

Mangroves at risk if carbon emissions not reduced 2050, international scientists predict



Scientists from Nanyang Technological University, Singapore (NTU Singapore), and an international research team have predicted that by 2050, mangroves will not be able to survive rising sea-levels if global carbon emissions are not reduced.

Using sedimentary archives from when the Earth underwent deglaciation up to 10,000 years ago, the researchers estimated the probability of mangrove survival under rates of sea-level rise corresponding to climate scenarios – low and high carbon emissions.

When rates of sea-level rise exceeded 6 mm per year, corresponding to what is estimated to result in emissions scenarios for 2050, the researchers found that mangroves were very unlikely (more than 90% probably stopped growing at the pace required).

In contrast, mangroves can survive by building themselves up vertically when the sea-level rise remains below 6 mm per year, which corresponds to that projected under low emissions scenarios during the 21st century.

The threshold of a 6 mm sea level rise is one that will be “easily surpassed” on tropical coastlines if not make concerted efforts to cut carbon emissions, said lead investigator of the study, Professor N from the Department of Earth and Environmental Sciences at Macquarie University.

Prof Saintilan said, “We know that 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 health of the earth.”

The team comprising scientists from NTU Singapore, Macquarie University, University of Hong Kong, and University of Wollongong published their findings on 5 June 2020 in the top academic journal *Science*.

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

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

Why mangroves matter

With roots that rise from under the mud, mangrove stands grow in a process called vertical accretion, a feature that is important to their ecosystem as it helps to soak up greenhouse gas emissions (carbon stored at densities far greater than other forests, and provides a buffer between the land and sea – helping to protect people from flooding on land).

The study, which covered 78 locations, explored how mangroves responded as the rate of sea-level rise increased 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 over this time contributed to lower greenhouse gas concentrations.

The study found that mangroves will naturally encroach inland if their ability to vertically accrete is doing so, mangroves will have to compete with other land-uses and may become squeezed behind protections.

Co-author Assistant Professor Nicole Khan, who is from The University of Hong Kong said, “Most of know about the response of mangroves to rising sea level comes from observations over the past s to decades when rates of rise are slower than projected for later this century. This research o ers n because we looked deeper into the past when rates of sea-level rise were rapid, reaching those pro high emissions scenarios.

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