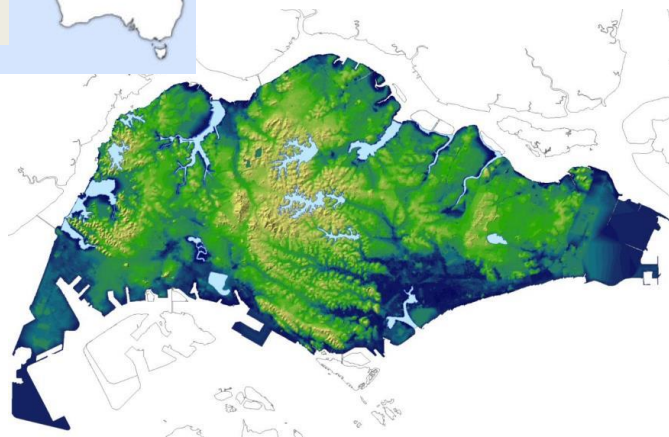


# Singapore's Approach Towards Coastal Protection

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*29 Jun 2023*



# Singapore is low-lying and vulnerable to flooding



Dark blue shades- Areas with elevation lower than 5.0m above mean sea level

## LOW-LYING

About 30% of land area < 5m from mean sea level  
Sea levels could reach 4 – 5m taking into account extreme high tides, storm surge and sea level rise

## SMALL & DENSELY POPULATED

Small island state of 730km<sup>2</sup> with one of the highest population densities in the world

## SURROUNDED BY THE SEA

Affected by conditions in Andaman Sea / Malacca Straits and South China Sea

## TROPICAL EQUATORIAL CLIMATE

Abundant rainfall with mean annual ~2000mm with intense tropical convective rains (up to 150 mm/hr)



# Singapore is committed to turn the crisis into an opportunity

1



2

**PUB appointed as the national coastal protection agency** in 2020 to develop and lead the implementation of coastal protection measures in Singapore

3



Coastal protection is one of our key strategies to **build a Resilient Future under the Singapore Green Plan 2030**

# OUR OBJECTIVES



Prevent loss of  
lives



Minimise damage to assets  
and infrastructures



Preserve functionality of land

## OUR STRATEGIES

- 01 Build continuous line of defence to keep out rising seas
- 02 Additional localised protection for critical infrastructure
- 03 Source-pathway-receptor approach for stormwater management

# APPROACHES

1

Holistic Risk Assessment



2

Flexible & Adaptive



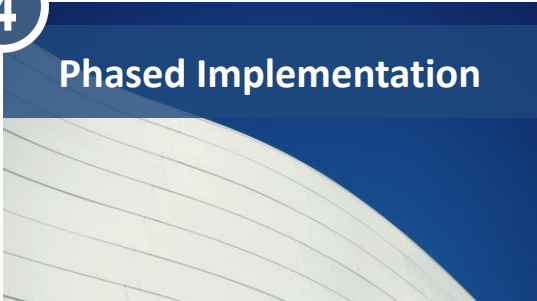
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Integrated Planning



4

Phased Implementation



5

Capability Building



6

Shared Stewardship



1

## Holistic Risk Assessment



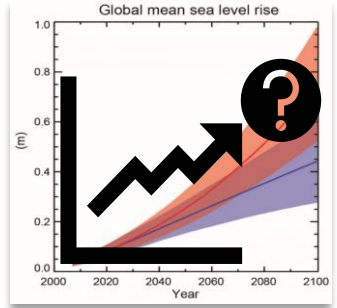
# Coastal-Inland Flood Model

- ▶ Simulates **combined effects** of extreme sea levels and inland floods
- ▶ Allows **continuous** review of flood risks based on **latest available data** from climate science
- ▶ **Predictive** capability

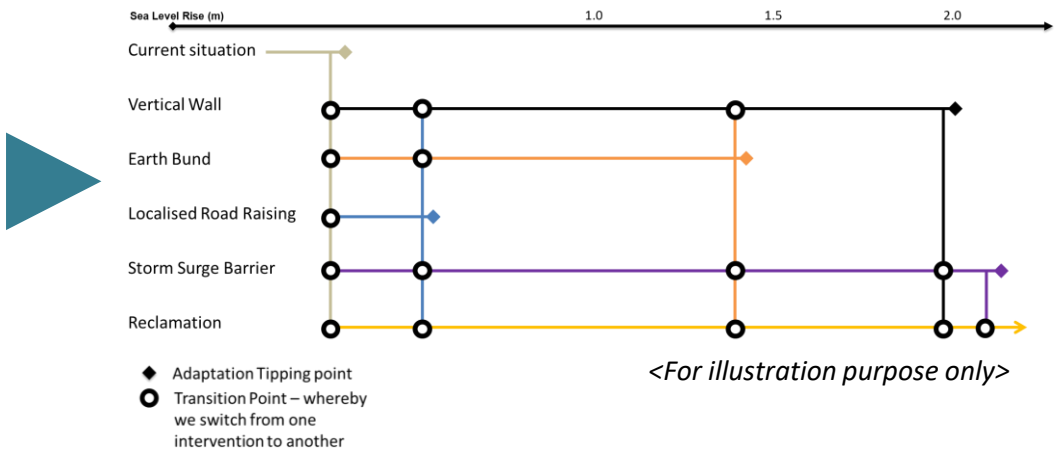
2

# Flexible & Adaptive

## Uncertainties



## Adaptation Pathways



# Adaptation Pathways

- ▶ Identify **range** of options that are flexible and adaptive to climate uncertainties
- ▶ **Sequence** options over time to form “pathways”



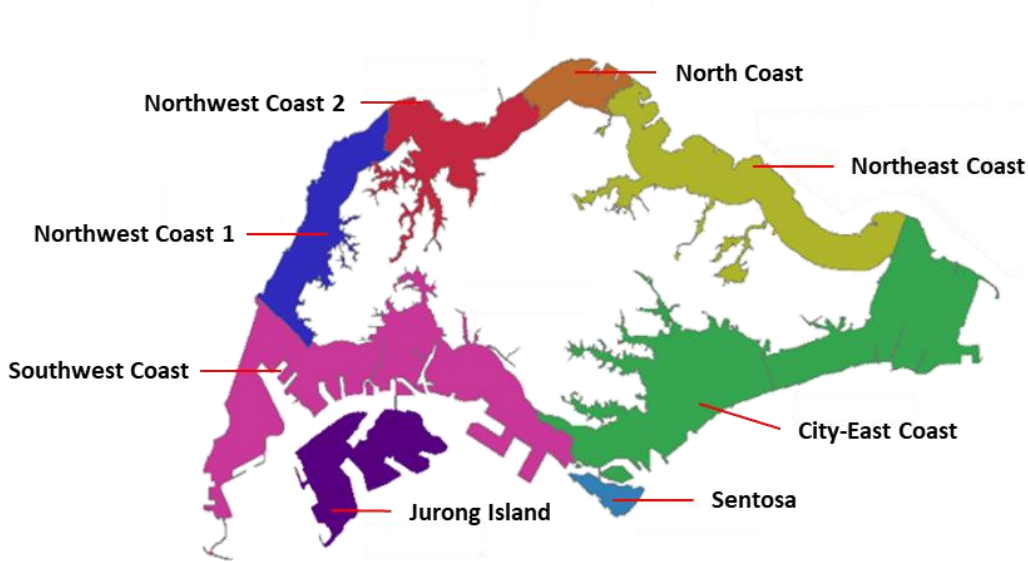


# Multi- Functionality

- ▶ Land scarcity, but highly-varied land use
- ▶ **Value creation** through achieving multi-functionality
- ▶ Opportunity for **nature-based solutions** (NbS)



# Phased Approach



- ▶ Site-specific studies (SSS) for different segments to be done progressively, starting with City-East Coast
- ▶ Phased implementation of measures to avoid bunching up of resources

# 5 Capability Building

A **dedicated research programme** to holistically address Singapore's flood protection challenge against climate change and **build long-term capability**

Centre of Excellence

Coastal Protection and Flood Management Research Programme (CFRP)

Applied Research

Living Lab



# Communications & Engagement

- Understanding the problem
- Awareness of challenges
- Recognise opportunities

## EDUCATE



3-part edu-tainment series on coastal protection



*“Our Coastal Conversation” – community dialogue*

## ENGAGE

- Contributing ideas and aspirations
- Acknowledging trade-offs

- Playing a part to co-develop solutions
- Building community resilience

## EMBRACE



*Deploying flood barriers at a residential house*



- Integrate development planning
- Drive and coordinate efforts in coastal protection

## GOVERNMENT

- Build knowledge through R&D
- Grow local capability & train workforce

## EXPERTS & IHLS



## INDUSTRY

- Develop innovative applied solutions
- Design and construct flood protection infrastructure

## COMMUNITY

- Support coastal protection endeavour
- Provide constructive feedback and co-create solutions

Thank You

