

Ecological tipping points could occur much sooner than expected, study finds

Amazon rainforest and other ecosystems could collapse ‘very soon’, researchers warn

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- Deforestation of the Amazon, near Santarém, Brazil. Photograph: Brazil Photos/LightRocket/Getty Images

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Ecological collapse is likely to start sooner than previously believed, according to a new study that models how tipping points can amplify and accelerate one another.

Based on these findings, the authors warn that more than a fifth of ecosystems worldwide, including the Amazon rainforest, are at risk of a catastrophic breakdown within a human lifetime.

“It could happen very soon,” said Prof Simon Willcock of Rothamsted Research, who co-led the study. “We could realistically be the last generation to see the Amazon.”

The research, which was **published on Thursday** in Nature Sustainability, is likely to generate a heated debate. Compared with the long-established and conclusively proven link between fossil fuels and global heating, the science of tipping points and their interactions is relatively undeveloped.

The United Nations’ top science advisory body, the Intergovernmental Panel on Climate Change, has been more cautious. In its latest report, it said there was a chance of a tipping point in the Amazon by the year 2100.

However, several prominent Brazil-based scientists, including Carlos Nobre, have warned that this may come much sooner. The new study underlines that alarming prospect. It observes that most studies until now have focused on one driver of destruction, such as climate change or deforestation. But when you combine this with other threats, such as water stress, degradation and river pollution from mining, the breakdown comes much quicker.

Lake Erhai in China collapsed sooner than most observers expected. According to Willcock, this was because projections had been based on one factor – agricultural runoff that was loading the water system with excess nutrients – but other stresses compounded and accelerated this degradation. When climate variation, water management and other forms of pollution were added into the mix, the lake system quickly lost its resilience.

Overall, the team, comprised of scientists from Southampton, Sheffield and Bangor universities, as well as Rothamsted Research, looked at two lake ecosystems and two forests, using computer models with 70,000 adjustments of variables. They found that up to 15% of collapses occurred as a result of new stresses or extreme events, even while the primary stress was maintained at a constant level. The lesson they learned was that even if one part of an ecosystem is managed sustainably, new stresses such as global warming and extreme weather events could tip the balance towards a collapse.

While the scope of the study was limited, the authors said the results showed the need for policymakers to act with more urgency.

“Previous studies of ecological tipping points suggest significant social and economic costs from the second half of the 21st century onwards. Our findings suggest the potential for these costs to occur much sooner,” the co-author Prof John Dearing noted.

Willcock said the findings were “devastating”, but said this approach – of analysis through system dynamics – also had a positive potential because it showed that small changes in a system could have big impacts. Although the study focused on the negative aspect of straws breaking the back of ecosystems, he said the opposite could also be true. Lake Erhai, for example, has shown signs of recovery.

“The same logic can work in reverse. Potentially if you apply positive pressure, you can see rapid recovery,” he said, though he emphasised time was running out faster than most people realised.