GEO-ANALYTICAL HIERARCHY PROCESS FOR FLOOD RISK MAPPING USING MODERATE RESOLUTION OF SATELLITE IMAGES

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Abstract

Career prospect, education and facilities attract more people gravitate toward urban areas. The population rate has increased significantly, placing a demand on metropolitan regions which become major drivers of natural hazard growth, including flood events. Satellite technology offers good services for flood mitigation and provides precautionary measures in a particular area. Thus, this study aims to produce flood risk map area in Kuantan using moderate- resolution satellite images and Digital Elevation Model (DEM) dataset was integrated with GIS tools to conduct flood risk analysis. The study found that the Kuantan city centre with low drainage capacity and high paved area is the highest risk flood zone, whereas Gambang with a huge green corridor and good drainage system is the lowest risk flood zone. These findings can provide the communities in this area with the required details and understanding of the type of floods normally occurring in study areas. This study is crucial to propose a solution to mitigate flood occurrences based on the satellite-based risk map analysis. This study supports the agenda of SDG13: Climate Action; where flood risk analysis serves to determine awareness and early warning to prevent loss of human life, biodiversity, crops and damage to property.

1 Introduction

Urban growth and land clearance for the city development are among the major drivers of natural hazard. Flood is one of the most damaging natural hazards on the Earth. High urbanization indicates higher flood risk and catastrophic effect including landslide occurrences. Conceptually, flood risk is a product two relative components; flood vulnerability and flood risk properties. The flood risk occurred due to increasing rapid urbanization while landslides tend to occur when the flood risk is high at steep surfaces during wet season.

According to Department of Irrigation and Drainage (DID), huge river network that flow through the entire country during the peak of northeast monsoon season from October to March has locate approximately 9% of the country's total land area at risk of flooding, which affecting an estimated 2.7 million people. Rapid urbanization would exacerbate the issue by increasing population concentrations, putting vulnerable facilities at risk, increasing land use and channelling water courses [1]. According to recent records, the worst flood catastrophes happened in December 2014 in Kelantan, Pahang, Terengganu, and Sabah, claiming numerous lives and wreaking havoc on property. Prominent states and urban areas such as Selangor and Penang and Kuala Lumpur were hit by floods each year that requires the government to highly spend significant time and resources to aid inhabitants in recovering and rebuilding infrastructure following disasters. Kuantan have been affected by flood during wet season in January and December 2021. Geospatial technology including Geographical Information System (GIS) and remote sensing is one of the most effective technologies to be implemented across with a smart intelligent system to efficiently solve the prolonged flood issue. GIS and remote sensing are also the powerful technology to forecast weather and flood prediction as both are technological tools for comprehending geography and making intelligent decisions. It is critical in urban planning because it enables a city's existing needs to be better understood and then designed to meet those needs. Therefore, urban planning has great importance in mapping and managing the natural risk of flash floods for future planning. The GIS has been shown to be an effective tool for analysing hydrological aspects, especially in the area of flood risk mitigation. The GIS can store attribute data using maps and could organize large databases.

The aim of this study is to map flood risk area as one of the crucial components to diagnose specific area with high to low vulnerability to flood. Geospatial approach offers the best way to generate such information to be used in flood-solving framework by the relevant local and national authorities. This study supports the agenda of Sustainable Development Goal (SDG) 13: 'Climate Action'; where flood risk analysis serves to determine awareness and early warning to prevent loss of human life, flora and fauna, crops and damage to property; and SDG 11: Sustainable Cities and Communities that driving continuous endeavours to provide a modern and intelligent urban development for the communities to thrive and prosper. This includes the efforts to reduce the environmental impact of cities, reduce the adverse effects of natural disasters and availability of safe communal spaces.