



Mangroves at risk if carbon emissions don't fall by 2050

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Unless global carbon emissions fall by 2050, mangroves cannot survive in higher sea-levels, according to an international research team that includes Professor Neil Saintilan from Macquarie University's Department of Earth and Environmental Sciences.

In an article published in *Science* (10.1126/science.aba2656), a team of scientists from Macquarie University, the University of Hong Kong, Nanyang Technological University Singapore, Rutgers University, and the University of Wollongong, found that a sea-level rise of greater than 6mm per year produced a 90 per cent probability that mangroves would stop growing at the pace needed for survival.

“The 6 mm sea level rise threshold will be easily surpassed on tropical coastlines without concerted efforts to cut carbon emissions,” says lead author Professor Neil Saintilan. The team used sedimentary archives from Earth’s deglaciation around 10,000 years ago to estimate the probability of mangrove survival under rates of sea-level rise in two climate scenarios – low and high carbon emissions.

In contrast, mangroves can survive by building themselves up vertically when the sea-level rise remains under 5 mm per year, the level projected under low emissions scenarios.

“We know sea-level rise is inevitable due to climate change, but not much is known about how different rates of sea-level rise affect the growth of mangroves, which is an important ecosystem for the health of the earth, Professor Saintilan said”

Professor Saintilan was part of the Blue Carbon team, who won the 2019 Eureka Prize for Environmental Research, for a study showing that coastal marshes capture and store more atmospheric carbon dioxide per unit area than any other natural system.

Co-author Professor Benjamin Horton, Chair of the Asian School of the Environment at NTU Singapore says, “In 30 years, if we continue on a high-emissions trajectory, essentially all mangroves will face a high risk of loss.”

“This research highlights yet another compelling reason why countries must take urgent action to reduce carbon emissions. Mangroves are amongst the most valuable of natural ecosystems, supporting coastal fisheries and biodiversity, while protecting shorelines from wave and storm attack”.

The study, covering 78 locations, explored how mangroves responded as sea-level rise slowed from over 10 mm per year 10,000 years ago to nearly stable conditions 4,000 years later. The drawdown of carbon as mangrove forests expanded helped to reduce greenhouse gas concentrations. The team also found that mangroves will naturally encroach inland if they can no longer grow upwards and compete with other land-uses.

Co-author Assistant Professor Nicole Khan, from the University of Hong Kong, says, “Most of what we know about how mangroves respond to rising sea levels comes from observations over the past several years to decades when rates of rise were slower than projected for later this century. This research offers new insights because we looked deeper into the past when rates of sea-level rise were rapid, reaching those projected under high emissions scenarios”.

“Our results underscore the importance of reducing emissions and adopting coastal management and adaptation measures that allow mangroves to naturally expand into low-lying coastal areas to protect these valuable ecosystems. ”