

EGU24-9583, updated on 21 Jul 2024

<https://doi.org/10.5194/egusphere-egu24-9583>

EGU General Assembly 2024

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Disentangling national carbon fluxes of African rainforest countries.

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African tropical ecosystems possess great potential for nature-based solutions in mitigating fossil fuel emissions through absorbing and storing carbon in soil and vegetation. However, past studies mostly focused on pan-continental carbon balance quantification, often ignoring regional differences. Remarkably, few science-informed attempts have been made to refine carbon flux estimates at the national level within African rainforest countries. Yet, such refined estimates are essential to improve the quantification of Nationally Determined Contributions for the United Nations Framework Convention on Climate Change.

In this contribution, we present preliminary results on quantifying national carbon budgets for African rainforest countries by disentangling three major carbon fluxes for the period 2001-2015: (1) net carbon uptake in tropical savannas, woodlands, and forests, (2) carbon losses from land-use change, and (3) fossil fuel emissions. Carbon fluxes in intact forests are quantified using ground-based data¹, while the carbon uptake by intact savannas and woodlands is based on Net Primary Productivity assessments estimated from remote sensing products^{2,3}. Furthermore, carbon emissions from land-use change are estimated by analyzing various satellite images and related products providing data on land-use change⁴⁻⁶, soil and tree carbon stocks⁷⁻¹², fire emissions^{3,13,14}, and carbon recovery in regrowing forests¹⁵⁻¹⁸ in tropical Africa. Country-level fossil fuel emissions are taken from the Global Carbon Project database¹⁹ to complete the national carbon balances.

We reveal that most Central and East African rainforest countries acted as net carbon sinks between 2001 and 2015, while West African rainforest countries exhibited minimal net carbon loss. Overall, tropical ecosystems have played an important role in mitigating carbon emissions due to land-use change and fossil fuels in African rainforest countries, particularly in Congo Basin

countries. Our insights into nation-level carbon fluxes will be crucial for informing African rainforest countries, guiding climate policies to stay on track to keep global warming well below 2°C.

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