UNIVERSITI TEKNOLOGI MARA

MONITORING OF MANGROVE AREA USING REMOTE SENSING TECHNIQUE TOWARD SHORELINE EROSION PROTECTION

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Thesis submitted in fulfilment of the requirements
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Candidate's Declaration

I declare that the work in this thesis was carried out in accordance with the regulations of University Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

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Abstract

Shoreline is particularly vulnerable to wave action resulting in coastal erosion. As shoreline erosion continues, more and more topsoil is drawn into the coastal areas, threatening aquatic life and eventually leading to the need for costly removal or dredging. Several preventive measures such as the use of breakwaters, geotubes, and groynes have been suggested that will provide benefits to the community, and led to a decrease in coastal erosion. The other option is to protect the shoreline by using natural vegetation resources such as mangrove forest. Previous research has found that mangrove can reduce shoreline erosion and protect shoreline against sea storms and floods. Remote sensing as a tool provides valuable information for mapping vegetation and monitoring of mangrove changes along the coastal areas. It can also provide up-to-date valuable information to monitor changes along shorelines. In this research remote sensing technology using Landsat 7 ETM+ and ERDAS Imagine version 8.6 and band combination 5,4,3 that are classified image of red, green and blue was utilized in detecting changes in mangrove areas from Tanjung Piai to Kukup Island within a ten year period. Three datasets images of 1995, 2000, and 2005 were overlayed to monitor the changes within the three training sites include Tanjung Piai, along the coastal area and Kukup Island of mangrove areas. Changes of the three datasets were performed by an image differencing process to detect the changes. The changes were analyzed based on three input raster data of 1995 and 2000, 1995 and 2005, 2000 and 2005. This was followed by ground truthing to enable the calibration of remote-sensing data, and aids in the interpretation and analysis of the data. The analysis of the overlay maps showed the changes in mangrove acreage. From the total original acreage of 890.28 hectares in 1995 the mangrove area has decreased to 761.40 hectares in 2005, a decrease of 128.88 hectares or 14 percent. To mitigate it is recommended that both the natural and man-made structures are combined together. Species such as *Rhizophora apiculata* (Bakau Minyak), *Rhizophora mucronata* (Bakau Kurap) and *Sonneratia* (Perepat) found along the shoreline was observed to be able to serve as a buffer against the destruction of wave action, wind and tide. However, mangrove trees which are at the front of the big wave energy will not be able to withstand the incessant assault.

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CHAPTER 1

INTRODUCTION

1.0 Background

Shoreline erosion is a natural process that affects all coastal areas with the shoreline moving as part of normal coastal behaviour (Figure 1.1). Shoreline is a boundary line between land and water. Typical causes of shoreline erosion include: change in sediment supply, wave processes or sea level change over a range of time scales windborne sediment transport, formation of updrift littoral barriers (e.g. through a rock fall) loss of headland control (e.g. through erosion of that feature), scouring of beach by storm water discharges and loss of vegetation (Auckland Regional Council, 2006). As shoreline erosion continues, more and more topsoil is drawn into the coastal areas, threatening aquatic life and eventually leading to the need for costly removal or dredging (Figure 1.2).

Figure 1.1: **Shoreline erosion**

Figure 1.2: **Shoreline eroded**

Shoreline erosion is often attributed to storm events and in particular to high wave energy, strong on-shore winds and heavy rainfall coincide with a high tide. Shoreline is particularly vulnerable to wind induced wave action and the implications of