

ScienceTalk

Sharing knowledge to protect our mangrove forests

Mangroves in much of S-E Asia threatened by aquaculture, agriculture, urban development

Daniel Friess

Mangrove forests are one of the most unique habitats we have in Singapore. They have evolved to survive in a dynamic and stressful coastal environment, where their plants and animals must tolerate changing waves, tides and salt.

But their position between the land and sea means they are a crucial buffer for coastal populations, protecting communities from storms, trapping pollution from rivers, providing a safe nursery habitat for fish and even cooling the urban climate.

Mangroves help to soak up greenhouse gas emissions, with mangroves in Singapore storing the equivalent of more than 1.4 million tonnes of carbon dioxide. This stock of carbon represents the annual emissions of 621,000 people.

In fact, mangroves here such as in Chek Jawa store 500 tonnes of carbon per ha, three times more than seagrass and almost double that of forests in the Bukit Timah Nature Reserve. Destroying mangroves, however, will mean releasing all the stored carbon into the atmosphere.

Later this month, on July 26, we celebrate the United Nations' International Day for the Conservation of the Mangrove Ecosystem, to highlight and acknowledge all the benefits that this crucial habitat provides us.

Despite their importance, we continue to lose mangroves across the world. The global rate of mangrove loss was previously esti-

mated at 1 to 3 per cent per year, making them more threatened than many other types of forest.

South-east Asia has been a traditional hot spot of mangrove deforestation. Mangroves have been cut down to make space for aquaculture ponds, cleared for rice paddy cultivation, and reclaimed for industrial and port development.

Singapore has lost more than 90 per cent of its original mangrove cover due to land reclamation and reservoir construction.

Mangroves covered 13 per cent of Singapore's land area more than 200 years ago. Today, only about 700ha, or 0.5 per cent, remain.

They are scattered over various parts of the island, including Sungei Buloh Wetland Reserve, Labrador Park and Pasir Ris, and can also be found offshore on Pulau Ubin, Pulau Tekong and Pulau Semakau.

Luckily, the turn of the century has seen a general slowdown in mangrove loss. In South-east Asia, we are now losing mangroves at a much reduced rate of 0.18 per cent per year. Singapore's mangrove area has become stable over the last decade, mangroves have been restored back to health and the area of mangrove forest that is protected has begun to increase.

Last year, the National Parks Board announced the creation of the new Mandai Mangrove and Mudflat Nature Park, protecting one of the most important mangrove areas in the country. This important coastal area, located about 3km to the east of Sungei Buloh Wetland Reserve, opens to the pub-

lic in 2022, and is designated a nature park as part of efforts to strengthen the conservation of wetland biodiversity in Singapore.

Increasing conservation efforts in Singapore are also mirrored in other countries in the region. There are good examples of mangrove rehabilitation projects in the Philippines, Indonesia and Thailand that include local stakeholders in management. Some mangroves in Indonesia are being harvested in a way that is sustainable and reduces the impact on biodiversity.

But when it comes to the study of mangroves, many questions remain – in particular, what lessons can be learnt to help conserve the large areas of mangrove that are still being threatened?

This week, more than 300 of the world's top mangrove scientists and practitioners descended on Singapore to answer these questions, at the 5th international conference on Mangrove Macrobenthos and Management (MMM5).

It is the first time this meeting has been held in South-east Asia, the centre of biodiversity for the mangrove ecosystem and home to a larger area of mangrove forests than anywhere else in the world.

The participants shared their knowledge and insights on mangrove management, conservation and restoration from across the globe, from diverse places like Australia, Colombia and Madagascar.

Sharing the knowledge of mangrove experts and stakeholders is crucial because the success of mangrove conservation is not evenly spread across the region.

Mangroves continue to be threatened by aquaculture, agriculture and urban development throughout much of South-east Asia. Myan-



Mangroves dying across a 1,000km length of coast in northern Australia in 2016. Experts believe a combination of extreme temperatures, drought and sea level changes was responsible, and likened the mangrove death to the large-scale bleaching of corals that is now seen more frequently in the region. PHOTO: COURTESY OF JAMES COOK UNIVERSITY

0.5%

Percentage of Singapore's land area covered by mangroves today, from 13% over 200 years ago. Totalling about 700ha, they can be found in places like Sungei Buloh Wetland Reserve and Pasir Ris, and offshore islands like Ubin and Tekong.

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mar and Malaysia in particular are still hot spots of deforestation, with these countries seeing some of the highest rates of mangrove conversion anywhere in the world.

Nor is the recent success of mangrove conservation guaranteed. Mangrove loss may accelerate again as new areas in countries, such as Indonesia and Myanmar, open up for agricultural expansion.

New government policies for food security can incentivise the conversion of mangroves to make way for agricultural crops. Many mangrove nature reserves also suffer from illegal encroachment.

Mangrove restoration efforts continue apace, but large-scale plantings have mixed or low success.

In many countries in South-east Asia, mangroves are also wrongly planted on other adjacent coastal habitats such as seagrass meadows.

Mangroves cannot survive in these locations, and the rare ones that do survive end up destroying seagrasses, which are an important ecosystem in their own right.

Worryingly, climate change is expected to substantially impact mangroves over the next century.

While mangroves have evolved to survive in the coastal environment, the coast is a stressful place to live, and they are already living at the limits of their tolerance to

flooding by the tide.

Sea level rise will further increase the amount of flooding that mangrove trees experience, potentially pushing them beyond their tolerance, which could lead to the drowning of large areas of mangrove forest.

Mangroves are also affected by climatic phenomena, such as El Nino, that are becoming more extreme with climate change. Changes in El Nino have contributed to large areas of mangrove death.

In 2016, mangroves died across a 1,000km length of coast in northern Australia, and this has been likened to the large-scale bleaching of corals that we now see more frequently in the region.

A lot still needs to be done to secure the future of our mangrove forests across the tropics. Only by sharing knowledge with all stakeholders, including researchers, managers and the public, and learning from our successes, can we secure a bright future for this important, but imperilled, habitat.

• Dr Daniel Friess is associate professor at the National University of Singapore's Department of Geography. A mangrove expert and chair of the MMM5 conference, he wrote this article on behalf of the MMM5 committee.