

HOW IS HONG KONG ADAPTING TO CLIMATE CHANGE?

typhoons & sea level rise



TYPHOONS, SEA LEVEL RISE, & CLIMATE CHANGE IN HK



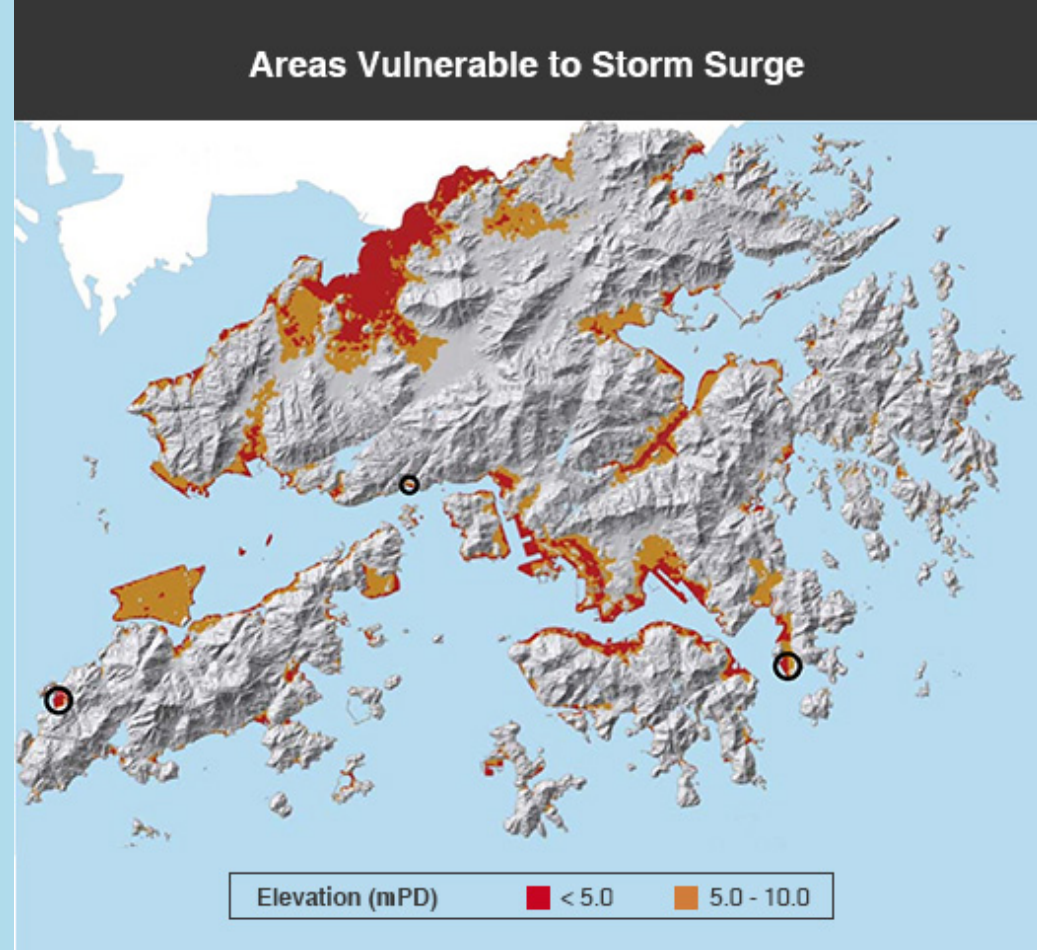
- Climate change is causing rising sea levels and increasing the frequency of extreme weather events
- In South China Sea, the rate of sea level rise (SLR) is 4.3mm/year from 1992 to 2009 (world average is 1-1.5mm)
- Proportion of strong typhoons will increase, and they will move slower and stay in one place for longer
- These two events combined may lead to increased storm surge. coastal & land-based flooding

PHYSICAL & SOCIAL IMPACTS OF TYPHOONS & SEA LEVEL RISE



2018 Typhoon Mangkhut caused a loss of \$4.6 billion HKD, injuries to 458 people, and significant damage to infrastructure & coastal landscapes

Sea level rise and associated storm surges could lead to coastal inundation of low-lying areas (red)
This could put 43k buildings, key infrastructure, and key habitats like mangroves, wetlands & mudflats at risk



CLIMATE ADAPTATION

Intergovernmental Panel on Climate Change

- To prepare for climate-change-induced threats, many places have adopted **climate adaptation** strategies
- IPCC categorizes adaptation into these 4 strategies

Protect

Hard engineering (seawalls, levees, flood barriers), nature-based solutions (coastal habitats)

Accommodate

Wet and dry proofing built environment for future climate scenarios

Advance

Land reclamation (i.e. infilling)

Retreat

Creating no build zones near risky areas, planned relocation

Is Hong Kong (HK) doing enough?

CLIMATE ADAPTATION?

Hong Kong

Key frameworks



Hong Kong's Climate Action
Plan – Ch 5 Adaptation &
Resilience



土木工程拓展署
Civil Engineering and
Development Department

CEDD's 2022 Coastal
Hazards Report

Big development plans



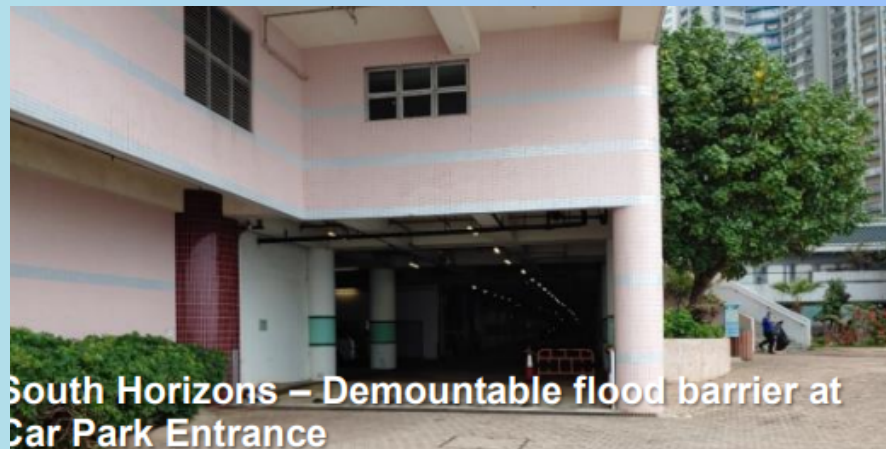
Northern Metropolis
Development Strategy
(北部都會區發展策略)



Lantau Tomorrow Vision
(明日大嶼願景)

PROTECTION

hard engineering & ecoshorelines



Existing seawalls protect against 1-in-100 to 200 flood return

Demountable flood barriers installed at South Horizons after damage during Super Typhoon Hato (2017) & Mangkhut (2018)



Hybrid approach: Ecoshoreline project

Structurally complex panels installed on pre-existing seawalls
in Victoria Harbour, Ma Liu Shui, etc, to allow intertidal
biodiversity to thrive

PC: CEDD, Ecoshorelines Hong Kong

PROTECTION

nature-based solutions

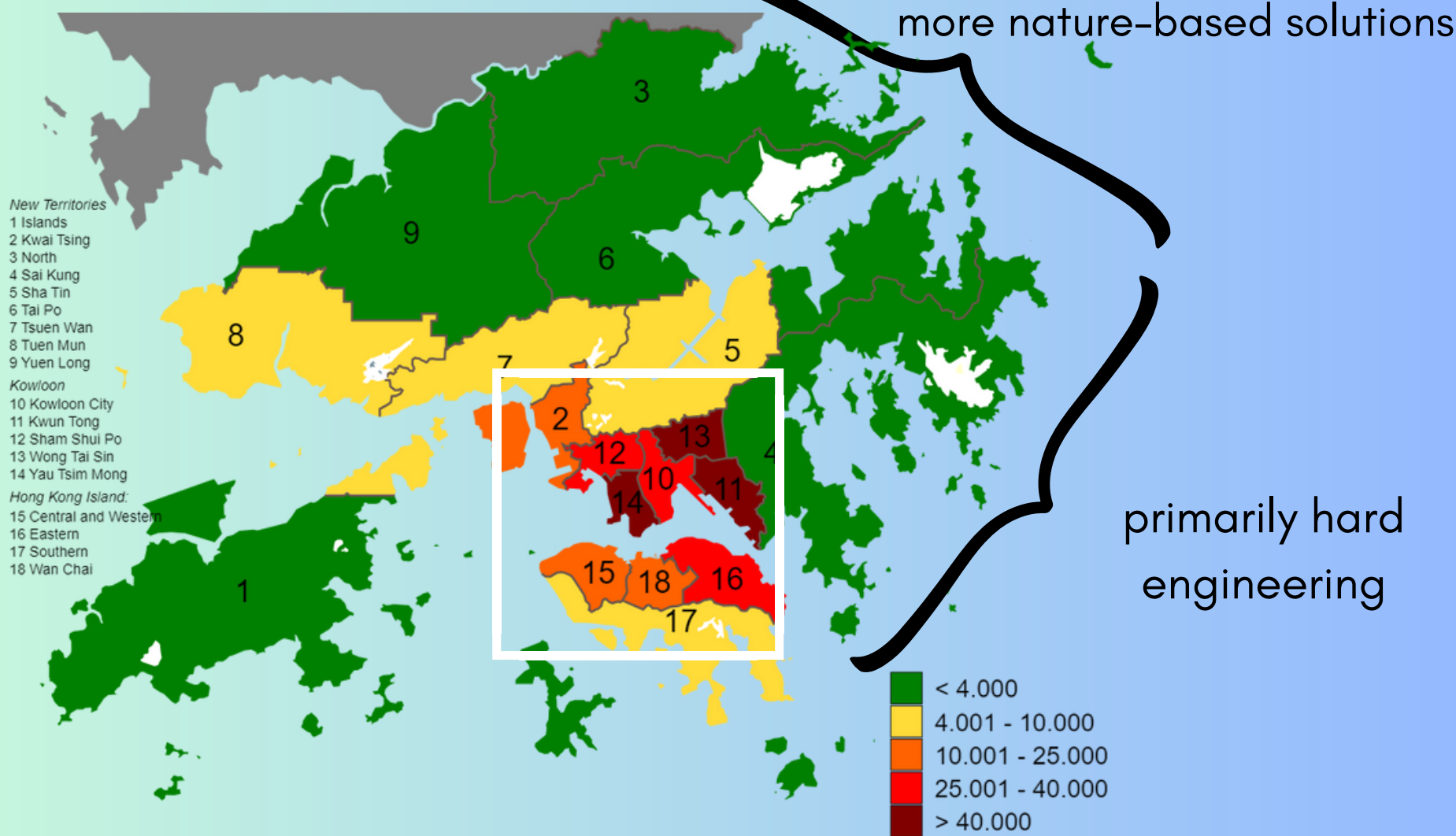
Case study: Habitats within Northern Metropolis Development Strategy (北部都會區)



- The Strategy aims to economically integrate HK and mainland China across the border
- 2000 ha of wetlands zoned for conservation purpose in the plan, however, development proposed will destroy some existing wetlands
- These wetlands prevented serious flooding in residential areas nearby during Super Typhoon Hato (2017)
- These mangroves provide carbon storage services (>750 tons of C per m² of mangroves)

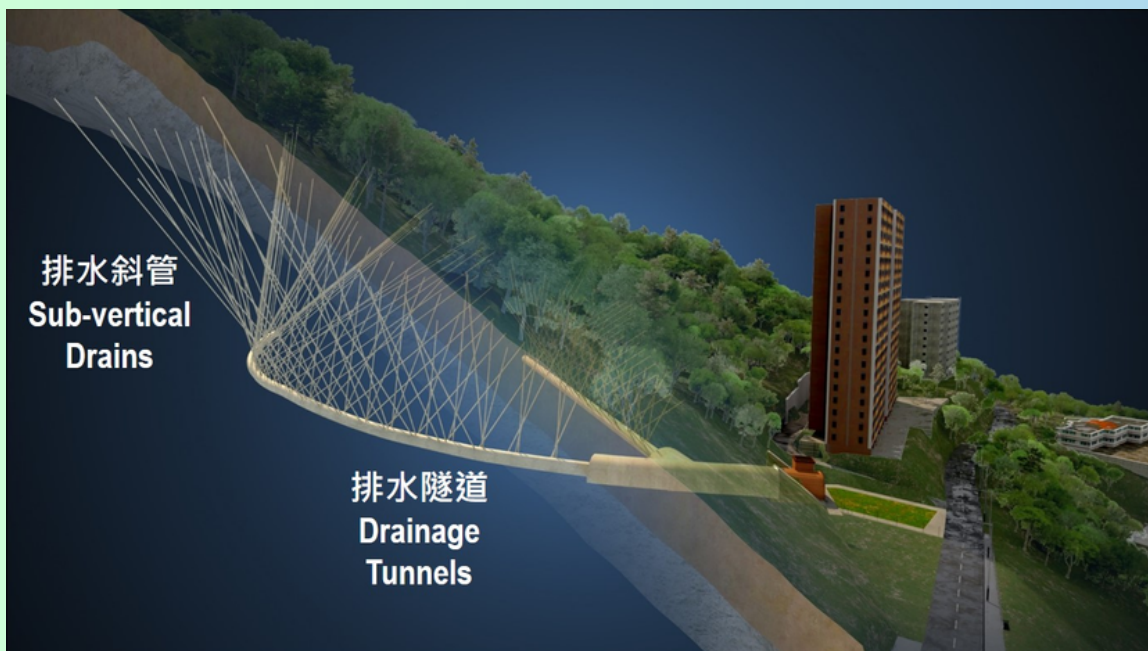
PROTECTION

how well is hong kong doing?



- Hong Kong's seawalls are prepared to withstand 100-year return period extreme weather till 2050
- Nature based solutions are also threatened by sea level rise
--> will not be useful under more serious SLR scenarios
- Highly urbanized areas (in yellow, orange & red) primarily get hard engineering treatment, which need regular maintenance

ACCOMMODATE



- Enhancing pre-existing early warning systems
- In 2020: Development Bureau called for blue-green drainage elements like bioswales, green roofs, floodable areas, flood storage tanks
- After IPCC's 5th Assessment Report, there were updates on infrastructure design manuals (port work, stormwater drainage, road pavement drainage) to withstand climate change
- Adding flood barriers, ditches for Mass Transit Railway (MTR) to accommodate enhanced rainfall

ACCOMMODATE

how well is hong kong doing?

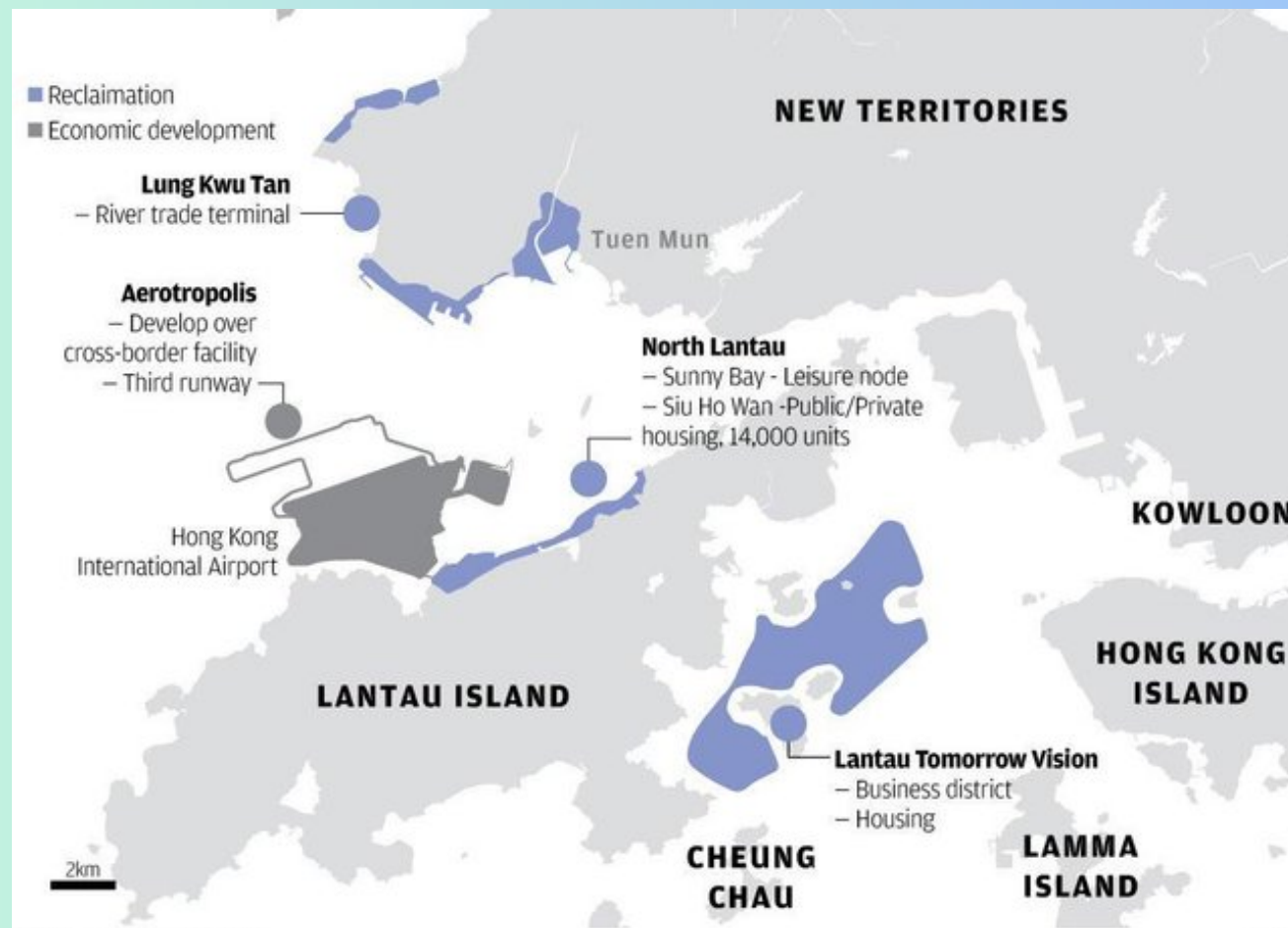


- Hong Kong's existing drainage system surpasses most cities in the world, better preparing it for floods and storm surge
- The Drainage Services Department is solely planning around a low-to-medium emissions scenario of 0.49 m SLR, even though the IPCC states that 2m of SLR by 2100 cannot be ruled out

ADVANCE

- Hong Kong has a long history of creating urban land using coastal reclamation due to its scarcity of flat land, with 7% of its land mass being reclaimed land

Case study: Lantau Tomorrow Vision (明日大嶼)



- Hong Kong's biggest reclamation project yet, announced in 2018, slated to start in 2025
- Reclamation will cover 1700 ha (violet areas in fig)
- Costs 624 billion HKD providing up to 400,000 residential units for 1 million people

ADVANCE

how well is hong kong doing?

Case study: Lantau Tomorrow Vision (明日大嶼)



- Puts endangered Chinese white dolphins, finless porpoises, rare pipefish, endemic lizards in jeopardy
- Will alter water currents and create sediment plumes that will damage local beaches, navigation, and fisheries
- Reclaimed, coastal land is still vulnerable to sea level rise
- There are other alternatives for housing, such as developing 1414 ha of brownfield sites in the inland parts of New Territories

RETREAT



- There seems to be no plans that fall under the 'retreat' umbrella, whether that be systemic relocation or banning building in low-lying areas
- In fact, property developers and the government are planning new developments in vulnerable low-lying areas
- Hong Kong is small, and retreating from it would mean moving to a place with different systems and culture
- Regardless: 30% of residents intend to emigrate from HK

OPPORTUNITIES & CHALLENGES

economy, society & geography



- As a global finance hub, Hong Kong has the funds & capacity to put into climate adaptation (HKD240 billion currently committed to climate mitigation & adaptation)
- There is no sense in the general community of climate resilience
- Hong Kong is small & hilly, with 24% of land being flat & developable, which is also more susceptible to SLR.

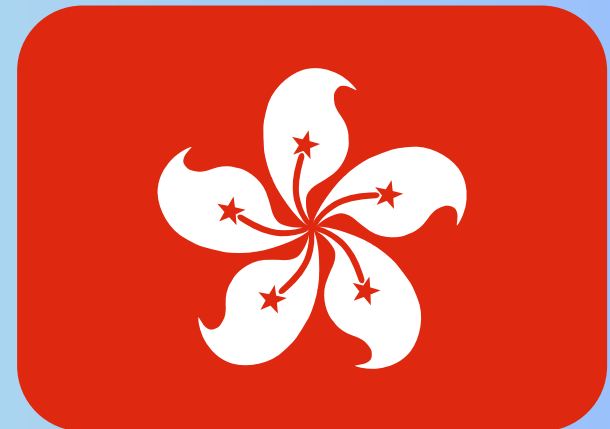
AN ADAPTATION GAP

a case study comparison on
climate adaptation



SINGAPORE

- Adapting to 5.5m SLR
- Very flat, but doesn't have typhoons
- Spending SGD100 billion (HKD 586 billion), 20% of its total GDP on adaptation alone



HONG KONG

- Adapting to 0.8 m SLR
- Hilly, but has an average of 6 typhoons a year
- Spending HKD 240 billion on mitigation & adaptation, and 20% of its GDP on Lantau Tomorrow Vision

CONCLUSION



- Hong Kong's existing infrastructure helps, to an extent, prepare against climate change
- Authorities lack of preparation for higher emissions scenarios may lead to lock-in of adaptation works and maladaptation
- Hong Kong's economy, complex governance and geography gives it a unique blend of opportunities and challenges with climate adaptation
- Development plans such as Lantau Tomorrow Vision and Northern Metropolis Development Strategy blatantly ignores the threats of SLR and typhoons