CHAPTER 2

Flooding as a Risk Event in Urban Development

Flooding is a potential threat with serious implications to development initiatives, especially in densely populated urban areas. It also exposes and increases communities to further risks and hazards. The role of government and financial restrictions are the two major problems that developing, and least developing countries face when managing disasters. It has serious implications as well as open avenues for identifying areas of improvement on the social and physical dimension of a city's development (Auzzir et al., 2014). Lasco et al. (2009) emphasized that the Philippines, in general, is considered as very vulnerable to climate change as an archipelago. The frequency of typhoons and storms that pass through the Philippines archipelago make it more vulnerable to flooding (Magalang, 2010).

Incidentally, the United Nations (2005) considered urbanization as a form of metropolitan growth that is a

response to often bewildering sets of economic, social, and political forces and to the physical geography of an area. It is the increase in the population of cities in proportion to the region's rural population. Furthermore, the 20th century is witnessing "the rapid urbanization of the world's population", as the global proportion of urban population rose dramatically from 13% (220 million) in 1900, to 29% (732 million) in 1950, to 49% (3.2 billion) in 2005 and is projected to rise to 60% (4.9 billion) by 2030. Urban ecosystems are the consequence of the intrinsic nature of humans as social beings to live together (Sudhira et al., 2003; Ramachandra et al., 2012; Ramachandra et al., 2014). The process of urbanization contributed by infrastructure initiatives, consequent population growth and migration results in the growth of villages into towns, towns into cities and cities into metros. Urbanization and urban sprawl have posed serious challenges to the decision makers in the city planning and management process involving plethora of issues like infrastructure development, traffic congestion, and basic amenities which includes electricity, water, and sanitation, among others (Kulkarni & Ramachandra, 2006).

The interplay of disaster and urban development is recognized in literatures that determine vulnerability during natural calamities such as flooding in urban areas. However, disasters also open new avenues for addressing weaknesses in both social and physical dimension of development, especially

in densely populated urban areas. Disasters that we experienced and anticipated to happen are subject to serious global and domestic policy issues and concerns. It magnifies the vulnerability of communities (Stephenson, 1994; Auzzir et al., 2014; Carrasco et al., 2016; Comfort et al., 1999; Mochizuki, et al., 2014). The process of urbanization contributed by infrastructure initiatives, consequent population growth and migration results in the growth of villages into towns, towns into cities and cities into metros. Rapid urbanization is happening at a global scale. Development towards metropolitan growth is an observed trend globally. The 20th century is witnessing rapid urbanization, transforming many semi-rural areas into master planned communities bustling with commercial, residential and leisure activities. Meanwhile, it has also facilitated spill over development in the fringes of these master planned communities. Communities arising from spill over would include informal settlers and associated issues with them like basic amenities, sanitation, education, peace and order, etc. This plethora of issues, along with infrastructure development and traffic congestion, pose serious challenges to urban planners and policy-makers. As such, cities and urban areas are considered critical components of global sustainability as well as drivers of global transformation (Ramachandra et al., 2012; McPhearson et al., 2014).

The International Bank of Reconstruction and Development (IBRD) in 2012 considered flooding as the most occurring natural event in the urban areas, thus, "*poses a challenge to development and the lives of people, particularly among the residents of rapidly towns and cities in developing countries*". Similarly, the frequency of typhoons and storms passing through the Philippine archipelago makes it more vulnerable to flooding (Magalang, 2010).

Urban flooding is considered as a risk event one of the most frequent natural disasters in the Philippines (Cayamanda & Lopez, 2018). The Intergovernmental Panel on Climate Change (IPCC) defined flood as "*the overflowing of the normal confines of a stream or other body of water, or the accumulation of water over areas that are not normally submerged. Floods include river (fluvial) floods, flash floods, urban floods, pluvial floods, sewer floods, coastal floods, and glacial lake outburst floods*".

In addition, Ramachandra et al. (2012) discussed further that floods in an urbanized landscape refer to the partial or complete inundation from the rapid accumulation or run-off resulting in the damage to property and loss of biotic elements (including humans). Urban flooding is a consequence of increased impermeable catchments resulting in higher catchment yield in a shorter duration and flood peaks sometimes reach up to three times. Thus, flooding occurs quickly due to faster flow times (in a matter of minutes). Causal

factors include combinations of loss of pervious area in urbanizing landscapes, inadequate drainage systems, blockade due to indiscriminate disposal of solid waste and building debris, encroachment of storm water drains, housing in floodplains and natural drainage and loss of natural flood-storages sites. Flood mitigation in urban landscape entails integrated ecological approaches combining the watershed land-use planning with the regional development planning. This includes engineering measures and flood preparedness with the understanding of ecological and hydrological functions of the landscape (Ramachandra et al., 2012).

Flooding as a focus of disaster studies have been documented in different parts of the world. Kerstholt, Duijnhoven and Paton (2017) focused the case of flooding in Netherlands emphasizing the role of flooding preparedness as affected by risk perception, social participation and community efficacy. Motoyoshi (2006) looked into flooding in Japan and analyzed the relationship of flood risk perception with community-based disaster preparedness. His study revealed the factors that affect risk perception as well as factors that increase public intention to participate in community-based preparedness activities. In Chile, a study focused on Talcahuano's flooding occurrences because of intense rapid urbanization and looked at flood risk perception, vulnerability, resilience, and coping capacity concepts. The study revealed

that the public's endogenous and exogenous characteristics have resulted determinants to explain their perception (Lara et al., 2016). Similarly, in Malaysia, a mapping perception of community preparedness on flooding has been analyzed using Likert Scale and GIS and found that community engagement plays a very vital role in flooding preparedness (Asmara & Ludin, 2014). In Germany and France, flooding and coping appraisals have been analyzed using the Protection Motivation Theory (PMT) and revealed that a strong positive social environment plays a significant role and recommended that risk communication should be enhanced using the observed social norms and network effects (Bubeck et al., 2018; Bubeck et al., 2012; Bubeck et al., 2017). Moreover, studies on flood risks have revealed that trust and communication play an integral role in the effectiveness of risk communication as well as the role of the institutions and other social networks, i.e. volunteer groups, emergency services and neighbors (Seebauer & Babcicky, 2017).