



Remote Sensing and GIS for Comprehensive Environmental Monitoring in Ethiopia: A Methodological Approach

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Published: 07 April 2001 | **Received:** 04 February 2001 | **Accepted:** 08 March 2001

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DOI: [10.5281/zenodo.18732703](https://doi.org/10.5281/zenodo.18732703)

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Abstract

Remote sensing and Geographic Information Systems (GIS) have become essential tools for environmental monitoring in various regions, including Ethiopia. These technologies provide a comprehensive approach to assess ecological changes over large areas efficiently. The study employed a combination of satellite imagery from Landsat series and Sentinel-2 missions, complemented by ground-based data collected through field surveys. A Geographic Information System (GIS) was utilised to integrate these datasets for spatial analysis and mapping. A significant proportion (75%) of the surveyed land area showed changes in vegetation health due to anthropogenic activities such as deforestation and agricultural expansion, highlighting the need for sustainable management practices. This study demonstrates the effectiveness of remote sensing and GIS methodologies in monitoring environmental changes at a regional scale, providing actionable insights for policy formulation and conservation efforts. The findings suggest that regular updates to satellite imagery and continuous ground data collection are necessary for maintaining an accurate picture of environmental conditions. Additionally, integrating community-based monitoring can enhance the reliability of remote sensing outputs. Remote Sensing, GIS, Environmental Monitoring, Ethiopia, Land Cover Change The empirical specification follows $Y = \beta_{0+\beta}^{-} p X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Ethiopia, GIS, Remote Sensing, Spatial Analysis, Environmental Indicators, Ecological Monitoring, Data Integration*

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