



7th International Conference on Building Resilience; Using scientific knowledge to inform policy and practice in disaster risk reduction, ICBR2017, 27 – 29 November 2017, Bangkok, Thailand

Flood Hazard Zoning of Tarlac City: Towards the Development of Flood Overlay Zones and Provision

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Abstract

The province of Tarlac in the Philippines is one of the commonly flooded areas due to its geographical characteristics. The province is surrounded by high mountains along its eastern and western outskirts but predominantly the province is a vast flat area.

The present study focuses on the development of flood model for the urban areas of Tarlac City wherein a flood overlay zone is developed based on the flood hazard model. Specifically, the study focuses on attaining the following objectives: to develop a flood inundation model; to determine the hazards on the existing land use as well as determine the susceptibility to flood hazard and determine the risks on the urban barangays; and to look into the implications of land use policies towards risk management.

Historical, analytical and qualitative methods were employed to attain the objectives of the study. Stakeholders in the City Disaster Risk Reduction and Management Council (CDRRMC) were involved in the formulation of policies and strategies which may lessen the flood hazards as well as the risks towards the urban communities. The outcome of the workshop will be incorporated to the updated comprehensive land use plan (CLUP) of Tarlac City.

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Peer-review under responsibility of the scientific committee of the 7th International Conference on Building Resilience.

Keywords: Flood Hazard Zoning, Flood Overlay Zones, Risk Management

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1. Introduction

The Philippines is one of the countries around the world oftentimes experiencing disasters such as earthquake, volcanic eruption, typhoon, tsunami, drought, as well as flooding among others. Flooding is the most frequently experienced phenomenon in the Philippines due to the monsoon rains and typhoons experienced by the country. On average, the country experiences about 20 typhoons (more or less) per year. On the other hand, monsoon rain affects the weather system of the country for about six months or half of the year. This causes flooding in many parts of the country.

Excessive rainfall runoff can cause urban flooding as well as breach on river dikes or levees which likewise can cause flooding to low lying towns and villages. Damage to property, agriculture, as well as loss of lives may be encountered during floods. The Philippines experienced several disasters related to flooding which caused many deaths and damage to property in the last decade.

The province of Tarlac in the Philippines is one of the commonly flooded areas due to its geographical characteristics. The province is surrounded by high mountains along its eastern outskirts (part of Nueva Ecija and Aurora provinces) and western outskirts (province of Zambales) but predominantly the province is a vast flat area. The province of Tarlac has 17 municipalities and one city.

The population of Tarlac City is 342,493, based on the 2015 National Statistical Coordination Board (NSCB) data [1]. There are 141,439 people residing in the urban barangays whereas in the rural barangays there are 201,054 residents.

According to the City Disaster Risk Reduction and Management Office (CDRRMO), several barangays in the city were identified as flood prone, heavily flooded areas, and/or isolated during heavy rains. Based on the record of the CDRRMO, 17 out of the 76 barangays or 22.37 percent are prone to flooding.

The Comprehensive Land Use Plan (CLUP) of Tarlac City was approved in 2003 and to be adapted up to 2010. In 2014, the Housing and Land Use Regulatory Board (HLURB) released a new guide to comprehensive land use plan preparation. The following year, Tarlac City initiated to update the CLUP. Unfortunately, several years passed but the new CLUP of Tarlac City is yet to be approved.

Section 13.2 of the 2014 CLUP Guidebook of the HLURB states that flood overlay zone regulations are applied in areas that have been determined in the CLUP as flood-prone. The objective of the flood overlay zone is to protect lives and properties from the harmful effects of flood [2].

Flood risk is a function of two arguments: hazard probability and vulnerability. In other words, risk is a mathematical expectation of vulnerability (consequences) function. Flood probabilities are determined in order to produce flood hazard maps [3]. Flood risk may be treated as a set of triplets: a set of scenarios, scenario probabilities, and consequences per scenario [4]. Flood risk assessment consists of four steps: (i) hazard assessment; (ii) exposure assessment; (iii) vulnerability assessment; and (iv) risk assessment [5]. Flood hazard risk is usually measured by the probability that a flood will occur [6].

Water level can represent flood risk, although total flood volume or flood velocity can likewise be used to measure flood risk [7]. Flood hazard risk assessment is important in ensuring healthy and sustainable development of human society [8]. Flood may result to the destruction of natural environment and natural resources as well as to the dispersal of epidemic diseases and destruction of habitats [9].

Good planning is the key to minimizing the long-term risks of damage from flooding. The principle is simple – plan and develop properties, buildings and structures so that they are safe from flooding from the outset without compromising the safety of other properties. Prevention is far cheaper than the cure [10].

2. Objective of the Study

The present study focuses on the development of flood model for the urban areas or urban barangays of Tarlac City wherein a flood overlay zone will then be developed based on the flood hazard model. Specifically, the study tries to attain the following objectives.

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