

Application of Remote Sensing in Mangroves at the Surrounding of Sungai Selangor Estuary in Kuala Selangor

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ABSTRACT

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The mangrove forest ecosystem protects the land area from the tidal wave hence preventing the coastal areas and properties from severe damage. Mangroves provide valuable ecological services and goods, sediment retention, food sources of some animals, and stabilisation of the coastal areas. Unfortunately, the species have been experiencing an extensive loss in many parts of the world. This paper aims to detect the changes in mangrove forests and possible changes in the Selangor river basin area. The methodology uses remote sensing data via supervised classification on maximum likelihood algorithm to analyse the distribution of mangrove forests at the Selangor River basin for a thirty two-year period, from 1989 to 2021. The findings indicate that the percentage of mangroves in the study area has reduced over the study period. The coverage of mangroves has reduced from 24.29 percent (1989) to 15.57 percent in 2008, and continued to reduce to 13.12 percent in 2021. The research finding indicates a decrease in mangroves due to aquaculture, tourism, agriculture, and other human activities. Such a trend may risk coastal and river erosion, thus necessitating a revision of the management policies for environmental protection.

Keywords: mangrove, forest, remote sensing, Selangor river basin

INTRODUCTION

Mangroves are woody trees and large shrubs that emerge within the land and sea surface in tropical and subtropical areas. Mangrove forests are sheltered along with the coasts and estuaries complexes in the tropical and subtropical region. The type of species includes *Rhizophora*, *Avicennia*, *Bruguiera*, *Sonneratia* and *Xylocarpus* sp. in species-specific belts, depending on soil and inundation patterns (FAO, 1981). Acting as a natural filter, mangroves improve water quality by providing shelter for various aquatic life forms and acting as a significant carbon sink in the coastal ecosystem (Omar et al., 2018). Mangrove forests grow near large rivers that provide a lot of sediment from sand and mud. The Forestry Department Peninsular Malaysia, Forestry Department Sabah, and Forest Department of Sarawak reported that until 2008, the total forested area in Malaysia amounted to 19.52 million ha or about 59.5 percent of the total land area (Omar et al., 2012). The *World Atlas of Mangroves* estimates the global area of mangroves during 2000–2001 to be 152,361 km².

Several analyses have been performed on the mangrove forests in the local areas. Amran et al. (2020) found that the mangrove forests at Kuala Selangor Nature Park have become less or unhealthy in 2018. The study also notes that the distribution density of mangrove forests at Kuala Selangor Nature Park has changed over a year, leading towards deforestation. The rate of mangrove deforestation was about 0.1% per year between 1990 and 2017, and the changes were mainly located outside the Permanent Forest Reserve (Omar et al., 2018). However, in Tumpat, Satyanarayana (2011) discovered that the mangroves near the River Kelantan Delta have experienced significant changes as a result of human activity in 2006. Although the mangroves at Tumpat had a wide deltaic habitat with the size of 1200 hectares, they occupied only 339.6 hectares in that respective year (Mohd-Azhar, 2008, in