IMPACT OF LAND USE CHANGE ON STREAMFLOW IN THE KELANTAN RIVER BASIN, MALAYSIA

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OVERVIEW

- Introduction
- Study Area
- Objectives
- Land Use Change Analysis
- SWAT Modelling

INTRODUCTION

- Floods in Malaysia are regular natural disasters due to the monsoon season.
- Malaysia's geographical location that experienced cyclical monsoons during the local tropical wet season that are characterized by heavy and regular rainfall from October to March annually.
- However, in some urban area, floods occurred may result by inadequate drainage systems.
- Thus, studying the impact of land use change towards streamflow in Malaysia is somewhat important to further identify the major cause of floods.

Source: The Star Online on 21 Oct 2019, flash flood at Jalan Segambut, Kuala Lumpur.

STUDY AREA

Kelantan River Basin

Location: north-east part of Peninsular Malaysia

Main River Length: 248 km

Latitude: 4° 40’ and 6° 12’ to the North

Longitude: 101° 20’ and 102° 20’ to the East

Surface Area: 12685 km², occupies 85% of the whole Kelantan state

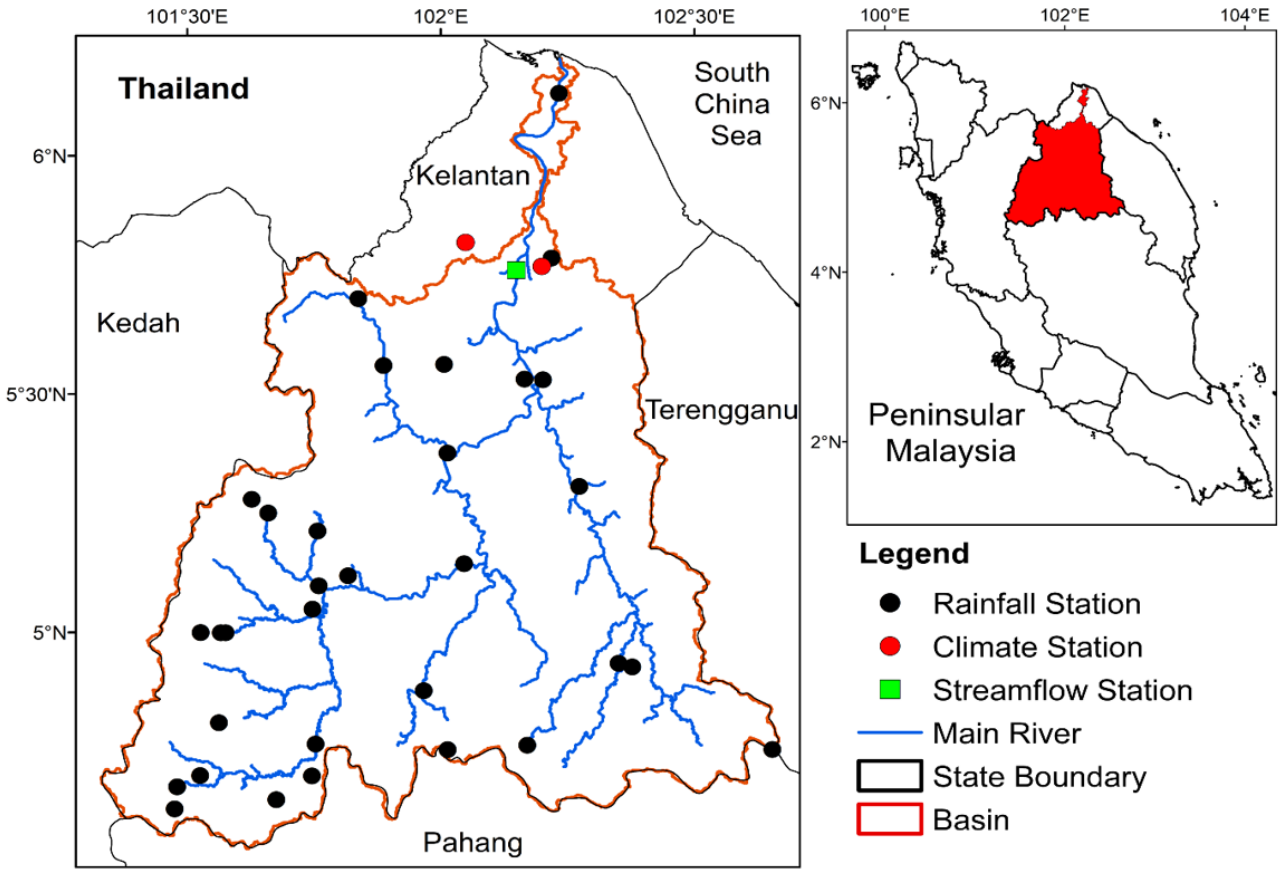
Elevation: 8 – 2174 meters

Rainfall: 2100 – 4000 mm

Temperature: 20 – 35 °C

Population: ≈ 2 million

Land Cover Types: virgin forest, rubber, paddy, oil palm, agriculture activities, and urban



OBJECTIVES

Understanding of the impact of land use and land cover changes on streamflow is important for water engineers, town planners and local authorities to make better decision in their planning and management.

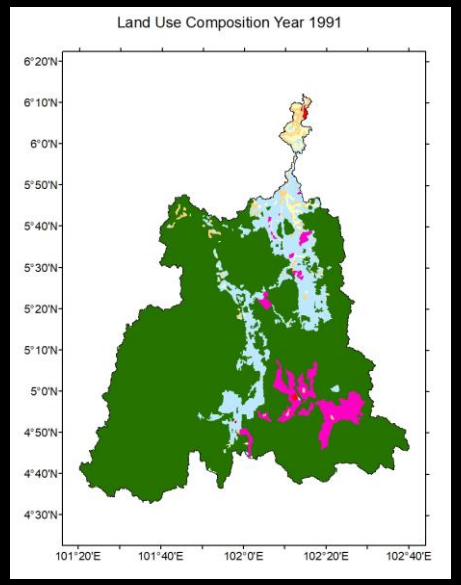
The objectives of this study are:

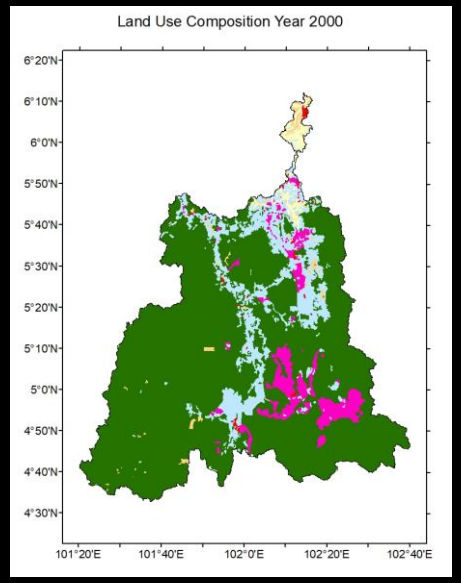
I. To identify the land use and land cover changes took place in the Kelantan River Basin, Malaysia.

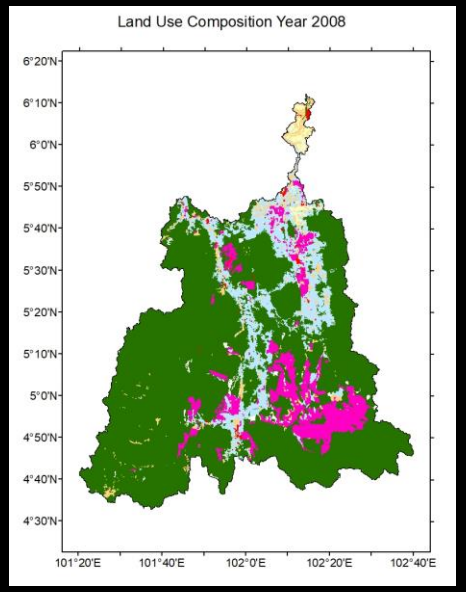
II. To study the impact of land use change on streamflow in the Kelantan River Basin, Malaysia using SWAT models.

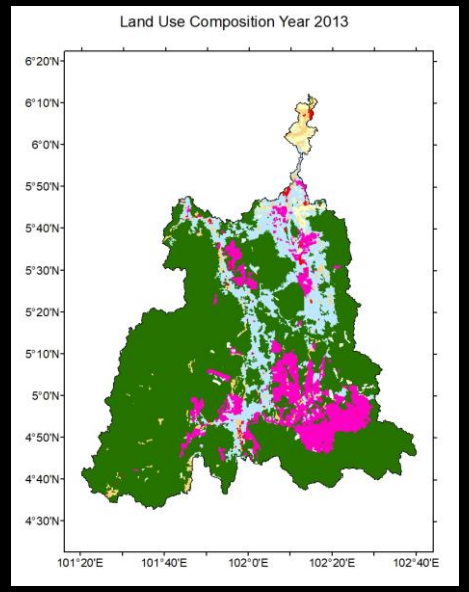
Land Use Change Analysis

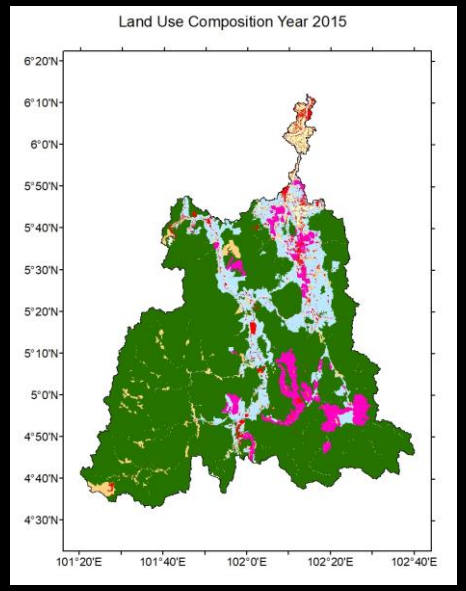
- Land use and land cover maps of the Kelantan state of years 1991, 2000, 2008, 2013, 2015 and 2018 were prepared by digitizing the existing land use maps, applying from the government geospatial infrastructure agency and through remote sensing means of classifying the satellite imagery.
- These ready to use land use data are then subset into Kelantan River basin extent to be inserted into the SWAT model.
- The land use and land cover class of the actual land use is then generalized into the land use types as per tabulated in SWAT model.
- The statistics of the land use and land cover class of the Kelantan River Basin are as tabulated in the table in the nest page.

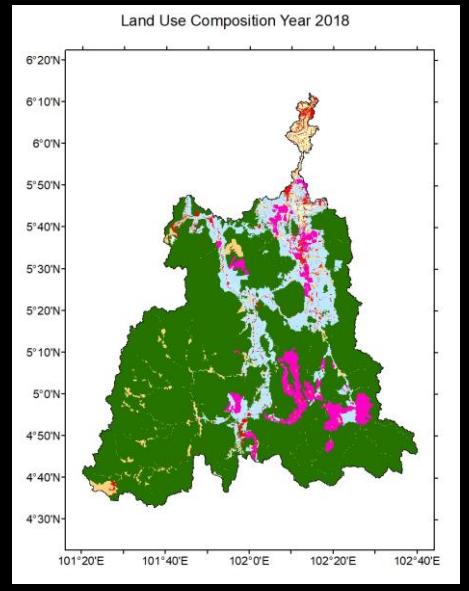








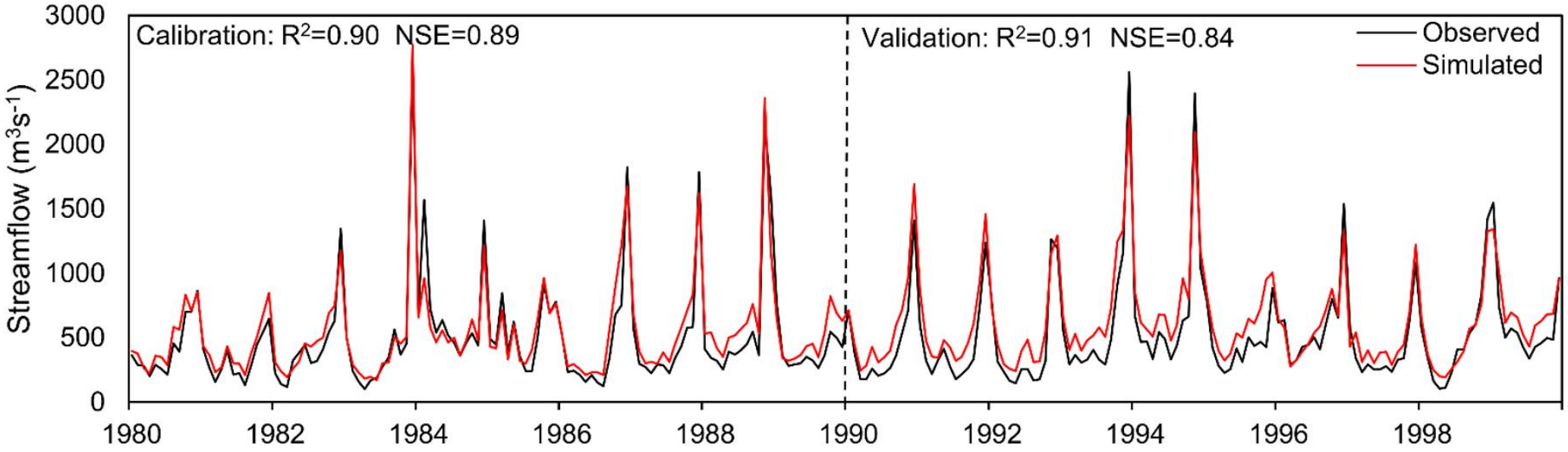




Land Use Maps of Kelantan River Basin

Land Use Change Analysis

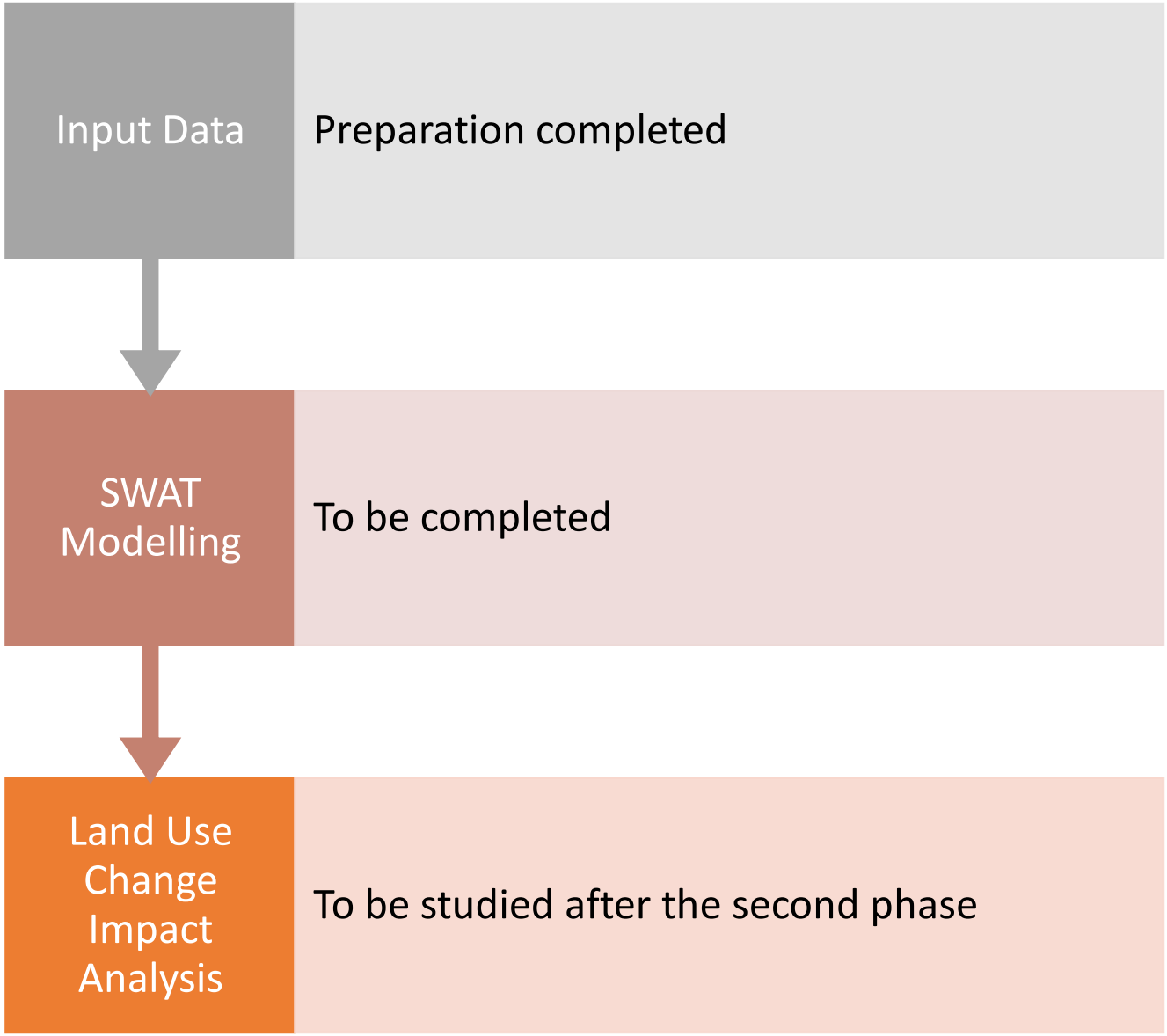
YEAR	Built Up	Forest	Oil Palm	Other Agriculture	Paddy	Rubber	Water Bodies
1991	0.14%	81.67%	4.31%	1.37%	1.06%	11.19%	0.26%
2000	0.36%	78.19%	5.74%	1.20%	1.38%	12.98%	0.15%
2008	0.47%	72.88%	9.45%	3.43%	0.88%	12.19%	0.70%
2013	0.61%	70.45%	11.10%	2.64%	1.27%	13.33%	0.60%
2015	2.17%	75.03%	5.16%	3.18%	0.70%	12.49%	1.27%
2018	2.18%	74.90%	5.23%	3.20%	0.72%	12.60%	1.17%



SWAT Calibration and Validation

SWAT has been successfully applied in KRB (i.e. Tan et al., 2017, 2018), hence the well-defined parameters ranges were directly applied in the calibration and validation. SWAT performed well in monthly streamflow simulations, with the R^2 and NSE values of 0.91 and 0.84 during the validation period (1990-1998).

SWAT Modelling



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THANK YOU