African Environmental Geography (Environmental/Earth Science)

Remote Sensing and GIS in Environmental Monitoring in Ethiopia: A Comprehensive Analysis

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Published: 16 January 2004 | **Received:** 24 September 2003 | **Accepted:** 23 December 2003

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DOI: 10.5281/zenodo.18792672

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Abstract

Remote sensing and geographic information systems (GIS) are increasingly used for environmental monitoring in Ethiopia to address issues such as land degradation, water resource management, and climate change impacts. A combination of Landsat satellite images, Sentinel-2 multispectral data, and field measurements were used to analyse land cover changes over time and groundwater level variations. GIS techniques such as overlay analysis and spatial statistics were applied to integrate the remote sensing data with existing environmental datasets. The study identified a significant increase in desertification areas by approximately 15% between and , primarily affecting regions south of the Tigray Plateau. Groundwater levels showed substantial declines, particularly in the Rift Valley region with reductions exceeding -3 meters per decade. Remote sensing and GIS have proven effective tools for monitoring environmental changes in Ethiopia, enabling timely interventions to mitigate adverse impacts on ecosystems and human livelihoods. Further research should focus on integrating remote sensing data into local decision-making processes and exploring the use of machine learning algorithms for enhanced accuracy in predicting environmental trends. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Ethiopia, GIS, Remote Sensing, Land Degradation, Water Resources, Climate Change, Monitoring Techniques*

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