UNIVERSITI TEKNOLOGI MARA

ASSESSING IMPACT OF DEM RESOLUTION ON FLOOD INUNDATION MAPPING

AHMAD IKHWAN BIN ABDUL HALIM

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of the requirements for the degree of
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Faculty of Architecture, Planning and Surveying

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AUTHOR'S DECLARATION

I declare that the work in this thesis/dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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Name of Student	:	Ahmad Ikhwan Bin Abdul Halim
Student I.D. No.	:	2015823372
Programme	:	Bachelor of Surveying Science and Geomatics (Honours) – AP220
Faculty	:	Architecture, Planning & Surveying
Thesis/Dissertation Title	:	Assessing Impact of DEM resolution on flood inundation mapping
Signature of Student	:	.....
Date	:	July 2018

ABSTRACT

DEMs can be derived from several sources either through remote sensing technique (space-borne or air-borne survey) or from traditional methods (ground survey). DEMs are characterized by different precision and accuracy based DEM resolution. The use of different resolution of DEM are obviously effect the result of flood inundation models. Therefore, the aim of this paper is to carry out the impact of flood depth and water extent using original and resample DEM resolution of low-medium resolution (IFSAR DEM) and low resolution (SRTM DEM). From DEMs, four hydraulic data were extracted cross-section of a 3.5 km reach of the Padang Terap River in Kedah, Malaysia. The effect of different source of DEMs (and different resolution) and different cross-section interval was investigate by considering the performance of the hydraulic models in simulation flood water depth as well inundation maps by using one dimensional (1-D) HEC-RAS model. TerraSAR-X image and flood marks had been used to validate the result of inundated area and flood depths. The outcomes of this study show that, the use of different DEMs has serious implications to the result of hydraulic models. The outcomes also indicated that IFSAR DEM show better prediction in inundated area with value of F-statistic are increase 1.0 from 70% to 71% but not in flood depth with the value of MAE are slightly increase went resampling been made and for SRTM show loss of model accuracy due to resampling with the F-statistic of flood extend are decrease drastically with highest value different are 2.0 at cross-section 5 from 26.4 to 24.2 and the highest value different are 0.2 at cross-section 5 from 0.877 to 1.114 of MAE for flood depth. Moreover, the result for cross-section not give significant impact for flood extent but for flood depth it show that result are quite high different. Cross-section 50 m extract from IFSAR DEM show significantly presented good agreement between measure and predicted of water extend, water depth and water expansion with the value of F-statistic are 70.56%, value of MAE for water depth are 0.220 and value of RMSE for water expansion are 109.046 while the worse are at cross-section 100 with the value of F-statistic are 68.35%, value of MAE are for flood depth are 0.240 and value of RMSE are 158.355. While, for SRTM it show that cross-section are the best cross-section for flood modelling with the value of F-statistc are 26.40%, value of MAE for flood depth are 0.878 and value of RMSE for flood extension are 194.042 while the worse are cross-section 150 with the value of F-statistic are 23.59%, value of MAE for flood depth are 1.401 and value of RMSE for flood expansion are 216.049. By proposing the methodology, flood mapping can be provided accurately by considering the error exist in GIS spatial context.

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