

*Original Research*

# Landsat-5 Time Series Analysis for Land Use/Land Cover Change Detection Using NDVI and Semi-Supervised Classification Techniques

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## Abstract

Rapid urbanization and the risk of climatic variations, including a rise in temperature and increased rainfall, have urged research in the development of methods and techniques to monitor the modification of land use/land cover (LULC). This study employed the normalized differencing vegetative index (NDVI) and semi-supervised image classification (SSIC) integrated with high-resolution Google Earth images of the Kuantan River Basin (KRB) in Malaysia. The Landsat-5 (TM) images for the years 1993, 1999, and 2010 were selected. The results from both classifications provided a consistent accuracy of assessment with a reasonable level of agreement. However, SSIC was found to be more precise than NDVI. Overall accuracy was 82% for 1993 and 1999, and 80% for 2010, with the kappa values ranging from 0.789 to 0.761. Meanwhile, NDVI accuracy was attained at 64% with kappa value at 0.527 for 1999. In addition, 70% and 72% accuracy were obtained for 1993 and 2010 with estimated kappa values of 0.651 and 0.672, respectively. The study is anticipated to assist decision makers for better emergency response and sustainable land development action plans, thus mitigating the challenges of rapid urban growth.

**Keywords:** LULC, Landsat-5, NDVI, SSIC, Kuantan

## Introduction

The spatial and temporal changes in land use/land cover (LULC) have proceeded rapidly as a result of increased urban populations and anthropogenic activities.

The modification of LULC and the interaction of humans and the environment have caused variability of dynamic changes to the environment and climate [1]. Several flood plains and river deltaic regions are highly vulnerable to flooding due to rapid urbanization and the threat of changed climatic events such as temperature rise, wind storms, and heavy precipitation [2]. Therefore, it is required to monitor the modification of LULC under

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