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Looking to nature to protect us from climate change

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For The Straits Times

The future impacts of climate change loom large for island nations such as Singapore. Countries may soon have to contend with increasing temperatures, volatile weather patterns and rising seas. The potential impacts are so great that the issue is increasingly put front and centre in government planning and policy.

Prime Minister Lee Hsien Loong's speech during the National Day Rally, with its focus on climate change and how it will be dealt with, was a bold statement of intent. This speech highlighted how few countries are embracing the challenges of climate change in the way that Singapore is. It is clear that the Government has carefully considered how climate change will have major implications on urban development, and keeping shorelines safe from sea-level rise and extreme weather is a key national priority.

When we think about protecting ourselves from storms and rising seas, we traditionally think about concrete seawalls or increasing the height of reclamations. We often ask: How can we engineer our way to safety?

Coastal engineering solutions, such as these, are the backbone of any coastal protection strategy. But there are other options to mitigate and adapt to climate change, particularly if we utilise the benefits provided by nature.

Singapore's environment provides a range of ecosystem services, or benefits that the environment provides to people. One ecosystem service is the ability of forests to suck up carbon dioxide. Removing carbon from the atmosphere and locking it up in trees is one way that we can mitigate or offset some of our carbon emissions.

Singapore's coastal mangrove forests are particularly good at doing this because they can lock up huge amounts of carbon in their waterlogged soils over thousands of years. Singapore's mangroves store the equivalent of 1.6 million tonnes of carbon dioxide, despite covering only a small length of the coast.

Unfortunately, the huge volume of annual greenhouse gas emissions, and the global scale of climate change means mitigation alone will not be enough to protect Singapore from rising sea levels or extreme weather. So, it is crucial to anticipate and adapt to future climate change.

Traditionally, we protect our coasts by building things. The National Day Rally speech gave several such examples, including increased land reclamation heights and constructing offshore islands along the east coast.

Engineered structures are crucial to protecting our shorelines, but they are expensive to build and maintain. It has been estimated that climate change will cost us $100 billion over the next 100 years. This is a worthwhile investment, but could utilising nature make this cheaper?

Another ecosystem service provided by nature is coastal protection, with coral reefs and mangroves acting as a sponge to storm waves. Ecosystems can form the first line of defence, meaning that the sea wall behind can be smaller and cheaper.

Engineered structures are also static and inflexible, and cannot adapt to the changing conditions we expect with climate change. Mangroves can trap mud within their complex tangle of roots, which builds up the elevation of the soil surface and helps the shoreline keep up with sea-level rise. This gives an insurance policy when faced with the uncertainty caused by climate change.

What might be most effective is a combination of hard coastal defences and soft natural solutions.

There are already examples of such ecological engineering in Singapore. On Pulau Tekong, mangroves were planted within a rock wall to help reduce shoreline erosion.

Emerging community groups, such as the Restore Ubin Mangroves Initiative, are promoting mangrove restoration on Pulau Ubin. Coral reefs are being restored in the waters off the southern islands and grown on seawalls. These examples help in the fight against climate change, and they can do this even more if coastal defence structures and new reclamations are designed in such a way that they allow natural coastal habitats to flourish.

Incorporating nature into coastal defences has some interesting co-benefits too, such as creating space for recreation. Many of Singapore's parks can be found along the coast, and after a hard week at work, who doesn't feel more relaxed after walking along the beach at East Coast Park, or exercising in Labrador Park?

Sungei Buloh Wetland Reserve is a popular destination for local and international visitors, and a new nature park at Mandai Mangrove and Mudflat will be coming our way in 2022. You can visit and enjoy these places, knowing that they are playing a key role in defending our coastline.

Singapore's coastline will soon face some serious challenges because of climate change, and time to prepare is running out. Nature can complement engineered solutions to combat sea-level rise, and contribute to creating a safe, liveable and "future-proofed" city for the next century and beyond.

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A researcher from the National University of Singapore conducting a carbon stock assessment of mangrove forests here. Singapore's mangroves store the equivalent of 1.6 million tonnes of carbon dioxide, despite covering only a small length of the coast.
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