Climate-proofing Singapore’s coastlines

To address rising sea levels, national water agency PUB and the National University of Singapore (NUS) have opened a Coastal Protection and Flood Resilience Institute (CFI Singapore) to develop innovative, multi-functional coastal protection and flood management solutions for Singapore’s coastlines, and build up expertise on the matter. Cheryl Tan and Lim Yong look at some projects that the institute will embark on.

**CFI SINGAPORE’S GOALS**

- Conduct coastal science research to study the impact of climate change on coastal processes such as wind, waves, storm surge levels and astronomical tides, and coastal protection structures.
- Integrate nature-based solutions including mangroves, seagrasses and corals with various man-made structures to shore up coastal protection.
- Develop innovative engineering solutions to create multi-functional solutions for Singapore’s coastal environment.
- Monitor and predict the coastal environment to enhance forecast systems for coastal processes, rainfall and water runoff.

**Impending threat**

- Mean sea levels are expected to increase by 1m by 2050.
- In 2022, for example, the mean sea level in Tangang Papar was around 73.2cm.
- Sea levels can rise by 4m or 5m as a result of daily tidal activity, storm surges (abnormally high tide due to a storm) and sinking land.

**SOME OF THE PROJECTS**

- **Retrofit existing coastal protection structures**
  - Modular, waterproof units can also be added on top of existing protection structures, such as seawalls, to better protect against sea level rise.
  - PUB is working with Delta Marine Consultants to explore the use of modular blocks known as DModu Plus along Singapore’s coastlines.
- **Testing existing hybrid protection solutions**
  - **Mangroves and rock revetments**
    - Natural ecosystems like mangroves can be harnessed to keep pace with rising sea levels as their tangled roots can trap sediments brought in by the tides.
    - They can supplement man-made structures like rock revetments to prevent coastal erosion and reduce the force of waves.
    - If found to be effective, these hybrid solutions can reduce the extent of infrastructure needed.
  - **Perched beach**
    - A submerged breakwater, comprising rock bunds and sand, is constructed to create a beach.
    - The underwater structure can reduce wave energy on the beach, while seagrass habitats help to trap sediment on the seabed, thus preventing coastal erosion.
- **Flexible sea walls**
  - Developed by a team of scientists from Nanyang Technological University.
  - Sea walls are designed to protect land and infrastructure from erosion caused by waves and tides.
  - A flexible sea wall with adjustable height can be installed to address uncertainties in sea level rise.

**SITE-SPECIFIC STUDIES**

The research findings by CFI Singapore will help to guide the coastal protection solutions that Singaporean coastal implement. This will be done in phases, from around 2020 starting with the City-East Coast area.

Singapore’s coastlines have been divided into eight different segments for site-specific studies of coastal protection measures. Here’s a look at the progress:

- **North Coast**
- **North-East Coast**
- **South Coast**
- **South-East Coast**
- **City-East Coast**
- **City-West Coast**
- **West Coast**
- **North Coast**

**SOURCE**

- PUB
- The Straits Times

**NOTES**

- To be confirmed.