

Land Cover Change Detection for Dzalanyama Forest Reserve, Lilongwe, Malawi

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(1) Introduction: Dzalanyama Forest Reserve is one of the most threatened natural ecological systems in Malawi due to tobacco curing, brick burning, firewood and charcoal selling that has intensified in the rural environment surrounding it. This results in part from increased poverty levels of the rural population and urban-sprawl.

(2) Objective: With degradation resulting from human pressures on the forest reserve exceeding its regenerative capacity, it is important to quantify the forest loss. Using multi-temporal satellite images, this paper is aimed at determining the land use/cover changes of the Dzalanyama Forest Reserve. This takes advantage of remotely sensed imageries in detecting major land use/cover changes.

(3) Methodology: 2-scene satellite images obtained from Landsat, for the years 1990 and 2000, and ALOS for 2008 were acquired. ERDAS Imagine 9.1 software was then used to mosaic the images. The images were then subset to local Traditional Authority boundaries of Masumbankhunda, Masula and Chiseka that surround the reserve. The fuzziness of the area made it difficult to obtain straight training samples; instead an unsupervised classification was run on 100 classes. These signature classes were merged manually into four classes that were used in a supervised classification. A seven-by-seven fuzzy convolution window was then run three times to smoothen the output. Accuracy assessment used a set of hundred randomly generated spatial points.

(4) Results: Figure 1 shows the four land use categories for the years 1990, 2000 and 2008. While accuracy assessment for 1990 and 2000 is still pending, that of 2008 is 81% ($K=0.7014$). Owing to the fuzzy nature of the landscape this kappa value suffices for this

analysis. Figure 2 identifies the land use/cover changes over the years. Over the years grasslands have penetrated the forest area significantly. For 2008, there is a sharp rise in forest cover especially around the water body area, though there is significant loss in the reserve area (see Figure 1).

(5) Conclusion: The land use/cover changes for the area have been identified using remote sensing. The trend suggests a dynamic population behavior as evidenced by the continued forest loss in the reserve area over the years and a gain elsewhere for 2008.

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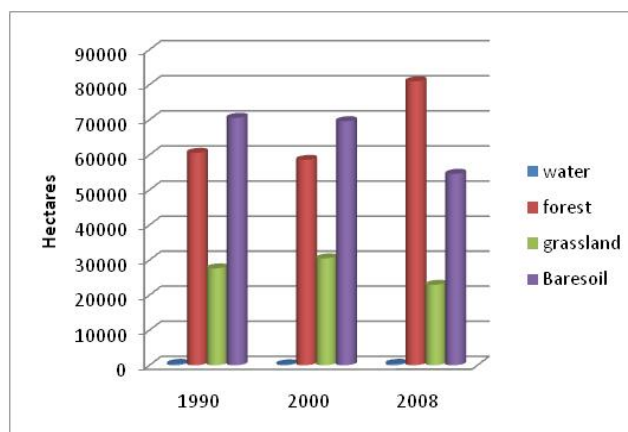


Figure 2: Land use change detection

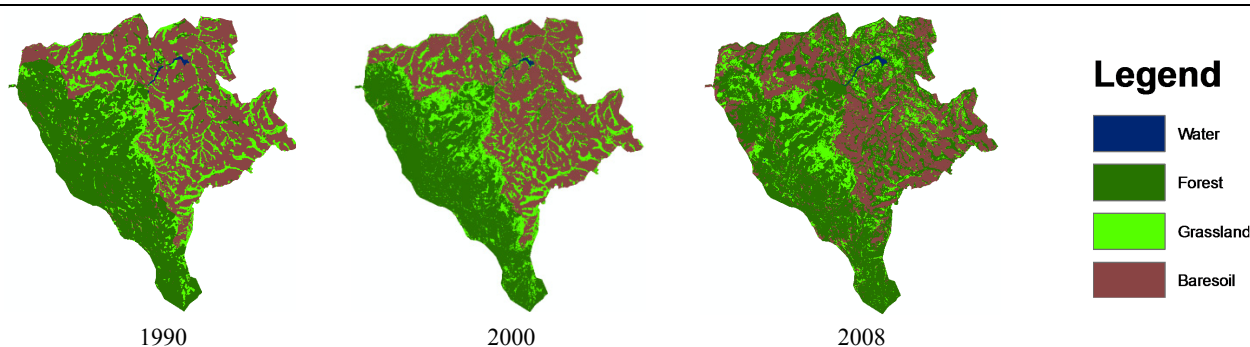


Figure 1: Land use/cover maps for Dzalanyama Forest Reserve area.