A STUDY ON SEDIMENT LOAD AT KERTEH RIVER CATCHMENT AREA USING AVSWAT

SHANGIREYV A/P VENUGOPAL

FACULTY OF MARITIME STUDIES AND MARINE SCIENCE
UNIVERSITI MALAYSIA TERENGGANU

2012

A study on sediment load at Kerteh river catchment area using AVSWAT / Shangireyv Venugopal.

A STUDY ON SEDIMENT LOAD AT KERTEH RIVER CATCHMENT AREA USING AVSWAT.

By

SHANGIREYV A/P VENUGOPAL

Research Report submitted in partial fulfilment of
the requirement for the degree of
Bachelor of Science (Marine Science)

Department of Marine Science

Faculty Of Maritime Studies And Marine Science

UNIVERSITY MALAYSIA TERENGGANU

2012

This project report should be cited as:

Shangireyv, V. 2012. A Study on Sediment Load at Kerteh River Catchment Area using AVSWAT. Undergraduate thesis, Bachelor of Science in Marine Science, Faculty of Maritime Studies and Marine Science, Universiti Malaysia Terengganu, Terengganu.58p.

DEPARTMENT OF MARINE SCIENCE
FACULTY OF MARITIME STUDIES AND MARINE SCIENCE
UNIVERSITI MALAYSIA TERENGGANU

DECLARATION AND VERIFICATION FORM

FINAL YEAR RESEARCH PROJECT

It is hereby declared and verified that this research report entitled:

A Study On Sediment Load at Kerteh River Catchment Area Using AVSWAT by **SHANGIREYV A/P VENUGOPAL**, Matric No. **UK 20954** has been examined and all errors identified have been corrected. This report is submitted to the Department of Marine Science as partial fulfillment towards obtaining the Degree of **Bachelor of Science (Marine Science)**, Faculty of Maritime Studies and Marine Science, Universiti Malaysia Terengganu.

Verified by:

.....

Principal Supervisor

Name: DR.RAZAK ZAKARIYA

Official stamp: DR RAZAK BIN ZAKARIYA
TIMBALAN DEKAN (SISWAZAH & PENYELIDIKAN)
FAKULTI PENGAJIAN MARITIM DAN SAINS MARIN
UNIVERSITY MALAYSIA TERENGGANU (UMT)
21030 KUALA TERENGGANU

Date: 17/6/2012

.....

Head of Department of Marine Science

Name: Prof. Madya Dr. Rosnan Yaacob

Official stamp: PROF. MADYA DR. ROSNAN BIN YAACOB
Ketua
Jabatan Sains Marin
Fakulti Pengajian Maritim dan Sains Marin
Universiti Malaysia Terengganu
21030 Kuala Terengganu

Date: 20/6/2012

Acknowledgement

First and foremost, I would like to express my sincere gratitude and appreciation to my Project supervisor Dr. Razak Zakariya for all the advices and guidance given throughout the year in assisting me to complete my project successfully.

Next, I would like to thank all the staffs in the Remote Sensing and GIS laboratory for their cooperation and also guidance while doing my final year project. I also would like thank Mr.Taufiq Bin. Abu Bakar for helping me in teaching and sharing the knowledge of Remote Sensing and GIS in order to complete my final year project.

Besides that, my gratitude also goes to Malaysia Center for Remote Sensing (MACRES), Department of Drainage and Irrigation of Malaysia (DID), Malaysia Department of Agriculture (DOA), Malaysia Meteorological Department (MMD), Malaysia Department of Survey and Mapping and Institute of Oceanography Universiti Malaysia Terengganu for their cooperation and support on materials and data.

Next, I also would like to take this opportunity to thank my team member Miss. Amirah binti Ruslan for her cooperation and help during sampling and also in the laboratory. Last but not least, my sincere gratitude to my beloved family for their care and support. Especially, I would like thank my parents for giving me full encouragement and also keep faith on me to achieve my goals.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

%	- Percentages
^{0}C	- Degree celcius
µm	- micrometer
AVSWAT	- Arc View Soil and Water Assessment Tool
DEM	- Digital Elevation Model
E	- East
FRST	- Forest
g	- Gram
GIS	- Geographical information System
GPS	- Global Positioning System
HRU	- Hydrology Respond Unit
km	- kilometer
mg/L	- milligrams per liter
mm	- millimeter
m/s	- meter per second
MJ/m2/day	- Megajoule per square meter per day
N	- North
ORCH	- Orchard
.shp.	- Shape file
R^2	- Correlation Coefficient
SSC	- Suspended Sediment Concentration

SWAT	- Soil Water and Assessment Tool
TSS	- Total Suspended Solid
URMD	- Residential-medium density
USDA	- United State Department of Agriculture
USGS	- United States Geological Survey
WATR	- Water

LIST OF APPENDICES

ABSTRACT

The study on sediment load was conducted at Kerteh River catchment area. The study site was chosen due to the rapid development of Kerteh along with the increase in the population. In general, the study consists of two main parts which was the ground sampling and using GIS technology (AVSWAT) to create watershed model to predict the sediment load in the study area. During ground sampling, water samples collected from station 1 and station 2 for suspended sediment concentration (SSC) analysis which was conducted in the laboratory using SSC method. Besides that, the land use activities in the study area was also recorded to be later used in the AVSWAT simulation. For AVSWAT simulation, input of Digital Elevation Model, land cover data, stream network data, soil data, weather data and precipitation data were loaded into the AVSWAT database. The simulation results of sediment load compared with SSC results obtained from ground sampling to enable AVSWAT to simulate an accurate and reliable data of sediment load in the study area. The analysis used to determine the relationship between SSC and simulation of suspended sediment load by AVSWAT in station 1 and station 2 was correlation coefficient. The correlation coefficient analysis shows a strong relationship between SSC data from ground sampling and simulation data of sediment load by AVSWAT for both stations. This is because the R^2 value for station 1 was 0.906 and for station 2 was 0.922. The AVSWAT was also predicted the sediment load for next 20 years in the Kerteh River catchment area which was from 2013 until 2032 and the sediment load value ranges from 673000 metric tonne per year and 1893000 metric tonne per year.

In overall, the study on sediment load using AVSWAT is applicable for catchment area and also for future prediction. Besides, it is also easier and economic if compare with ground sampling which will take a longer period of time.

Kajian Terhadap Jumlah Hasil Sedimen Yang Berada Pada Kawasan Tadahan Kerteh Dengan Menggunakan AVSWAT.

ABSTRAK

Kajian terhadap jumlah hasil sedimen dijalankan di kawasan tadahan Kerteh. Kawasan tadahan Kerteh dipilih sebagai kawasan kajian kerana perkembangan pesat yang diikuti oleh peningkatan penduduk di kawasan tersebut. Secara umum, kajian dijalankan secara dua bahagian utama iaitu kaedah sampling dan kaedah simulasi AVSWAT. Dalam kaedah sampling, sampel air sungai diambil dari station 1 dan station 2 untuk mengkaji kepekatan sedimen terapung (SSC) di makmal dengan menggunakan kaedah SSC. Selain daripada itu, penggunaan tanah di kawasan tadahan Kerteh juga dicatatkan untuk digunakan dalam AVSWAT. Dalam simulasi AVSWAT, data DEM, data penggunaan tanah, data rangkaian aliran sungai Kerteh, data tanah dan data cuaca telah dimasukkan ke dalam AVSWAT untuk disimulasi dan memberi keputusan untuk jumlah hasil sedimen yang ada di kawasan kajian. Keputusan SSC dibandingkan dengan keputusan simulasi supaya AVSWAT memberi data yang lebih tepat. Pekali kolerasi digunakan untuk kajian ini bagi mendapatkan hubungan antara data SSC dengan data simulasi iaitu jumlah hasil sedimen di station 1 dan station 2. Pekali kolerasi menunjukkan hubungan yang kuat diantara data SSC dan data simulasi bagi station 1 dan station 2 iaitu nilai R^2 di station 1 0.906 dan di station 2 0.922.

Seterusnya, ramalan untuk jumlah hasil sedimen di kawasn tadahan Kerteh dibuat dari tahun 2013 sehinnga 2032 dan jangkaan menunjukkan jumlah hasil sedimen berada dalam lingkungan 673000 metrik tan dan 1893000 metrik tan. Secara keseluruhan, AVSWAT adalah sangat sesuai untuk digunakan dalam kajian jumalah hasil sedimen di kawasan tadahan dan juga untuk ramalan pada masa depan. Ini kerana AVSWAT merupakan satu cara yang mudah dan ekonomi jika dibandingkan dengan kaedah sampling yang mengambil masa yang lama untuk mengumpul data dan mendapat keputusan.