Urban Dwellers' Hazard Awareness and its Implications on Disaster Risk Reduction and Management Towards Climate Change Adaptation and Urban Resilience

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Abstract

The role of urban design in disaster risk reduction and management (DRRM) has taken more attention in the advent of the COVID-19 pandemic, as transmission rates are highest where cities are mostly crowded. Rapid urbanization is taking place in Asia, making its populations most vulnerable to hazards and disasters, including this current pandemic. This paper aims to assess the basic hazard awareness of the city population, particularly in the central business district (CBD), as a prerequisite for urban resilience. A comprehensive survey of the daytime population of Davao City's CBD was conducted in the latter half of 2019, focusing on the respondents' awareness of the five (5) most prevalent disasters in the study area. Existing government policies and programs on climate change adaptation and DRRM were also examined as to how they are translated into community development and other forms of interventions. Research results show that the majority of the daytime urban population are in their early and prime working age and despite their high educational background, they have low awareness of hazards, and their recall of experiences in disasters is short-term. The majority of them are not able to identify which hazard they are most susceptible to, and DRRM-related terminologies are poorly understood. In conclusion, this study hoped to provide a basis for integrating risk communication in architectural and urban design interventions toward a sustainable and resilient built environment.

Keywords: hazard awareness, risk communication, disaster risk reduction, urban resilience, Davao City

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I. Introduction

The adverse impacts of climate change on society have never been more apparent in recent years, with various hazards happening more frequently and threatening human civilization. While the scientific community has known this for quite a while, it was not only recently that people around the world began paying attention. Significantly, the role of urban design in disaster risk reduction and management (DRRM) is becoming more important, especially during the time of the COVID-19 pandemic. All over the world, transmission rates are highest and cities are mostly crowded, facing the same threats from other forms of urban disasters we were used to such as typhoons, flooding, landslides, fire, and earthquakes. Minding on these known disasters, it is important to note the urban dwellers' awareness of related hazards towards disaster risk reduction and urban resiliency.

Historically, environmental awareness and movement at the global level went through a series of political processes. In 1988, the Intergovernmental Panel on Climate Change (IPCC) was born through the United Nations Environment Programme and the World Meteorological Organization. With a mandate from the United Nations (UN), IPCC's task was to provide a scientific basis for international climate policy making, with its reports playing important roles in succeeding international treaties pertaining to global warming, coping with its consequences, and the need for adaptation. The establishment of IPCC took place even before "sustainable development" became a buzzword in 1992, through the "Rio Declaration on Environment and Development, and the Statement of Principles for the Sustainable Management of Forests," otherwise known as Agenda 21, then declared at the United Nations Conference on Environment and Development held in Rio de Janeiro, Brazil. However, it took more than a decade for climate change to gain popularity. It was only when former United States Vice President Al Gore began a campaign to educate people about global warming, eventually drawing worldwide attention through a documentary film entitled, *An Inconvenient Truth* in 2006. Consequently, in 2007, the IPCC and Gore both received the Nobel Peace Prize "for

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their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change" (IPCC, 2012). From this global political scenario, environmental awareness in relation to climate change adaptation and disaster risk reduction management and strategies is now part of the culture at the national and local levels.

Along with more than 178 governments adopting Agenda 21, the Philippines came up with its own national agenda for achieving sustainable development in the twenty-first century. As integrated into the country's medium-term and long-term development plans in 1993 and 2000, respectively, the Philippine Agenda 21 aimed for the sustainable development of every local government unit (LGU) in the country. By virtue of the country's local government code, every province, town, and city in the Philippines is mandated to draw up its development plans in accordance with the significant national agenda. Over the years, major policies have also been enacted to address climate change issues and mainstream disaster risk reduction and management towards adaptation, for example, in the construction of low-income housing and resettlements (Malaque III and Golimlim, 2019). Among these policies are the Climate Change Act (CCA) of 2009, which seeks to build resilience to climate-change-related hazards, and the Disaster Risk Reduction and Management Act (DRRMA) of 2010, which "provides for the development of policies and plans and the implementation of actions and measures pertaining to all aspects of DRRM, including good governance, risk assessment and early warning, knowledge building, and awareness raising, reducing underlying risk factors, and preparedness for effective response and early recovery" (Republic of the Philippines, 2010). Furthermore, sustainable development in terms of the resilience of Filipinos amid the increasing occurrence of hazards remains to be seen through the preparedness, adaptive response, and recovery of LGUs whenever disaster strikes. For example, in 2013, the world's strongest typhoon in history, internationally named "Haiyan" (or domestically known as "Yolanda") claimed more than 6,000 lives across the central regions of the Philippines. Moreover, in 2020 about the same period in November, five typhoons came in a row all within a month, three of which were similarly destructive – "Molave" ("Quinta"); "Goni" ("Rolly"); and "Vamco" ("Ulysses') — affecting the northern regions including the country's capital Manila, and recording less than 150 fatalities, collectively (UN-OCHA, 2020). The Philippines, being most vulnerable to natural hazards and disasters, must consider climate change and its related environmental issues as priorities towards aiming for sustainable development.

Now, three decades after the declaration of Agenda 21, the global community is facing the challenges of the twenty-first century with Agenda 2030 which is elaborated by the 17 Sustainable Development Goals (SDGs). These 17 SDGs are interlinked and designed to be "a blueprint to achieve a better and more sustainable future for all by 2030."

Specifically related to urban design, SDG-11 aims to "make cities and human settlements inclusive, safe, resilient and sustainable" (UN, 2015). However, while the reduction in fatality rates of Philippine disasters over the years indicates improvement, Filipino resilience as a target within the remaining decade is still hard to measure by its operational definition.

II. Background to the Study

A. Defining Resilience by Understanding Risk

While resilience is generally defined in reference to ecosystems, the climate change sector assumes resilience to be the inverse of vulnerability, with vulnerability being a factor of risk. Vulnerability is determined by exposure to climate change, sensitivity to climate extremes, and adaptive capacity to climate impacts (IPCC, 2012). In 2017, the United Nations Office for Disaster Risk Reduction released a handbook for local government leaders on how to make cities resilient. The handbook presented a theoretical framework for understanding risk, as a function of hazards, exposure, vulnerability, and coping capacities. Risks, as defined by Gencer (2017), "are a function of the hazard (e.g., cyclones/typhoons, earthquake, flood, or fire), the exposure of people and assets to hazards, and the conditions of the vulnerability of the exposed population or assets." Depending on the institutional and individual capacity to cope and/or act to reduce risk and increase resilience, since these factors are not static, thus can be improved. Furthermore, new risks are created because development patterns increase exposure and vulnerability in the social and environmental realms (Gencer, 2017). As these factors vary from city to city and are difficult to measure, the framework presents more of a definition rather than a mathematical equation (Figure 1).

$$\frac{\text{Hazard} \times \text{Vulnerability} \times \text{Exposure}}{\text{Resilience or coping capacities}} = \text{Disaster Risk}$$

Figure 1. Factors of Disaster Risk
Source: UNISDR, 2019

In other words, as presented in Figure 1, disaster risk prevails if hazard, exposure, and vulnerability are all present. As a sample scenario, an area that is probably prone to flooding (hazard) cannot be considered at risk, if there are no dwellers on the site (exposure and vulnerability). In the same way, an informal settlement (socio-economically vulnerable) may not be considered at risk if it is not located in a flood-prone area (exposure and hazard). Numerous works of literature on sustainability and disaster risk reduction directly point to resilience as a means to combat risk, and their frameworks imply that

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resilience can be achieved by strengthening the population's coping capacities.

In the urban planning context, resilience is the ability of a locality and its citizens to withstand impacts and shocks, and to rebuild, reorganize, or transform itself when necessary. Since the enactment of related Philippine laws in 2009 and 2010, respectively, the CCA and DRRMA have strengthened and mainstreamed the comprehensive land use planning processes throughout the country. Moreover, these national policies are reflected along with the key principles in urban development and housing, which established resilience as a foundation in planning and decision-making for designed and built environments or spaces such as neighborhoods, settlements, development areas, municipalities, provinces, regions, and cities (HLURB, 2017).

B. Importance of Hazard Awareness in Achieving Resilience

Similar to the Philippines, a neighboring country Japan is also frequented by hazards, particularly earthquakes. It is also where the UN framework for disaster risk reduction was adopted in 2015, also known as the Sendai Framework (UNOOSA, 2020). Learning from its experience, Japan has long integrated disaster reduction education into its school systems to improve children's risk awareness. The effectiveness of such good practice is evidenced by some successful stories, particularly the so-called "Miracle of Kamaishi", where all school children survived the 2011 great tsunami disaster, compared to an equally damaging earthquake in 1995 that killed nearly 700 young people in the Tohoku area. The survival of all school children in 2011 is attributed to their high awareness. Since the 2011 disaster, new tools like the "Gensai Pocket YUI," a handkerchief printed with disaster information graphics, were proposed to augment Japan's disaster reduction education, as awareness needs to be maintained even outside the classroom and in everyday life (Suppasri, 2015). Among other strategies developed with their conditions, Japanese initiatives were made role models in DRRM strategies by other countries.

Risk communication plays a crucial role in achieving resilience, and its core lies in the population's awareness of hazards. In the Philippine practice, however, risk communication remains too highly scientific and technical to be understood in layman's terms. For example, in the aftermath of Typhoon Haiyan in 2013, it was learned that the disaster could be further attributed to the people's lack of understanding of terms such as "storm surge" and "Category 5 typhoon" (Fong, 2015). The strong winds that crushed thousands of properties across regions could have been better understood, and well-prepared if "Signal Number 5" was used in the announcements. In the same way, the "storm surge" that killed thousands on the coasts of Tacloban City could have been better understood and expected, if it was referred to as a "tidal wave" or "tsunami-like waves," considering that the harrowing images from

the 2011 tsunami disaster in Japan were still fresh in people's memories that time.

C. Importance of Urban Dwellers' Hazard Awareness

Among the more than 1,500 towns and cities in the Philippines, Tacloban City is classified as a highly urbanized city (HUC) along with 32 other HUCs that includes and ranks Davao City as the third in terms of population, and the first in terms of land area. The Philippine urban development and housing framework acknowledges urbanization as a catalyst for growth, with more than half of Filipinos now living in urban areas, where 75% of the country's economic output can be attributed. The referred framework also recognizes awareness as a key strategy for the resilience and sustainable development of settlements. In addition, the framework's strategy on public administration, urban governance, and management aims to ensure urban safety and security. While man-made hazards, risks, and crime, are usually resolved through police presence and emergency response, these can also be addressed through greater community participation and awareness of safety and security issues (HLURB, 2017). Considering that a greater number of people now live in urban areas, in the same way, that the achievement of SDGs is centered on the people, all the more that hazard awareness of urban dwellers must be given importance toward the achievement of sustainable and resilient cities.

III. Aims and Objectives

Considering that the Philippines ranks third among the countries with the highest disaster risks in the world (World Risk Report, 2018, as cited in Malaque III and Golimlim 2019), the growing number and concentrations of populations exposed to hazards in the urban areas make HUCs as the most vulnerable cities in the Philippines. To explore this critical urban phenomenon, this paper aims to assess hazard awareness, as a pre-condition for the resilience of urban dwellers of Davao City, by probing through the daytime population of its CBD which is also referred to as the Poblacion. Furthermore, the study aims to understand the community at risk, according to the population's literacy level and proximity of residence to the CBD. Specifically, for this paper, the study aimed to sieve the urban dwellers from the daytime population of the CBD and to investigate if perceptions differ between those who are living in and outside of the CBD. The study also aimed to enumerate and classify the hazards that the CBD population is aware of and to examine if some terminologies used in the usual risk communications, as practiced by the authorities, are well understood by the urban population. The final objective is to analyze if the population's literacy or educational background has anything to do with their hazard awareness. For the discussion, this paper focuses on the gaps in risk communications in urban areas and attempts to

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recommend corresponding mitigating measures through urban planning interventions for the natural and built environments.

IV. Case Study Area and Sampling

Davao City is the case study area, the comprehensive survey was conducted in Poblacion District - the urban area within the political boundary of the city. A ten-question survey questionnaire was designed covering three components, other than respondents' profile, to include: housing; transportation; and disaster risk awareness. However, this paper only covers the third component which is urban dwellers' awareness. For the distribution of surveys, the study area was divided into eight zones. For the conduct of surveys, 50 research enumerators were deployed to cover all the zones resulting in a total of 1,026 respondents who participated in the survey. Research respondents included the daytime population when the survey was conducted in the Poblacion District, who either lived in or outside of the case study area. The survey was conducted from November to December 2019, most of which were gathered in the first half of November. Incidentally, the region experienced a phenomenal swarm of earthquakes around the same period from September to December 2019.

V. Research Results

A. Respondents' Profile

In terms of age, a total of 1,023 respondents revealed their ages in the survey. Their responses were then tabulated and clustered according to their age classification based on age structures or categories used by the Philippine Population Commission. The majority of respondents' ages are in the early (15–24 years old) and prime (25–54 years old) working age categories (Figure 2). This profile reflects the "youth bulge" of the entire population of the country, where there are more than 30 million Filipinos aged between 10 and 24 years old. Per the UNDHF 2017–2022 report, this young age group comprised almost a third of the Philippine population; thus, with the potential to be developed.
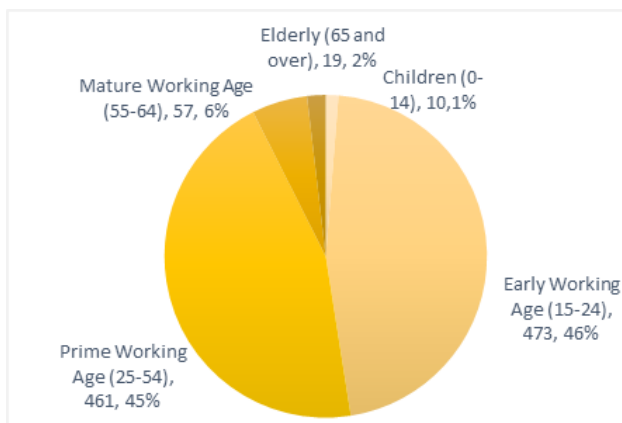

Figure 2. Respondents' Age Profile

In terms of educational attainment, for a total of 1,025 respondents obliged to this item in the survey questionnaire, only five percent of the total respondents have not completed elementary school; and 95% are literate (Figure 3).
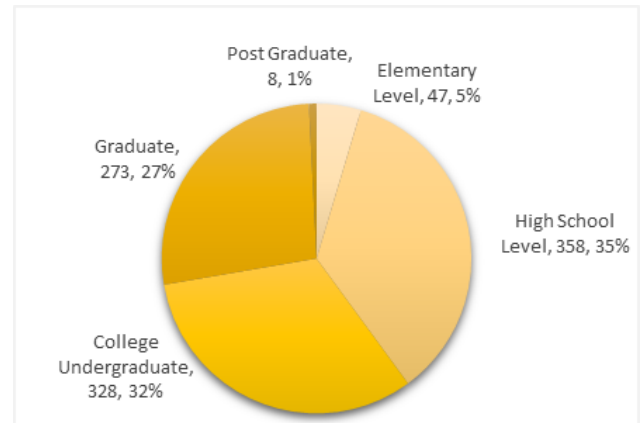

Figure 3. Respondents' Educational Attainment

B. Disaster Risk Awareness

In the Philippines, the high vulnerability to disaster is caused by typhoons. With an average of 20 typhoons entering the Philippine area of responsibility every year, the entire country is placed susceptible to typhoons. In order to find out if the respondents realized this and if they really knew the dangers brought about by typhoons, this was asked in the survey questionnaire. As shown in Figure 4, "typhoon" is identified as one of the country's most common and most destructive natural hazards, among others that include: earthquakes, floods, and landslides; volcanic eruption identified as other; and fire in the case of the Philippines that is mostly man-made, not natural like in the case of wild forest fires in continental countries.
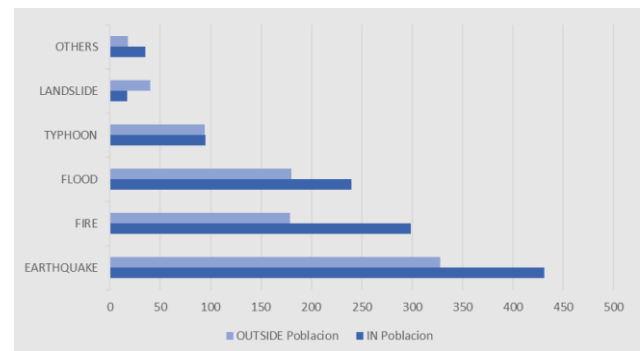

Figure 4. Hazards Identified by Number of Respondents Living in and Outside the Poblacion District

In the aftermath of typhoon "Haiyan" ("Yolanda") in 2013 as shown in Figure 5, it was observed that many people did not know what "storm surge" means. This term is commonly interchanged with "tsunami" or "tidal wave". This simple misunderstanding of nomenclature poses a serious threat, as evidenced by the death toll during typhoon "Haiyan". In order to find out the respondents' knowledge of the identified hazard by identifying the correct tidal hazard associated with typhoons, it was asked in the survey what is caused by typhoons. As a result, shown in Figure 6, only 36% answered "storm surge" correctly, and an additional six percent gave multiple answers with "storm surge" also included. On the other hand, two percent gave incorrect answers, and 39% admitted that they did not know which of the hazards were caused by typhoons.

Figure 5. The MV Eva Jocelyn was among the ships washed ashore by storm surges of Haiyan, in Bgy. Anibong, Tacloban City. The ship has now become a memorial.
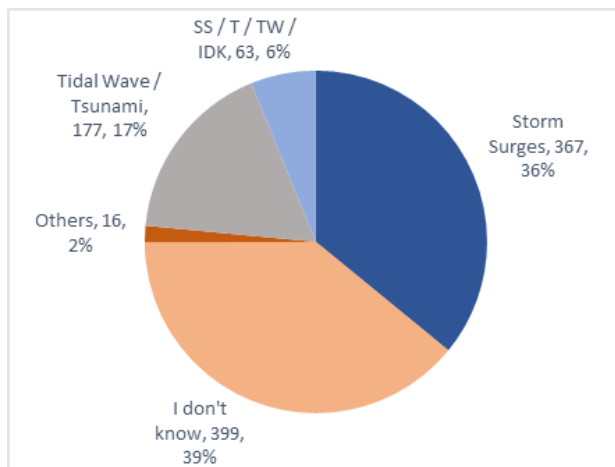
Source: Photo c/o Dalen Palami

Figure 6. Respondents' Awareness of Storm Surge

Per practice in the Philippines in time of typhoon, the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) issues Public Storm Warning Signals (ranging from Signals 1 to 5), which basically indicates wind speed regardless of rainfall. In order to find out if people understood hazard categories set by the authorities, this was asked during the survey. As a result, shown in Figure 7, only 23% gave the correct answer, while most of the respondents associated typhoons with floods and heavy rains. On the other hand, two percent gave incorrect answers; and 25% admitted that they did not know which of the hazards were caused by typhoons to be associated with categories set by authorities.
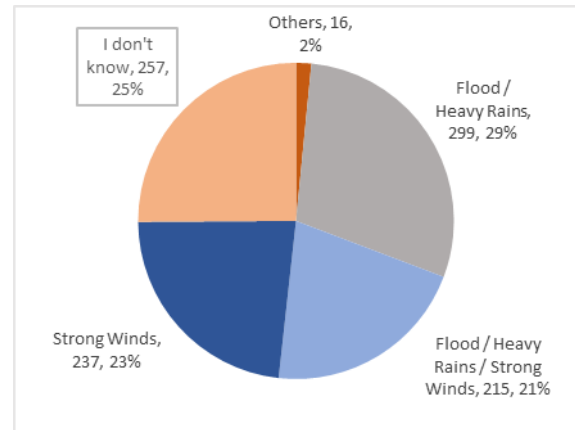

Figure 7. Respondents' Awareness of Typhoon

VI. Discussion and Conclusion

Referring to the respondents' profile and consolidating the respondents' age and educational attainment, a good literacy level among the respondents representing the daytime population in Davao City is generally exhibited (Figure 3). With the respondents having more than the minimum literacy level assumed required for coping with everyday life, the study further examined if they are also equipped with the basic knowledge of natural hazards. As shown in Figure 4, "typhoon" did not come in as the top answer among the identified hazards. This means that respondents were more aware of earthquakes, fire (that is more man-made rather than natural), and flooding instead. The graph (Figure 4) also shows the responses from both those living in and outside of the Poblacion District, in which case the discussion with the context of hazard awareness may not be as significant as to relate it with other issues on housing and transportation that imply comparative confidence level on infrastructure.

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Figure 8. Damage from several earthquakes that hit the study area shortly before the survey was conducted.

Source: https://www.philstar.com/headlines/2019/10/31/1964919/photos-aftermath-october-31-mindanao-earthquake

Despite the literacy of urban dwellers, as shown in the profile of their educational attainment, the most destructive hazard (typhoon) in the entire country was not identified as much as the more recent hazards (e.g., earthquake as shown in Figure 8). Moreover, the majority do not know nor understand the dangers that typhoons will further cause. Therefore, in terms of disaster risk awareness, a high literacy level cannot guarantee high awareness. Hence, it is recommended that communication in relation to disaster awareness should be regular and frequent, and developed to be simply understood by the entire population. To be more effective in the context of the built environment, aspect of disaster risk communication must also be integrated into urban planning and urban design towards sustainable, safe, and resilient urban areas.

Acknowledgment

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