Future Land-use Changes in the transboundary Sio-Malaba-Malakisi Basin of East Africa: Simulations using the CLUE-S model and Classified Satellite Land Cover Datasets

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Abstract

A comprehensive undertanding of land-use/cover(LUC) change processes, their trends and future trajectories is essential for the development of sustainable land-use management plans. While contemporay tools can today be employed to monitor historical land-cover changes, prediction of future change trajectories in most rural agro-ecological landscapes remains a challenge. This study evaluated potential LUC changes in the transboundary Sio-Malaba-Malakisi River Basin of Kenya and Uganda for the period 2017-2047. The land use change drivers were obtained through a rigorous fieldwork procedure and the Logistic Regression Model (LGM) to establish key factors for the simulation. The CLUE-S model was subsequently adapted to explore future LUC change trajectories under different scenarios. The model was validated using historical land cover maps for the period of 2008 and 2017, producing overall accuracy result of 85.7% and a Kappa coefficient of 0.78. The spatial distribution of vegetation cover types could be explained partially by proximate factors like soil cation exchange capacity, soil organic carbon and soil pH. On the other hand, built-up areas were mainly influenced by population density. Under the afforestation scenario, areas under forest cover expanded further occupying 54.7% of the basin. Conversely, under the intense agriculture scenario, cropland and pasture cover types occupied 78% of the basin. However, in a scenario where natural forest and wetlands were protected, cropland and pasture only expanded by 74%. The study successfully outlined proximate land cover change drivers, including potential future changes and could be used to support the development of sustainable long-term transboundary land-use plans and policy.

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