

# Study reveals how climate change can significantly impact one of the world's most important carbon-rich ecosystems

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Mangrove forests in Indonesia's Wakatobi National Park. Credit: Dr Ian Hendy, University of Portsmouth

Mangrove forests play a vital role in the health of our planet. The trees and shrubs absorb a substantial amount of greenhouse gas emissions, help protect communities from rising sea levels, and act as nurseries for baby fish.

These coastal forests are the second most carbon rich ecosystem in the world, being able to store more than 1,000 tons of carbon in just one hectare; that's about the size of a football pitch. They do this by capturing the chemical element from the air and storing it in leaves, branches, trunks and roots.

But despite environmental efforts to prevent the loss of these important [ecosystems](#), they are still at risk. A new study, by the University of Portsmouth and facilitated by research organization Operation Wallacea, has revealed how the stored carbon from atmospheric CO<sub>2</sub> in large woody debris is processed by organisms. The findings suggest [climate change](#) can significantly impact this 'blue carbon' system.

Scientists from the University of Portsmouth analyzed large woody debris (LWD) in four mangrove forests in Indonesia's Wakatobi National Park with differing intertidal zones. Each survey area had up to 8 sections (transects)—each revealing their own way of processing carbon.

In the upper reaches of the ecosystem, closer to land, the team discovered organisms typically found in tropical rainforests are breaking down fallen wood. These include fungi, beetle larvae, and termites. Further towards the ocean, the LWD is being degraded more quickly by worm-like clams with calcium carbonate shells, known as shipworms.

Two consequences of climate change can affect the delicate process of fixed-carbon degradation in the mangrove forest. The first being rising sea levels, as the carbon cycle is driven by tidal elevation. The second is

an increase in ocean acidity caused by rising CO<sub>2</sub> in the atmosphere, which can dissolve the shells of the marine organisms degrading the wood in the lower reaches.

Lead author of the study, Dr. Ian Hendy from the University of Portsmouth's School of Biological Sciences, said: "This data highlights the delicate balance between wood-biodegrading organisms and fallen mangrove wood. Mangrove forests are crucial to mitigating climate change, and alterations to the breakdown of fallen wood in the forests will change the above-ground carbon cycles which may have an effect on mangrove carbon stores".

Dr. Hendy and his team now have their sights set on taking part in large-scale mangrove forest restoration in Mexico. The joint biodiversity initiative [rePLANET](#) is working exclusively with a group of scientists at Portsmouth, Brighton, Singapore, and CINESTAV to fund a series of Ph.D. projects examining the innovative approaches being taken to preserve and protect forests.

"The team's goal now is to use the findings from this study to guide large-scale restoration of mangrove forests across the globe", added the study's co-author, Dr. Simon Cragg from the University of Portsmouth.

The "Biodegraders of Large Woody Debris Across a Tidal Gradient in an Indonesian Mangrove Ecosystem" study is published in *Frontiers in Forests and Global Change*.

**More information:** Ian W. Hendy et al, Biodegraders of Large Woody Debris Across a Tidal Gradient in an Indonesian Mangrove Ecosystem, *Frontiers in Forests and Global Change* (2022). [DOI: 10.3389/ffgc.2022.852217](#)

Provided by University of Portsmouth

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