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IMPACT OF FLOOD INUNDATION AFTER FLOOD DISASTER IN TANAH MERAH, KELANTAN

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IMPACT OF FLOOD INUNDATION AFTER FLOOD DISASTER IN TANAH MERAH, KELANTAN

BY

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A project report submitted to Faculty of Agriculture, Universiti Putra Malaysia, in fulfilled of requirement of PRT4999 (Final Year Project) for the award of degree of Bachelor of Agriculture Science.

Faculty of Agriculture
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FACULTY OF AGRICULTURE
UNIVERSITI PUTRA
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CERTIFICATION

This project report entitled " Impact of flood inundation after flood disaster in Tanah Merah, Kelantan" is prepared by Noor Janatun Maqwa Binti Jemali (170199) and submitted to the Faculty of Agriculture in fulfillment of the requirement of PRT 4999 (Final Year Project) for the award of the degree Bachelor of Agriculture Science.

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ABSTRACT

Over the past 30 years, floods have been the most tragic natural disaster affecting about 80 million people per year causing economic damage worth over USD11 million annually around the world. In December 2015, flooding in Kelantan has been classified as the worst in the history of the state. Conventional methods of assessing flood hazard are unable to provide quick, efficient and effective solutions. This study using ArcGIS to determine the differences of agriculture area of two consecutive dates that represent pre-flood and post-flood disaster. Images from Google Earth and agriculture map of Tanah Merah used as the raw data of this study. There were changes in area of agriculture landuse that shows that flood give impact for this type of area. Findings from this work will provide the necessary benchmark (especially in terms of agricultural land use) for a more comprehensive approach to manage the impact of flood disasters in the near future.

ABSTRAK

Sejak 30 tahun yang lalu, banjir telah bencana alam yang paling tragis yang melibatkan kira-kira 80 juta orang setiap tahun menyebabkan kerosakan ekonomi bernilai lebih USD 11 juta setiap tahun di seluruh dunia. Pada Disember 2015, banjir di Kelantan telah diklasifikasikan sebagai yang paling teruk dalam sejarah negeri tersebut. Kaedah konvensional menilai bahaya banjir tidak dapat menyediakan penyelesaian yang cepat, cekap dan berkesan. Kajian ini menggunakan ArcGIS untuk menentukan perbezaan kawasan pertanian dua tarikh berturut-turut yang mewakili pra-banjir dan selepas banjir bencana. Imej dari Google Earth dan peta pertanian Tanah Merah digunakan sebagai data mentah kajian ini. Terdapat perubahan di kawasan penggunaan tanah pertanian yang menunjukkan bahawa kesan memberi banjir untuk jenis kawasan. Hasil daripada kerja-kerja ini akan menyediakan penanda aras yang diperlukan (terutamanya dari segi penggunaan tanah pertanian) untuk pendekatan yang lebih menyeluruh untuk menguruskan kesan bencana banjir di masa akan datang.

Chapter 1

Introduction

1.1 Research study

Flood is one of the common natural disaster that attack most country in the world every year. Flooding is to a great degree perilous and can possibly wipe away a whole city, agriculture area, coastline or range, and reason broad harm to life and property. It additionally has magnificent erosive power and can be to an extraordinary degree ruinous, regardless of the possibility that it is a foot high.

Flood disaster happen almost every year in Malaysia (Mohit, 2013). It affects most states in East Malaysia. This flood is mainly caused by Northeast monsoon and heavy rain continuously. Northeast monsoon brings more rainfall compared to Southeast monsoon. This season is faced by Malaysia from November to March every year.

The worst flood disaster in history of Malaysia was on 17 December 2014 until 3 January 2015. The disaster involved Kelantan River Basin. Kelantan River is the major river in Kelantan. It is originated from Mount Ulu Sepat and flow into South China Sea. This river covered about 11 900 km^2 of catchment area with length of 248 km. During the flood water level of Kelantan River which has danger level of 25 meters had reached 34.17 meters. This is because the rainfall over the area range shifts between 0 mm in the dry season (March–May) became 1750 mm in the

monsoon season (November–January). The average runoff from the area is about 500 m^3/s. At least 21 died in the flood and 200,00 people are forced to evacuate their homes.

Flood disaster also affects agriculture area. Total agriculture area of Kelantan state is about 335 660 hectare. It covers 22.5% of total area of Kelantan. This agriculture area is generally divided into seven main categories of plants which are, rubber, oil palm, other industrial plantation, paddy, fruit crops, vegetable and other food crops. This study will briefly explain on the changes of agriculture land use due to flood inundation.

Figure 1 : Agriculture area that affected by flood disaster at Tanah Merah, Kelantan.

(Source : www.malaysiakini.com.my)

1.2 Problem statement

Over the past 30 years, floods have been the most catastrophic natural disaster affecting about 80 million people per year causing economic damage worth over USD11 million annually around the world (Dewan, 2015). Increasing human activity downstream and upstream of river systems results in greater flood damage in terms of size and frequency.

In Malaysia, the National Security Council (NSC) had classified the recent flooding events in Kelantan as the worst in the history of the state. Apparently, the water level of the Kelantan River at Tambatan Di Raja, which had a danger level of 25 m, reached 34.2 m in December of 2014 compared to 29.7 m in 2004 and 33.6 m in 1967. Two main reasons for the unprecedented flooding magnitude are (HO, 2007):

i) changing climatic patterns that cause adverse weather effects and

ii) uncontrolled land management and increased exploitation of land resources.

Conventional methods such as manual measurement of assessing flood hazard are unable to provide quick, efficient and effective solution. Geospatial tools such as remote sensing and geographical information system have been pursued as a viable means to manage flood hazard. This methods will help in assessing the flood severity of the agriculture land use in Kelantan generally and Tanah Merah specifically.

1.3 Objective & Hypothesis

Objective of this study is to assess the changes in agriculture land use after flood disaster at Tanah Merah, Kelantan

H_O : There is no change in area of agriculture land use in Tanah Merah Kelantan before and after flood inundation

H_A : There are changes in area of agriculture land use in Tanah Merah Kelantan before and after flood inundation

Reference

Alias, B., Mohd, M.S., Daud, D,. (2014). GIS Analysis for flood Hazard Mapping: Case Study; Segamat, Johor, West Malaysia.

Baharuddin, K.A., (2014). The Record-Setting Flood of 2014 in Kelantan: Challenges and Recommendations from an Emergency Medicine Perspective and Why the Medical Campus Stood Dry.

Campbell, J.B., (2002). Introduction to Remote Sensing.

Chau, V.N., Holland, J., Cassells, S., Tuohy, M., (2013). Using GIS to map impacts upon agriculture from extreme floods in Vietnam

Cruz, F.T., Narisma, T.G., Villafuerte, M.Q., Cheng-Chua, Olaguera, L.M., (2012). A climatological analysis of the southwest monsoon rainfall in the Philippines. Atmospheric Research, 122 : 609–616.

Dao, P.D., and Liou, Y.A., (2013). Object-Based Flood Mapping and Affected Rice Field Estimation with Landsat 8 OLI and MODIS Data.

Dewan, T.H., (2014). Societal impacts and vulnerability to floods in Bangladesh and Nepal.

El-Magd, I.A., Hermas, E.S., Bastawesy, M.E., (2010). GIS-modelling of the spatial variability of flash flood hazard in Abu Dabbab catchment, Red Sea Region, Egypt. The Egyptian Journal of Remote Sensing and Space Science 13 (1), 81-88.

FAO., (2003) Theoretical framework for land evaluation Geoderma, 72 , pp. 165–190

FAO, Rome

Foote, and Lynch, M., (1996). Geographic Information Systems as an Integrating Technology: Context, Concepts and Definition. Vol. 2. University of Texas, Austin, USA

.

Ghafari, A., Cook, H.F., Lee, H.C., (2000). Integrating climate, soil and crop information: a land suitability study using GIS. In: 4th International Conference on Integrating GIS andEnvironmental Modeling (GIS/EM4). Problems, Prospects and Research Needs, Banf, Alberta.

Haque, A., Jahan, S., (2015). Impact of flood disasters in Bangladesh: A multi-sector regional analysis.

Hassan, A.J., Ghani, A.B ., (2006). River and floodplain Modeling for the development of flood risk map: A case study of Sungai Selangor. Msc Thesis, Penang : Universiti Sains Malaysia.

Houborg, R., Soegaard, H., Boegh, E., (2007). Combining vegetation index and model inversion methods for the extraction of key vegetation biophysical parameters using Terra and Aqua MODIS reflectance data. Remote Sensing of Environment 106 (1), 39-58.

Huffman, G.J., Adler, R.F., Arkin, A., Chang, A., Ferraro, R., Gruber, A., Janowiak J., McNab, A., Rudolf, B., Schneider, U., (1997). The Global Precipitation Climatology Project (GPCP) combined precipitation dataset. Bulletin of the American Meteorological Society 78: 5–20.

Kawano, N., (2009). Flood disaster monitoring with ALOS/PALSAR observation.

Kerkhof, B.V.D., Persie, M.V., Noorbergen, H., (2015). Spatio-temporal Analysis of Remote Sensing and Field Measurements for Smart Farming. Procedia Environmental Sciences.Vol 27, 21–25.

Khairuddin, M.A., (2015, January 10) Harakah Daily. Bah Kuning: Jangan tuding jari salahkan Kelantan. Retrieved from from: http://www.harakahdaily.net.

Kripalani, R.H., Kulkarni, A., (1997). Rainfall variability over South?east Asia-connections with Indian monsoon and ENSO extremes: new perspectives.

Loo, Y.Y., Billa, L., Singh, A., (2014). Effect of climate change on seasonal monsoon in Asia and its impact on the variability of monsoon rainfall in Southeast Asia. Geoscience Frontiers. Vol 6, 817–823.

Lyn, B.S., (2015, January 15). East coast flood victims possibly more than half a million. The Malay Mail Online. Retrieved from http://www.themalaymailonline.com.

Lyon, J.G., Hutchinson, W.S,. (1995). Application of a radiometric model for evaluation of water depths and verification of results with airborne scanner data. Photogrammetric Engineering Remote Sensing 61:161–166.

Marcus, W.A., Marston, R.A., Colvard, J.R., Gray, R.D., (2002). Mapping the spatial and temporal distributions of large woody debris in rivers of the Greater Yellowstone Ecosystem, USA. Geomorphology (in press).

Mohit, M.A., (2013) Quality of Life in Natural and Built Environment – An Introductory Analysis, AMER (ABRA malaysia) International Conference on Quality of Life, AicQoL2013 Langkawi.

Murty, M., (2015, January 13) Wrong to blame logging as the main cause of floods in KelantanMalaysia. The Rakyat Post Retrieved from http://www.therakyatpost.com.

Portal Rasmi eBanjir Negeri Kelantan., (2015). Laporan Catatan Aras Air Tertinggi Mengikut Tempat. Retrieved from: http://ebanjir.kelantan.gov.my/p_parpt01.php

Rawat, J.S., Kumar, M., (2004). Monitoring land use/cover change using remote sensing and GIS techniques: A case study of Hawalbagh block, district Almora, Uttarakhand, India. The Egyptian Journal of Remote Sensing and Space Science. Vol 18 : 77–84.

Reuter, M., Andrea, K.K., Harzhauser, M., Kroh, A., Piller, W.E., (2012) Global warming and South Indian monsoon rainfall—lessons from the Mid-Miocene.

Sapa dpa, M., (2015, January 2015) One missing, thousands flee homes in flood-hit north-eastern Malaysia. The New Age. Retrieved from http://www.thenewage.com

Serreze, M.C., Barry, R.G., (2010) Climate change. Atmosphere, Weather and Climate, Routledge, Oxon.

Walsh, S.J., Butler, D.R., Malanson, G.P., (1998). An overview of scale, pattern, process relationships in geomorphology: a remote sensing and GIS perspective. Geomorphology 21, 183–205.

Wang, B., Xiang, B., Lee, J.Y., (2013). Subtropical high predictability establishes a promising way for monsoon and tropical storm predictions. Proceedings of the National Academy of Science of the United States of America, 110 : 2718–2722.

Warrant, G.W.M., Whittaker, G.W., Gary, M. B., Stephen, M.G., Bradley, L.B., (2015). Methods for improving accuracy and extending results beyond periods covered by traditional ground-truth in remote sensing classification of a complex landscape. Int. J. Applied Earth Observation and Geoinformation 38: 115-128 .