


Chapter 1


Flood Vulnerability, Risk, and Susceptibility Assessment: Flood Risk Management

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ABSTRACT

Flood can be assessed through flood vulnerability, risk, and susceptibility analysis using remote sensing, geographic information system, and hydrological modelling. In this chapter, different stages, complexities, and processes of flood vulnerability, risk, and susceptibility assessment were discussed. The study reveals that flood vulnerability should be assessed based on four aspects: physical, social, economic, and environmental. Flood risk should be assessed by three stages: risk analysis, disaster relief, and preparedness, whereas flood susceptibility assessment involves three processes. Overall, it was found that the responsible factors vary as per the local conditions, which need to be carefully analyzed and selected. Furthermore, the role of remote sensing and geographic information system in flood risk management were found important especially in flood risk mapping and in the selection of responsible flooding factors.

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INTRODUCTION

Natural Hazard is a natural phenomenon that have the potential to affect negatively on humans and on the environment because of their location, severity and frequency. Flood is one of the common natural hazard in the world which affects loss of life, economy and agricultural activities. According to a National Geographic news, in the United States, floods causes approximately \$6 billion worth of damage and killing of approximately 140 people every year. In a report issued by the Organization for Economic Cooperation and Development in 2007, it was found that coastal flooding inflict around \$3 trillion damage worldwide. It is also added in the news about China's Yellow River valley where some of the world's worst floods have occurred, millions of people have died in floods during the last century (NGN, 2015). Whereas, in India and Nepal, thousands of killings were due to flooding in 2013, while the Philippines has suffered from recurring flooding that caused more than 100 fatalities every year between 2011 and 2013 (Tanoue et al., 2016). Major recent floods occur in East African Countries (Kenya, Rwanda and Somalia) in May 2018 (NASA, 2018), Japan (Southwestern Japan) flood in July 2018 (UNISDR, 2018), India (Kerala) flood in August 2018 (Kerala Government, 2018) and Jordan (Zara Maeen hot springs area) flash flood in October 2018 (UN, 2018). In future, it is expected that flooding will occur more rigorously and frequently due to rapid urbanization, climate change, land use and land cover pattern changes, poor watershed management activities and reduction of infiltration capacity due to urbanization (Nasiri et al., 2016). It is a serious issue which should be analysed to lower the impact of flooding on the humans and on the environment.

There are three most common types of flooding such as coastal, river and flash flooding while tsunami and hurricanes are also two less common types of floods witnessed and reported in the literature (Jonkman, 2005). Coastal flooding are due to the processes of waves, tides, storm surge, heavy rainfall from coastal storms or stream overflow. River flooding occurs when stream has bankfull discharge which means that the capacity of stream channel is not enough to conduct the amount of water available in the channel. Mostly, the bankfull discharge is due to high rainfall, steep slope and deposition of sediment on river bed which lowers the river's depth. Flash floods caused by high intensity of rainfall at local level due to which sudden rise in water levels. Tsunamis are long-period waves generated by disturbances in the ocean such as earthquakes, volcanic activity and undersea landslides. Hurricanes are large swirling storms which produces winds at very high speed (average speed of 120 km/h). The high speed winds damages buildings and trees which effects the humans.

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