

Tropical forests in Africa's mountains store more carbon than previously thought—but are disappearing fast

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Montane forest in Cameroon. Credit: Jiri Dolezal

Scientists studying tropical forests in Africa's mountains were surprised to uncover how much carbon they store, and how fast some of these

forests are being cleared.

The international study reported today in *Nature*, found that intact tropical mountain (or montane) forests in Africa store around 150 tons of [carbon](#) per hectare. This means that keeping a hectare of forest standing saves CO₂ emissions equivalent to powering 100 homes with electricity for one year.

The study found that African mountain forests store more carbon per unit area than the Amazon rainforest and are similar in structure to lowland forests in Africa. Existing guidelines for African mountain forests—which assume 89 tons of carbon per hectare—greatly underestimate their role in global climate regulation.

The international team also investigated how much tropical mountain forest had been lost from the African continent in the past 20 years. They found that 0.8 million hectares have been lost, mostly in the Democratic Republic of the Congo, Uganda and Ethiopia, emitting over 450 million tons of CO₂ into the atmosphere. If current deforestation rates continue, a further 0.5 million hectares of these forests would be lost by 2030.

Lead author Dr. Aida Cuni-Sanchez, from the University of York's Department of Environment and Geography and at Norwegian University of Life Sciences, said: "The results are surprising because the climate in mountains would be expected to lead to low carbon forests.

"The lower temperatures of mountains and the long periods they are covered by clouds should slow tree growth, while strong winds and steep unstable slopes might limit how big trees can get before they fall over and die.

"But unlike other continents, in Africa we found the same carbon store

per unit area in lowland and mountain forests. Contrary to what we expected, large trees remain abundant in mountain forests, and these large trees (defined as having diameters over 70 cm) store a lot of carbon."



Tropical forest in Africa's mountains. Credit: Dr Aida Cuni-Sanchez, University of York

Scientists measured 72,000 trees in 44 mountain sites in 12 African countries, from Guinea to Ethiopia, and south to Mozambique. In each mountain site they established plots where they recorded the diameter, height and species of every tree.

Researchers said that better knowledge about how much carbon mountain forests store is especially important for the ten African nations

where the only [tropical forests](#) they have are those found on mountains.

"While we know what makes African forests special, we don't yet know *why* they are different. It is possible that in Africa, the presence of large herbivores such as elephants plays an important role in mountain forest ecology, as these large animals disperse seeds and nutrients, and eat small trees creating space for others to grow larger, but this requires further investigation," Dr. Cuni-Sanchez added.

Co-author Dr. Phil Platts, from York's Department of Environment and Geography and the IUCN's Climate Change Specialist Group, said: "About five percent of Africa's tropical mountain forests have been cleared since 2000, and in some countries the rate exceeds 20 percent. Besides their importance for climate regulation, these forests are habitats for many rare and endangered species, and they provide very important water services to millions of people downstream".

Most African nations have committed large amounts of land to forest restoration under the [Bonn Challenge](#). Although forest restoration is important to mitigate climate change, avoiding deforestation is a greater priority.

Co-author Dr. Martin Sullivan, at the Department of Natural Sciences, Manchester Metropolitan University, added: "Previous carbon estimates for tropical mountain forests in Africa were much lower than the values we report in our study.

"We hope that these new data will encourage carbon finance mechanisms towards avoided deforestation in tropical mountains. As outlined in the Paris Agreement, reducing tropical deforestation in both lowland and [mountain](#) forests must be a priority."

Co-author Dr. Gerard Imani, at the Department of Biology, Université

Oficielle de Bukavu in DR Congo, added: "Carbon finance mechanisms could help improve conservation interventions on the ground—even within protected areas, deforestation, [forest](#) degradation and defaunation remain a challenge."

More information: High aboveground carbon stock of African tropical montane forests, *Nature* (2021). [DOI: 10.1038/s41586-021-03728-4](#) , www.nature.com/articles/s41586-021-03728-4

The forest inventory data is part of AfriMont and AfriTRON plot networks, covering 13 countries in Africa, www.afritron.org . The data are curated at www.forestplots.net .

Provided by University of York

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