

Analysis of Road Network Vulnerability Due to Merapi Volcano Eruption

Authors : Imam Muthohar, Budi Hartono, Sigit Priyanto, Hardiansyah Hardiansyah

Abstract : The eruption of Merapi Volcano in Yogyakarta, Indonesia in 2010 caused many casualties due to minimum preparedness in facing disaster. Increasing population capacity and evacuating to safe places become very important to minimize casualties. Regional government through the Regional Disaster Management Agency has divided disaster-prone areas into three parts, namely ring 1 at a distance of 10 km, ring 2 at a distance of 15 km and ring 3 at a distance of 20 km from the center of Mount Merapi. The success of the evacuation is fully supported by road network infrastructure as a way to rescue in an emergency. This research attempts to model evacuation process based on the rise of refugees in ring 1, expanded to ring 2 and finally expanded to ring 3. The model was developed using SATURN (Simulation and Assignment of Traffic to Urban Road Networks) program version 11.3. 12W, involving 140 centroid, 449 buffer nodes, and 851 links across Yogyakarta Special Region, which was aimed at making a preliminary identification of road networks considered vulnerable to disaster. An assumption made to identify vulnerability was the improvement of road network performance in the form of flow and travel times on the coverage of ring 1, ring 2, ring 3, Sleman outside the ring, Yogyakarta City, Bantul, Kulon Progo, and Gunung Kidul. The research results indicated that the performance increase in the road networks existing in the area of ring 2, ring 3, and Sleman outside the ring. The road network in ring 1 started to increase when the evacuation was expanded to ring 2 and ring 3. Meanwhile, the performance of road networks in Yogyakarta City, Bantul, Kulon Progo, and Gunung Kidul during the evacuation period simultaneously decreased in when the evacuation areas were expanded. The results of preliminary identification of the vulnerability have determined that the road networks existing in ring 1, ring 2, ring 3 and Sleman outside the ring were considered vulnerable to the evacuation of Mount Merapi eruption. Therefore, it is necessary to pay a great deal of attention in order to face the disasters that potentially occur at anytime.

Keywords : model, evacuation, SATURN, vulnerability

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