Source: *The Straits Times,* pB8
Date: 21 March 2020

Tapping nature in fight against climate change

New research centre at NUS will be helmed by Singaporean conservation scientist

Audrey Tan
Environment Correspondent

A research centre focusing on how nature can be harnessed to help tackle climate change will be set up by the end of the year at National University of Singapore (NUS), in a move that underscores the Republic's interest in being part of the global push in learning more about nature-based solutions.

Called the Centre for Nature-based Climate Solutions, it will be helmed by conservation scientist Koh Lian Pin, who will be returning to Singapore under a National Research Foundation (NRF) scheme after working for more than a decade abroad.

Professor Koh, 43, who is moving back home from Seattle in the US, told The Straits Times that such solutions could include the conservation, restoration and improved management of natural ecosystems such as forests and wetlands, as well as agricultural lands.

Well-managed lands, he said, can help increase the amount of carbon sequestered from the atmosphere. This refers to the natural processes through which trees and soils take in carbon dioxide.

For example, when plants photosynthesise, they use sunlight to convert carbon dioxide into organic matter, which is then locked in tree biomass such as trunks and roots.

This process draws down the amount of carbon dioxide in the atmosphere, contributing to climate mitigation and enhancing climate resilience. Carbon dioxide, produced by human activities such as the burning of fossil fuels for energy, is the main greenhouse gas driving climate change.

Prof Koh cited a 2017 paper published in the scientific journal Proceedings of the National Academy of Sciences, which had found that natural climate solutions can provide 37 per cent of cost-effective carbon dioxide mitigation needed through 2030 for a greater chance of holding global warming to below 2 deg C above pre-industrial levels.

Yet, while nature-based solutions have potential, trade-offs also have to be considered, he said.

For instance, preserving forests and preventing them from being cut down would mean less land for agriculture, which could negatively affect surrounding communities by compromising their livelihoods and food security.

Further research will help policymakers determine how to strike this balance, added Prof Koh, who was most recently vice-president of science partnerships and innovation at international environmental group Conservation International Foundation.

Prof Koh has over the past 16 years worked in institutions across Switzerland, Australia and the United States. On April 1, he will assume the appointment of professor of conservation science, technology and policy in the Department of Biological Sciences at the NUS Faculty of Science.

The upcoming centre will have two overarching mandates – investing in policy-relevant research, and building capacity in Singapore and the region to respond "appropriately and decisively" to climate change, Prof Koh said.

Discussions are on to identify a physical space within NUS to house the centre, he added.

"Over the next few months, we will be engaging and collaborating with government, non-governmental and corporate stakeholders to refine the specific aims and activities of the centre," he said.

Prof Koh is the sixth Singaporean scientist under the NRF's Returning Singaporean Scientists Scheme, which seeks to attract outstanding overseas-based Singaporean researchers back to lead research in areas important to the Republic.

Professor Chen Tsuhan, NUS deputy president for research and technology, said in a statement yesterday: "NUS is delighted that Prof Koh has chosen to return to his alma mater to lead strategic efforts in growing competencies and evidence-based science to fight climate change... I am confident that he can leverage NUS' strengths and expertise in different domains of sustainability to create innovative solutions that positively impact Singapore and beyond."

Last October, Minister for the Environment and Water Resources Masagos Zulkifli told climate scientists gathered in Singapore that the Republic's plans to deal with sea level rise will incorporate nature-based solutions such as mangroves, as well as engineering solutions.

It was the first time the Government had officially said nature-based solutions are on the cards, following Prime Minister Lee Hsien Loong's National Day Rally speech last August in which he said Singapore would need to spend $100 billion over the long term to buffer the country against sea level rise.

Prof Koh said Singapore is an "ideal innovation sandbox" for test-bedding climate solutions, pointing to its plan to plant one million trees over the next decade.

"The One Million Trees movement could be a microcosm of the World Economic Forum's One Trillion Tree initiative," he said.

Singapore's experience, he said, could help answer a few key questions, including: how tree-planting can be incorporated into spatial planning to demonstrate green (trees) – grey (concrete) infrastructural development, as well as how cost-effective techniques and technologies can be developed for mapping and monitoring of forest restoration efforts in other parts of the world.

Said Prof Koh: "It is not so much whether we achieve the goal of planting one million trees or what other nature-based solutions we implement in Singapore, but rather, how we do so that could become a model for other cities and countries to emulate."

The United Nations has said nature-based solutions are actions which can benefit human well-being and biodiversity.

Botanist Shawn Lum from the Nanyang Technological University said Singapore's One Million Trees initiative could, for example, help to develop communities and strengthen their bond with nature, and also help create habitats for wildlife.

LEADING THE WAY

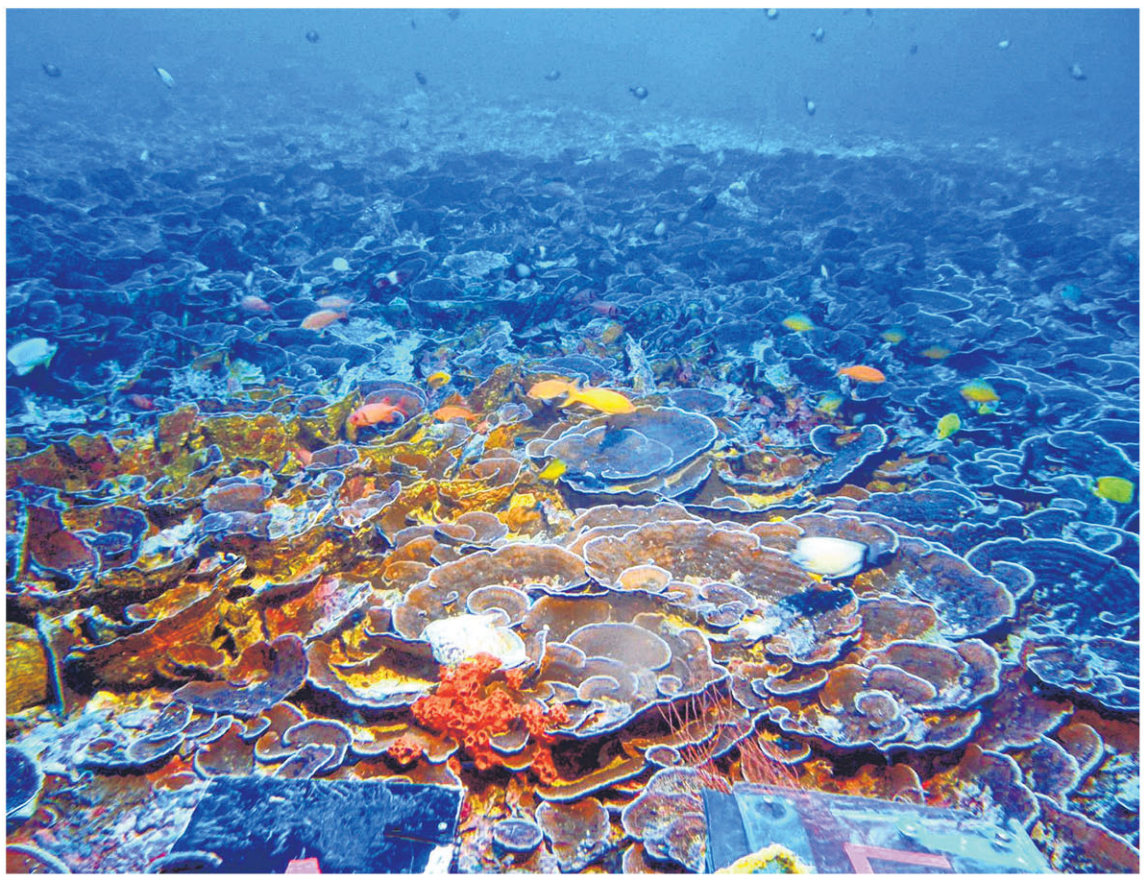
It is not so much whether we achieve the goal of planting one million trees or what other nature-based solutions we implement in Singapore, but rather, how we do so that could become a model for other cities and countries to emulate.

PROFESSOR KOH LIAN PIN, conservation scientist who will be helming the upcoming Centre for Nature-based Climate Solutions.

"Trees are wonderful but individually they are just that – trees. Trees in a thriving, functioning ecosystem are part of a complex, wondrous and life-giving web of life that confers benefits to people and nature alike," said Dr Lum, who is also president of the Nature Society (Singapore).

"Tree planting is beautifully complementary to, and not a substitute for, the care and protection of existing forest habitats."

audreyt@sph.com.sg



A mesophotic coral ecosystem in the Au'au Channel in Hawaii. Coral reef experts say healthy reefs could protect coastlines against erosion by functioning like breakwaters and reducing the full force of storm energy. PHOTO: NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, HAWAII UNDERSEA RESEARCH LABORATORY

Coral reefs can act as allies to deal with storm surges

Many options exist for tackling the rise in sea levels. These range from engineering feats such as building seawalls or reclaiming land to restoring coastal habitats like mangroves.

But coastal cities and nations may find another ally: coral reefs.

These gardens in the ocean are beacons for all sorts of marine life, from tiny sea slugs to gigantic manta rays.

But coral reef experts, like Emeritus Professor Chou Loke Ming, say such healthy reefs could protect coastlines against erosion by reducing the full force of storm energy.

"Reef flats and crests with rich coral growth function like breakwaters," explained the National University of Singapore (NUS) professor. "Storm surge energy diminishes while going across the reef crest and flat. By the time it hits the shore, the energy is insufficient to cause serious shore erosion."

Oceanic islands would not exist if not for the protection of coral reefs, he said.

Added Prof Chou: "The 2004 Asian tsunami showed that islands and mainland areas with good reefs were impacted less than those with degraded reefs."

How does a coral reef form?

It is born when free-swimming coral larvae attach themselves to submerged rocks or other hard surfaces along the edges of islands or continents. They then grow and expand from there.

But only a thin layer on the surface of the reef is living tissue – the coral animal itself.

The reef's main structure comprises mainly a material known as calcium carbonate (or limestone), which is produced by all species of reef-building hard coral.

This calcium carbonate "skeleton" helps the living tissue reach towards the surface of the ocean, where sunlight streams through.

The sun is essential because corals get their nutrition from the photosynthetic algae which lives in their tissues. And this algae uses sunlight to make food.

But this process of coral reef growth is slow.

The United States National Oceanic and Atmospheric Administration (NOAA) estimates that it could take up to 10,000 years for a coral reef to form from a group of coral larvae.

Its data shows the rise in the global mean sea level was 3.6 millimetres a year between 2006 and 2015. This means the rate of the rise in sea level may outpace coral growth, noted Prof Chou.

But a mix of hard engineering and nature-based solutions could help manage the rise, he said.

Prof Chou gave two examples: building seawalls conducive for coral growth or creating lagoons with corals that grow either on floating pontoons or nursery tables at the bottom of the sea.

In some communities, coral reefs could also boost economies and he cited the Philippines.

"The reefs at Apo Island were almost destroyed by destructive fishing practices.

"But after better management by the community, the reef started to thrive again, and the people benefited from sustained reef fisheries as well as tourism income."

Audrey Tan

Besides providing coastal protection, mangroves can help to reduce the amount of heat-trapping carbon dioxide in the atmosphere. PHOTO: RIA TAN

Restoring mangroves to protect coasts, reduce warming

Mangrove forests are iconic habitats. Even people who do not spend much time in nature would instantly recognise their prop roots, which rise up from the mud in an undulating fashion and intertwine with those of their neighbour.

Yet, few know that it is this feature of the mangrove forest that is instrumental in helping to protect human infrastructure on land.

The Food and Agriculture Organisation of the United Nations, for example, has noted that mangroves can reduce the coastal damage wrought by a tsunami by taking the first brunt of the impact and dissipating the energy of the wave as it passes through the mangrove area.

In Singapore, mangrove habitats are now few and far between.

But plans are afoot to restore more mangrove areas as the country looks to nature to help ease, if not overcome, the impact of climate change, like rising sea levels.

Second Minister for National Development Desmond Lee had announced earlier this month that Singapore will in the years ahead establish a 40ha nature park at Khatib Bongsu, a rich mangrove and mudflat habitat on the north-eastern coast of Singapore.

Associate Professor Daniel Friess, a mangrove expert with the National University of Singapore's (NUS) geography department, said mangrove forests can help in the world's fight against climate change in two ways.

One, they can help cities and communities adapt to climate change by providing coastal protection.

For instance, they can shield a coastline from being flooded by rising sea levels because of their ability to trap sediments between their roots.

This potentially increases the elevation of the surface to keep pace with the rise in sea level, he said.

Two, mangroves can help to reduce the amount of heat-trapping carbon dioxide in the atmosphere.

They can soak up carbon dioxide and store it at densities that are three to five times greater than other forests, Prof Friess added.

Such coastal "blue carbon" science and conservation will be key topics at the upcoming Centre for Nature-based Climate Solutions, which will be established at NUS by the year's end, its director Koh Lian Pin told The Straits Times.

Blue carbon refers to carbon that is stored in coastal ecosystems, like mangroves.

Prof Friess said there are a number of options for incorporating mangroves into coastal management strategies in Singapore.

For example, many of the abandoned aquaculture ponds on offshore Pulau Ubin used to be mangroves.

"These can be restored but we need to get the physical conditions right, like the amount of flooding mangroves can tolerate," he said.

"It may also be possible to modify or design more traditional engineered structures like sea walls to better integrate mangroves," he added.

Audrey Tan

Source: The Straits Times © Singapore Press Holdings Ltd. Permission required for reproduction.