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.

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

- **Input Data**: Preparation completed
- **SWAT Modelling**: To be completed
- **Land Use Change Impact Analysis**: To be studied after the second phase


• Mineral and Geoscience Department Malaysia (MGM) (2009). Hydrogeological map of the Kelantan River Basin. Scale 1:250,000


THANK YOU