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Estimating land cover change area using high spatiotemporal resolution land cover products: case study of Uganda.

Anthropogenic activities within the Agriculture, Forestry and Other Land Use (AFOLU) sector represent a major driver of greenhouse gas (GHG) emissions and a critical factor in global climate change. Accurate, transparent, and consistent monitoring of land use and land cover (LULC) dynamics is therefore essential to support climate mitigation frameworks such as the Paris Agreement (PA), the United Nations Framework Convention on Climate Change (UNFCCC), and Land Degradation Neutrality (LDN) targets under Sustainable Development Goal (SDG) 15.3. Despite global efforts to harmonize National Greenhouse Gas Inventories (NGHGIs), significant discrepancies persist across countries, primarily due to inconsistent methodologies and limited access to reliable land cover data. Recent advancements in cloud computing and remote sensing, particularly the emergence of high-resolution Global Land Cover
(GLC) products, present a promising opportunity to enhance AFOLU-related monitoring and reporting. However, these datasets—derived from distinct classification algorithms—require systematic evaluation to determine their suitability for national-scale applications and uncertainty quantification.
This study presents a methodological framework for evaluating two open-access 10 m-resolution GLC products, Dynamic World (DW) and Esri LULC, for national-scale LULC change detection in Uganda from 2019 to 2023. Uganda serves as a representative case study among African nations, where the AFOLU sector contributes substantially (76% in 2019) to total GHG emissions. The research develops a statistically robust reference dataset and applies IPCC-compliant sampling and estimation methods to assess the accuracy, consistency, and usability of the two products for AFOLU and LDN reporting. Comparative analysis highlights key LULC transitions relevant to emission accounting, including forest loss, cropland expansion, and settlement growth. The findings demonstrate the potential of high spatiotemporal GLC products to strengthen AFOLU emission reporting, enhance transparency under the UNFCCC, and support sustainable land management in data-scarce developing countries.

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