographic Society.*
38. *Navarro, K. and McKinnon, M. (2020). 'Challenges of communicating science: Neussner (2014) Neussner, O., 2014: Assessment of early warning efforts in Leyte NOAA (2022) perspectives from the Philippines'. JCOM 19 (01), A03.*
39. *Paul, B., and R. Bhuiyan. (2010). Urban earthquake hazard: Perceived seismic risk and preparedness in Dhaka City Bangladesh. Disasters 34(2): 337–359.*
40. *Phillips, N., T. B. Lawrence, and C. Hardy, (2004) Discourse and institutions. Acad. Manage. Rev., 29, 635–652. [Available online at www.jstor.org.*
41. *Rimal, R.N., and K. Real. (2003). Perceived risk and efficacy beliefs as motivators of change: Use of the risk perception attitude (RPA) framework to understand health behaviors. Human Communication Research 29(3): 370–399.*
42. *Salaverria, L. (2013). Tacloban mayor's wife recounts ordeal. Inquirer.net, accessed 25 October 2014. Retrieved from: newsinfo.inquirer.net*
43. *Social Amplification of Risk, Cambridge University Press, SSOP Training Workshop WMO RTC, Nanjing, China, Economic and Social Commission of Asia and Pacific*
44. *Storm surge Overview. (2022). National Hurricane Center and Central Pacific Hurricane Center. Storm surge. (2022) PAGASA. www.pagasa.dost.gov.ph*
45. *Vallejo, B. (2013). Tsu-balod or Tsunami?: Making disaster terms understandable. Rappler. www.rappler.com.*
46. *Webster et al. (2005), Webster, P.J., G.J. Holland, J.A. Curry, and H.R. Chang. 2005. Changes in tropical cyclone number and intensity in a warming environment. Science 309(5742): 1844–1846.*
47. *Wong, T., and Y. Yan. (2002). Perceptions of severe weather warnings in Hong Kong. Meteorological Applications 9(3): 377–382.*

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Figure 1. *Unofficial representation of Awiwit (converging/diverging waves) described by Aurora resident*

Figure 2. Statue of Tromba Marina in Baler, Aurora