

PUB awards \$14m for testing coastal defence projects in Singapore

They will be tested at Tanjong Rimau, Changi, Yishun Dam and East Coast Park

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An eco-friendly seawall that seals its own cracks and gradually adapts to rising sea levels is among five projects slated for testing along Singapore's coastline from 2027.

Backed by an injection of about \$14 million from national water agency PUB's Living Lab platform, these coastal protection projects could evolve from pilot projects into scalable solutions in the Republic.

The initiative was announced by Minister for Sustainability and the Environment Grace Fu on June 17, at the Coastal and Flood Resilience Leaders Summit at Singapore International Water Week.

Developed by universities, contractors and consultants, these test-bedded solutions are designed to fortify Singapore's coastal and flood defences, for which the Government set aside \$10 billion in 2020.

Fu said: "By bringing together universities and industry players in these R&D projects, we can turn promising ideas into deployable solutions, and deployable solutions into infrastructure at scale.

"As Singapore and cities around the world confront growing coastal and flood risks, one thing is clear: None of us can do this alone. But together, we can move faster and further."

The projects will be tested at Sentosa's Tanjong Rimau, Changi, Yishun Dam and East Coast Park, PUB said in a statement. These sites were chosen based on technical, operational and environmental factors.

Over three years, the Living Lab's findings will determine the solutions' viability for long-term, large-scale coastal protection.

Off the coast of Changi, a team will trial a "living seawall" designed to incrementally respond to gradu-



Xbloc Armour units on display at the Koh Civil Engineering booth at Singapore International Water Week. A few hundred XblocPlus blocks will be placed off Tanjong Rimau, where one of Singapore's last remaining coastal cliffs and rocky shores is located. ST PHOTO: JASON QUAH

al sea level rise while ensuring that marine biodiversity thrives.

Yang Zi Qian, managing director of Delta Marine Consultants, said the approach could upend the traditional view that vertical seawalls are at odds with nature, while providing flexibility to gradually extend the wall as the sea rises.

"The concept of an incremental build is going to be one of the essential elements of our coastal protection policy," said Yang, who leads one of the project's six partnering entities. "We don't build a giant seawall all at once, nor do we under-protect. We build what we need, monitor future forecasts and structurally scale it up accordingly to adapt to a changing climate."

The consortium also includes Japanese engineering firm Kajima Corporation, the National University of Singapore (NUS), the Singapore Institute of Technology, Samwoh Innovation Centre and Oung Construction.

The integrated wall will draw on Kajima's experience building an eco-friendly seawall in Tokyo, said Hiroyuki Takasuna, strategic adviser for Kajima Technical Research Institute Singapore. The Tokyo wall was planned with local biodiversity of fish, crabs and other marine life in mind, through the design of grooves, tide pools and other features.

This will be adapted to Singapore's tropical climate, factoring in

the Republic's humidity, temperature, tidal conditions, solar radiation and sea level projections, Takasuna added.

Samwoh Corporation director Ho Nyok Yong said the low-carbon structure will, like the human body, be able to seal itself whenever a crack surfaces, using an embedded network containing a patented sealing agent that acts like a blood coagulant.

He added: "The strength of the (sealing agent) is equal to or even better than the original concrete, allowing it to stand forever."

On Sentosa, another project will deploy an interlocking concrete armour system of blocks that blunts the impact of waves and erosion.

Originally created to protect the Netherlands, where 75,000 such blocks are already in use, the modular defence system known as XblocPlus will be tested for its effectiveness in tropical urban waters with lower wave energy.

A few hundred blocks, each weighing about a tonne, will be placed off Tanjong Rimau, where one of Singapore's last remaining coastal cliffs and rocky shores is located.

Because the armour requires only a single layer, it significantly reduces the material needed for coastal defence, said NUS civil and environmental engineering professor Adrian Law.

His team will use remote sensing

software and other monitoring methods to assess the barrier's strength.

The blocks' high porosity will also provide safe havens for marine life while effectively dissipating wave energy.

This project will mark local construction firm Woh Hup Engineering's first foray into the coastal protection industry, with the goal of ensuring the product is cost-effective enough for nationwide use.

Addressing concerns from nature experts that construction near Tanjong Rimau could disrupt wildlife habitats, PUB said the location of its project was identified by the agency and Sentosa Development Corporation for integration with planned slope stabilisation works.

The works to address slope integrity at Tanjong Rimau are aimed at protecting the area's valuable ecological and historical features, PUB told *The Straits Times*.

It added: "Deployed at the toe of the slope, XblocPlus will serve as a coastal protection measure to mitigate wave-induced erosion to preserve the stability and effectiveness of the slope stabilisation works and safeguard public safety."

These five projects bring the total number of projects under PUB's Coastal Protection and Flood Management Research Programme to 38.

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