UNIVERSITI TEKNOLOGI MARA

INTEGRATION OF REMOTELY SENSED DATA AND GIS IN NRCS MODEL

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Candidate's Declaration

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

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ABSTRACT

Rapid and massive (NRCS) was able to calculate the prediction of runoff. The aim of this study is to introduce the capability of remotely sensed data and Geographic Information System (GIS) for NRCS model in Klang River catchments and to overcome the gap for lack of integrated method between GIS application and hydrological model. The first objective of this study is to prepare the landuse information by following the Hydrological Soils Group (HSG) table within catchments' boundary from satellite imagery as main source. Second, this study aims to combine landuse information and soil classifications to form HSG table through an identified Curve Number (CN) for each intersection in ArcView software. Finally, this study aims to generate runoff value and compute validation with observed data. This study uses Landsat Thematic Mapper (TM) that is able to oversee big areas and could lessen the cost for obtaining landuse information. The research involves three stages of analysis. First, remote sensing technique was used to extract preliminary data. Second, two phases of GIS was involved which are accumulating and programming phase. The third stage that is involved in the research methodology is the validation stage of using SNT model in GIS. In remote sensing technique, 84% of accuracy assessment was obtained with 0.8 kappa value using data processed in 2001 by Landsat TM images. With that achievement, landuse map that contained waterbody, urban, forest, open area and disturbed/transitional area from Landsat TM that represent Klang River catchment was derived. GIS has successfully developed a simulation of NRCS model and graph. Validation stage was done by comparing the simulation of NRCS model from GIS with Observed Unit Hydrograph (OUH). Through validation stage, the SNT model only has an acceptable value of 6% error from the application of 2001 data compared to 12% error from application of 1991 data. Findings from this study have shown that satellite imagery such as Landsat TM are able to provide essential information for hydrology study. The simulation of NRCS model is suitable for monitoring runoff peak of catchment areas.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The application of hydrological models to physical flow is a powerful tool and capability for various purposes, but the actual applicability of the any said models to any catchment must be known before a model can be used appropriately. One of the hydrological models is the Natural Resource Conservation Services or NRCS. It is one of the oldest and widely used all over the world. This model created by the United State Soil Conservation Service, division of the USDA (United State Department of Agriculture) which developed equations and conducting experiments to determine reliable models for predicting peak discharge from storm events. It is used to approximate the total amount of rainfall which then becomes surface runoff (Gandini and Usunoff, 2004). Most the time, this model depends on Curve Number (CN) value that is related to landuse and soils type information in selected catchments. CN value describes the capability of soil based on landuse either to convene or channel the water. In this model, soils are explained in simple terms based on hydrology parameter such as absorption rate, soil texture and range of slope through the conduction of geomatic field.

Studies in runoff using the NRCS model applied landuse information as the main effect that influences the runoff process. Landuse refers to urbanization process and maintaining the green areas. Urbanization is reflected by road and variety of buildings like residence and industry. A great change in landuse due to urbanization leads more towards soil erosion and at the same time increases the possibility of flooding. This circumstances has an opposite condition with green area such as the forest. The growth