Climate research project
Royal Museum for Central Africa

Is the Democratic Republic of the Congo a genuine "Solution Country" to the global climate crisis?

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In the wake of the 26th 'Conference of Parties' (CoP) of the International Panel on Climate Change (IPCC, Glasgow 2021), the Democratic Republic of the Congo was declared a 'solution country' to global change. This was a direct result of two scientific breakthroughs in which the Wood Biology service of the Africamuseum played a significant role:

- First, intact Central African forests were shown to annually absorb more CO_2 from the atmosphere than other tropical forests, hence they were declared to be the Earths 'first lung' (Figure 1 and Table 1 below, Hubau et al 2020).
- Second, the Congo basin harbors the world's largest tropical peatland complex, storing 29.0 billion tonnes of carbon, which is roughly the equivalent to three years' worth of global fossil fuel emissions (Figure 2 below, Crezee et al 2022).

Table 1 | Carbon sink in structurally intact old-growth tropical forests in Africa, Amazonia and the pan-tropics, 1980–2040

Period	Number of plots		Per unit area aboveground live biomass C sink (Mg C ha^{-1} yr^{-1})			Total C sink (Pg C yr^{-1})[a]		
	Africa	Amazon	Africa	Amazon	Pan-tropics[b]	Africa	Amazon	Pan-tropics[b]
1980–1990	45	73	**0.33** (0.06–0.63)	**0.35** (0.06–0.59)	**0.35** (0.07–0.62)	**0.28** (0.05–0.53)	**0.49** (0.08–0.82)	**0.87** (0.16–1.52)
1990–2000	96	172	**0.67** (0.43–0.89)	**0.53** (0.42–0.65)	**0.57** (0.39–0.74)	**0.50** (0.32–0.66)	**0.68** (0.54–0.83)	**1.26** (0.88–1.63)
2000–2010	194	291	**0.70** (0.55–0.84)	**0.38** (0.26–0.48)	**0.50** (0.35–0.64)	**0.46** (0.37–0.56)	**0.45** (0.31–0.57)	**0.99** (0.70–1.25)
2010–2015[c]	184	172	**0.66** (0.40–0.91)	**0.24** (0.00–0.47)	**0.40** (0.15–0.65)	**0.40** (0.24–0.56)	**0.27** (0.00–0.52)	**0.73** (0.25–1.18)
2010–2020[d]	–	–	***0.63*** *(0.36–0.89)*	***0.23*** *(–0.05–0.50)*	***0.38*** *(0.11–0.65)*	***0.37*** *(0.21–0.53)*	***0.25*** *(–0.05–0.54)*	***0.68*** *(0.17–1.16)*
2020–2030[d]	–	–	***0.59*** *(0.24–0.93)*	***0.12*** *(–0.29–0.51)*	***0.30*** *(–0.08–0.67)*	***0.31*** *(0.13–0.49)*	***0.12*** *(–0.29–0.52)*	***0.47*** *(–0.15–1.07)*
2030–2040[d]	–	–	***0.55*** *(0.08–0.99)*	***0.00*** *(–0.54–0.49)*	***0.21*** *(–0.29–0.67)*	***0.26*** *(0.04–0.47)*	***0.00*** *(–0.50–0.46)*	***0.29*** *(–0.46–0.97)*

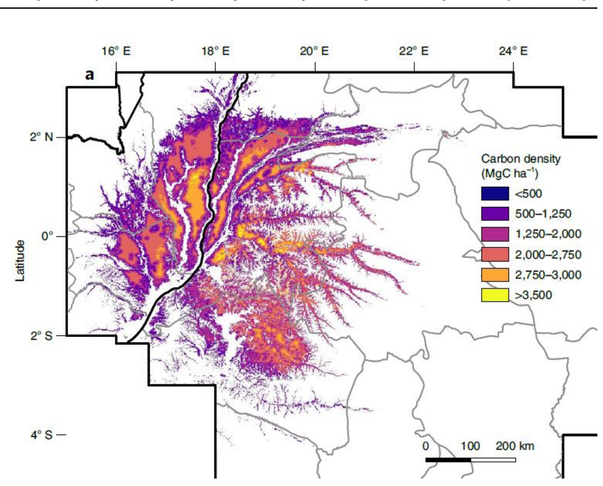

Figure 2 First ever map of below-ground peat carbon density across the central Congo Basin (Crezee et al 2022).

Figure 1 Observed (grey) and modelled (colors) past and future carbon dynamics of structurally intact old-growth tropical forests in Africa and Amazonia (Hubau et al 2020).

- The grey lines show that the carbon sink in intact African tropical forests (left top panel) has been stable for three decades to 2015, in contrast to the long-term decline in Amazonian forests (right top panel).
- The difference is largely driven by carbon losses from tree mortality, with no detectable multi-decadal trend in Africa (grey line in bottom left panel) and a long-term increase in Amazonia (bottom right).
- Both continents show increasing tree growth (middle panels), consistent with the expected net effect of rising atmospheric carbon dioxide and air temperature.
- A statistical model accounts for the observed trends and predicts a modest future decline in the African sink (blue line in top-left panel), whereas the Amazonian sink continues to weaken rapidly (brown line in top-right panel).

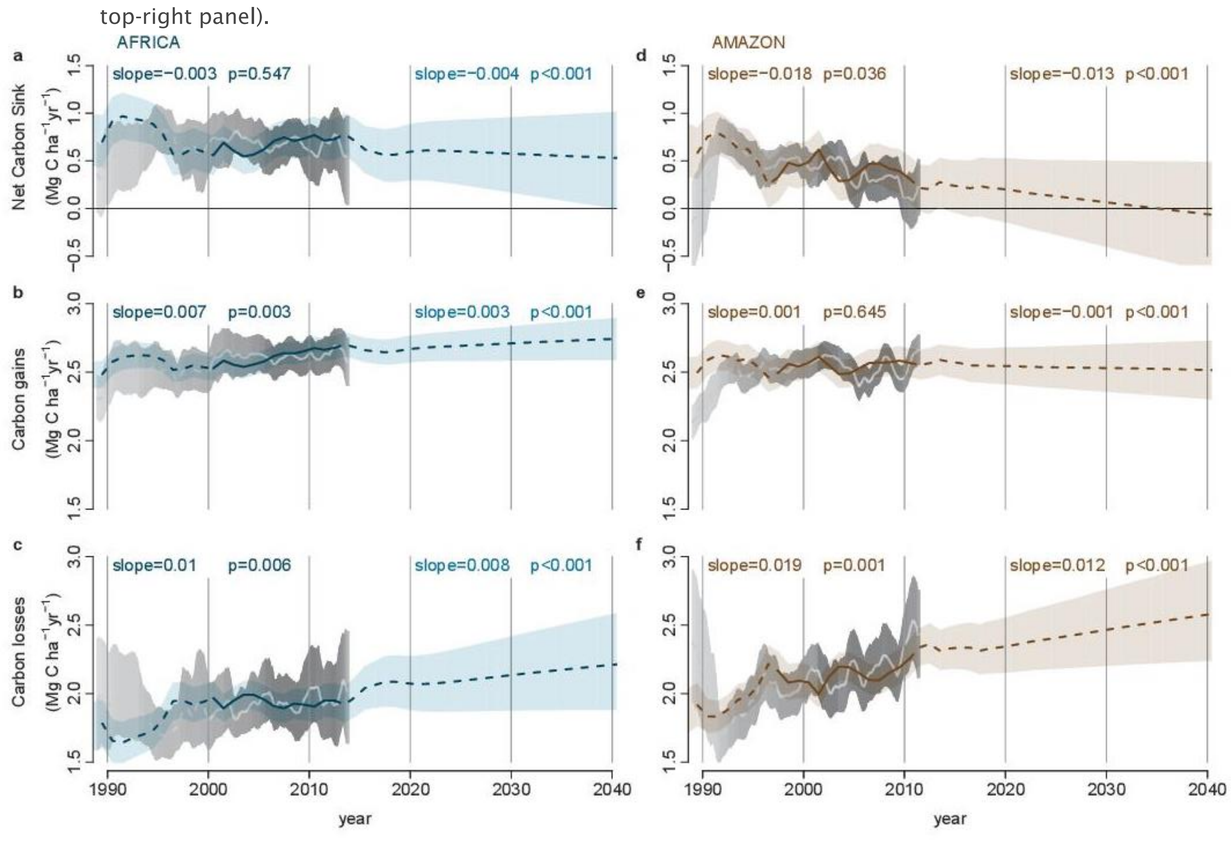

Table 1 (left) The red rectangle shows that the total carbon sink in African intact forests overtook the sink in Amazonian forests in the decade 2000-2010 (Hubau et al 2020).

As a conclusion, DRC will genuinely offer nature based solutions to the climate crisis, if international action is undertaken to protect its natural forests and peatlands, which contribute significantly to annual CO_2 absorption and long-term carbon storage. A first step was undertaken by giving DRC a voice through giving them the opportunity to organize the scientific part of the 27th Conference of Parties of the IPCC. This pre-CoP27 was held in Yangambi, a hotspot for climate research thanks to continuous efforts of the Wood Biology section of the Africamuseum and partner institutes such as UNIKIS, ERAIFT, INERA, UGent, Botanic Garden Meise.

Hubau W, Lewis SL, Phillips OL, et al (2020) Asynchronous carbon sink saturation in African and Amazonian tropical forests. *Nature* 579:80–87. https://doi.org/10.1038/s41586-020-2035-0
Crezee B, Dargie GC, Ewango CEN, et al (2022) Mapping peat thickness and carbon stocks of the central Congo Basin using field data. *Nature Geoscience* 15:639–644. https://doi.org/10.1038/s41561-022-00966-7

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