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“Reconcile land system changes
with planetary health”

Effect of anthropogenic activities on carbon stocks in protected areas within Ghana’s forest-savannah transition zone

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Abstract

Tropical forests are vital in mitigating climate change by sequestering atmospheric carbon dioxide. However, deforestation and forest degradation compromise their carbon storage potential. In Ghana, reports show increasing anthropogenic pressures – such as hunting, farming, and charcoal burning – are degrading forests in the Boabeng Fiema Monkey Sanctuary (BFMS) and Kogyae Strict Nature Reserve (KSNR). This study assessed the effects of these activities on carbon stocks in BFMS and KSNR between 1992 and 2023 using satellite imagery, field data, and allometric models. The results revealed substantial carbon losses: BFMS lost 40,236 Mg C, and KSNR lost 272,109 Mg C. Closed forests had the highest carbon stocks across all vegetation types, while soils represented the largest carbon pool within both reserves. These findings highlight the importance of vegetation structure and soil conservation in enhancing carbon sequestration. The observed variations in carbon stocks across vegetation types underscore the climate mitigation potential of the Forest-Savannah Transition Zone. This zone, situated between the forest and savannah ecosystems, provides a critical buffer that supports biodiversity and ecosystem resilience. BFMS and KSNR are promising ecosystems for implementing nature-based solutions, supporting both biodiversity and climate action. The study aligns with the objectives of Ghana’s National Climate Change Policy and the Sustainable Development Goals, particularly Goals 13 (Climate Action) and 15 (Life on Land). Overall, the research offers essential insights for integrating forest conservation into carbon trading mechanisms and policy frameworks. By emphasising the role of protected areas in climate mitigation and biodiversity preservation, it advocates for strategic forest management and the adoption of nature-based solutions to address global environmental challenges.

Keywords: Carbon pool, carbon sequestration, carbon stock, climate change mitigation, REDD+

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