Climate change causes strong declines in ecosystem services provided by tropical forests, shows study

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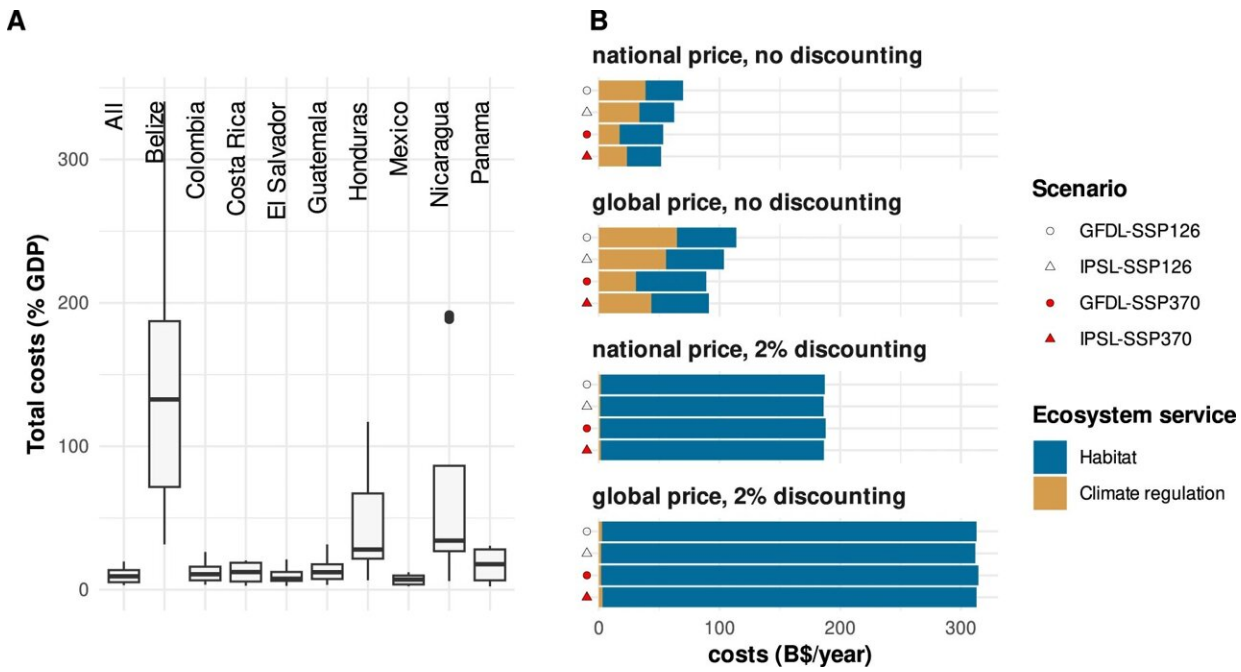

Economic costs of projected ecosystem service declines. **A** Boxplots of total costs by country as fraction of their GDP (computed across all price, discounting and climate change scenarios). **B** Costs for ecosystem service declines for the whole study region (billion $/year) for all combinations of price, discounting and climate change scenarios (global climate models: GFDL = GFDL-ESM4, IPSL = IPSL-CM6A-LR; shared socio-economic pathways: SSP126 = SSP1-2.6, SSP370 = SSP3-7.0). Credit: *Nature Communications* (2023). DOI: 10.1038/s41467-023-37796-z

Tropical forests provide a variety of ecosystem services that are also of great global relevance, such as climate regulation and the provision of habitat for animals and plants.

However, climate change can impair these services, which also has serious economic consequences. For the forest ecosystems of Central America, climate effects cause a reduction in the services of climate regulation and provision of habitat in 24 to 62 percent of the study area, depending on the scenario—and may cause associated economic costs of 51 to 314 billion dollars per year by the end of the 21st century.

This is shown in a study by the Freiburg forest scientists Lukas Baumbach, Prof. Dr. Marc Hanewinkel and Dr. Rasoul Yousefpour and Prof. Dr. Thomas Hickler of the Senckenberg Biodiversität und Klima Forschungszentrum (Senckenberg Biodiversity and Climate Research Centre) in Frankfurt a. M. The results have been published in the journal *Nature Communications*.

Global biodiversity hotspots

Tropical forests function, among other things, as important carbon sinks and thus contribute to climate regulation. They also make a significant contribution to the conservation of biodiversity by providing habitat for a large variety of species. This is especially true for the forests of Central America, which are known as global biodiversity hotspots. "Until now, however, there has been a lack of analysis of climate effects on these services as well as of their economic impacts on Central America's forest ecosystems," says Baumbach.

In the scientists' study, the decline of these services due to climate effects is particularly pronounced in tropical dry forests and montane rainforests. Especially in countries with low gross domestic product, these changes result in high economic losses of up to 335 percent of the

gross domestic product. "Interestingly, in most scenarios, the costs of reduced habitat provision exceeded the costs of reduced carbon storage or climate regulation," says Baumbach.

On the one hand, the study provides a first assessment of the magnitude of possible economic impacts of climate change in Central America's forests. On the other hand, it particularly emphasizes the economic relevance of other ecosystem services besides climate regulation, which is often in the foreground due to the strong economic role of carbon markets. "Our results show that there should also be a stronger focus on other ecosystem services of tropical forests," says Baumbach.

More information: Lukas Baumbach et al, High economic costs of reduced carbon sinks and declining biome stability in Central American forests, *Nature Communications* (2023). DOI: 10.1038/s41467-023-37796-z

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