GREEN COUNCIL
環保促進會

Webinar:
Climate Change Risk Issues: How does it affect business?

Risk of climate Change – Engineering Perspective

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Head of Environmental Affairs, HK Electric

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Risk of Climate Change – Engineering Perspective

Webinar on

Climate Change Risk Issues: How does it affect business?

Ir. HO Hing Yu Steven
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Content

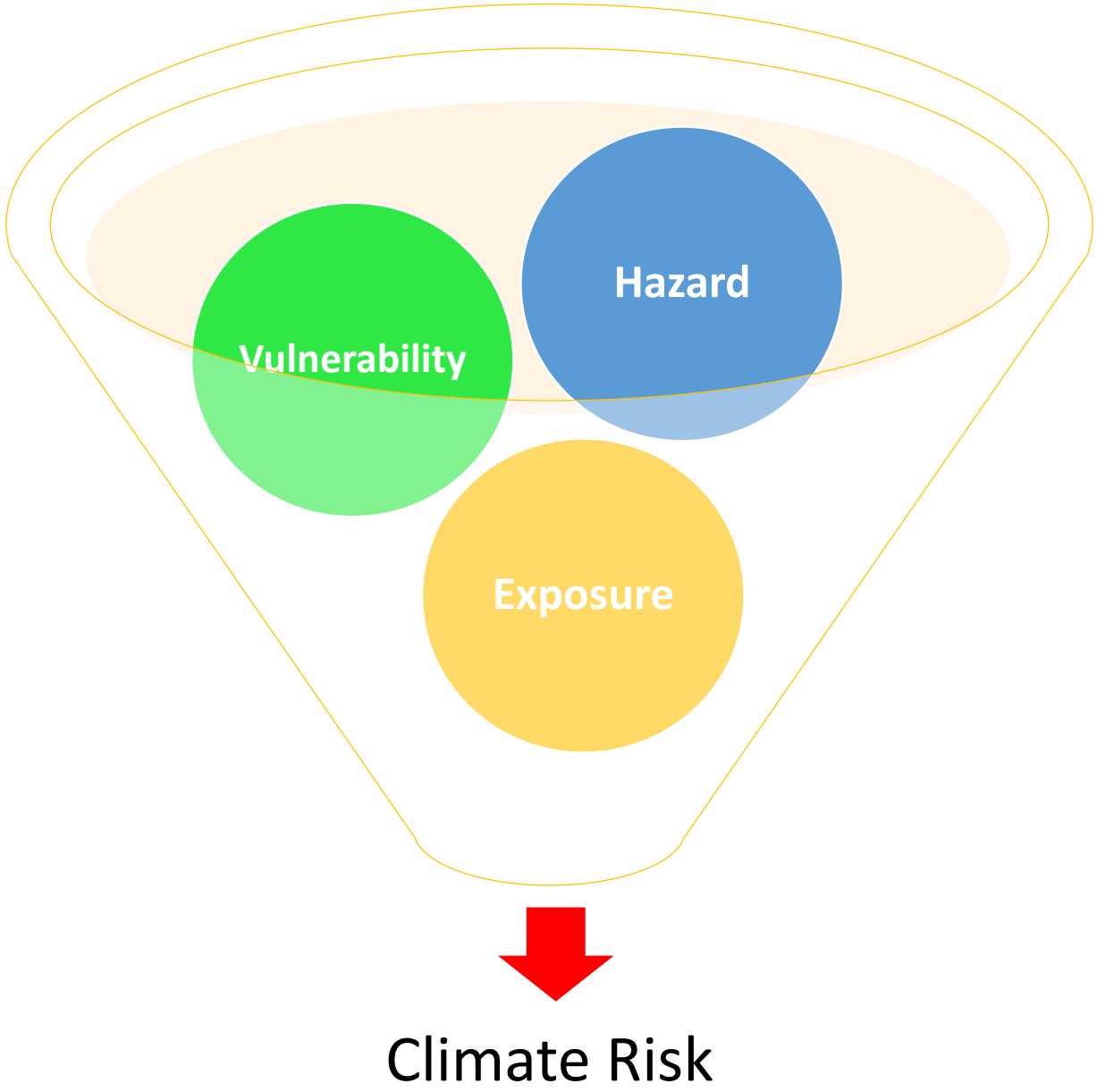
- Climate Risk
- Recent Weather Events Worldwide
- Climate Projection for Hong Kong
- IPCC 6th Assessment Report
- Decarbonization Efforts of HK Electric
- Climate Resilience

Climate Risk

The combination of physical hazards and the vulnerability of exposed elements…..

Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation, IPCC

Example: Rainstorm (the hazard) poses a risk to our city through its tolerance to flooding (vulnerability) and location (exposure)



Recent Weather Events Worldwide

Recent Weathers Events Worldwide

- Hong Kong
  - Coldest new year's day in 16 years, 2021
  - Hottest May, 2021
    - Jul 2020 is the Hottest Month Ever
- Texas, US – Winter Storms, Feb 2021
- Canada – Heat dome, Jun 2021
- California & Europe – Raging wildfire, summer 2021
  - Fire weather: hot, dry & windy

Erratic Rainfall

Worldwide, over 900 people killed in floods & landslides in July 2021

- Zhengzhou
- 20 July 2021
- Max 201.9 mm/hr.
- 24 hr. 552.5mm
- Statistically over 1000-year event

- London
- 12 – 15 July 2021
- 47.8mm of rain in 24 hr. period average
- Monthly rainfall in July 44.5mm

- Netherlands
- 12-15 July 2021
- Over 100mm rainfall in 24 hours & over 200mm for 3 day period
- Representing once in a 1,000 year

- India
- 23 July 2021
- Some areas received 1074.8mm rainfall in 48 hours

- New York
- ….
- ..

Rainstorm in Hong Kong

- Highest hourly rainfall recorded: 145.5 mm
- Hourly rainfall for black rainstorm signal: 70 mm
  - 28 June, first black rainstorm signal in 2021
- Design reference

Return Period (years)	50	100	200	500	1000
60 min. extreme Intensity (mm/hr)	128	137	145	156	163

Climate Projection for Hong Kong

Climate Projection for Hong Kong

- Temperature, rainfall and sea level change of Hong Kong are projected by utilizing data in the IPCC 5th Assessment Report (AR5) and relevant statistical methods
- The annual rainfall in late 21st century is expected to rise by about 180 mm when compared to 1986-2005
- Under the high Representative Concentration Pathway scenario (RCP8.5), the temperature is expected to rise by 1.5-3°C and 3-6°C in the mid-21st century and late 21st century respectively
- Under the medium-low greenhouse gas concentration scenario (RCP4.5), the temperature is expected to rise by 1-2°C and 1.5-3°C in the mid-21st century and late 21st century respectively
- Under the RCP8.5 scenario, the annual mean sea level in Hong Kong and its adjacent waters in 2091-2100 (with the effect of local vertical land displacement incorporated) are expected to rise by 0.73 - 1.28 m (*Revised based on the latest data provided by "The Special Report on the Ocean and Cryosphere in a Changing Climate" published in 2019 by IPCC*)
- Refer to Hong Kong Observatory's website (https://www.hko.gov.hk/en/index.html) for details
- It is expected that the scenarios updated with the 6th Assessment Report of IPCC in Hong Kong would be available soon.

IPCC 6th Assessment Report

IPCC 6th Assessment Report

Headlines

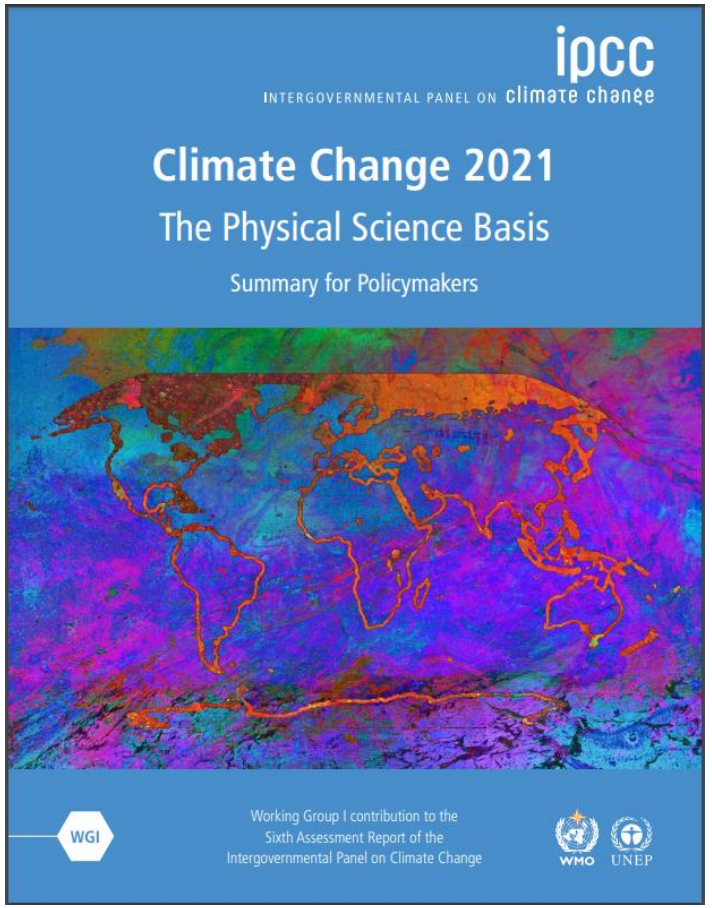
It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred.

Global surface temperature will continue to increase until at least the mid-century under all emissions scenarios considered. Global warming of 1.5°C and 2°C will be exceeded during the 21st century unless deep reductions in carbon dioxide (CO2) and other greenhouse gas emissions occur in the coming decades.....

9 August 2021, IPCC

*"Code **Red** for Humanity" ……*

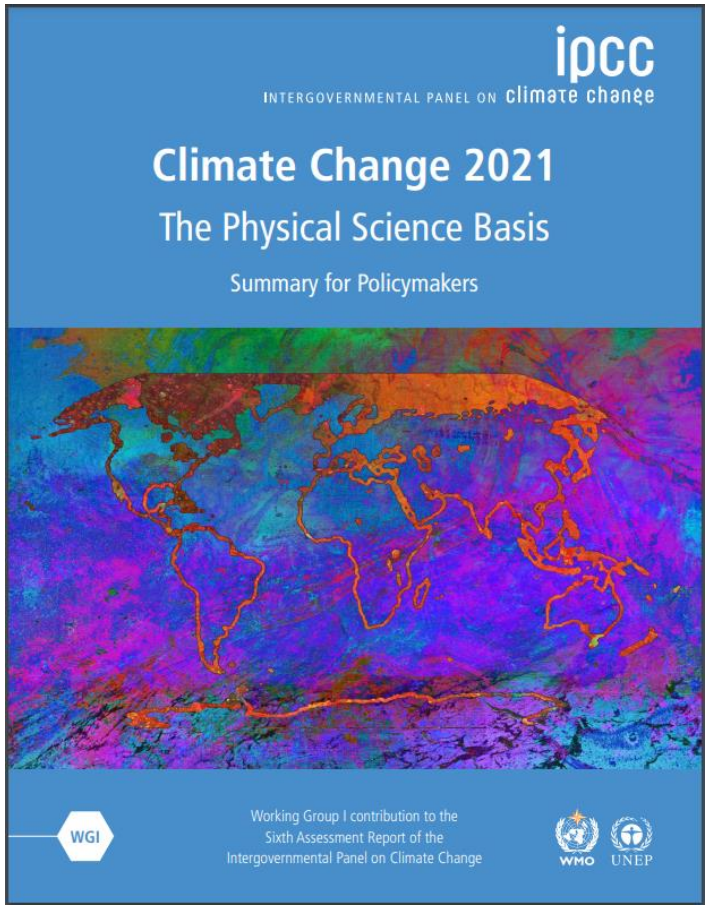
UN Secretary-General, Antonio Guterres



Source: The Intergovernmental Panel on Climate Change

IPCC 6th Assessment Report – Code Red for Humanity

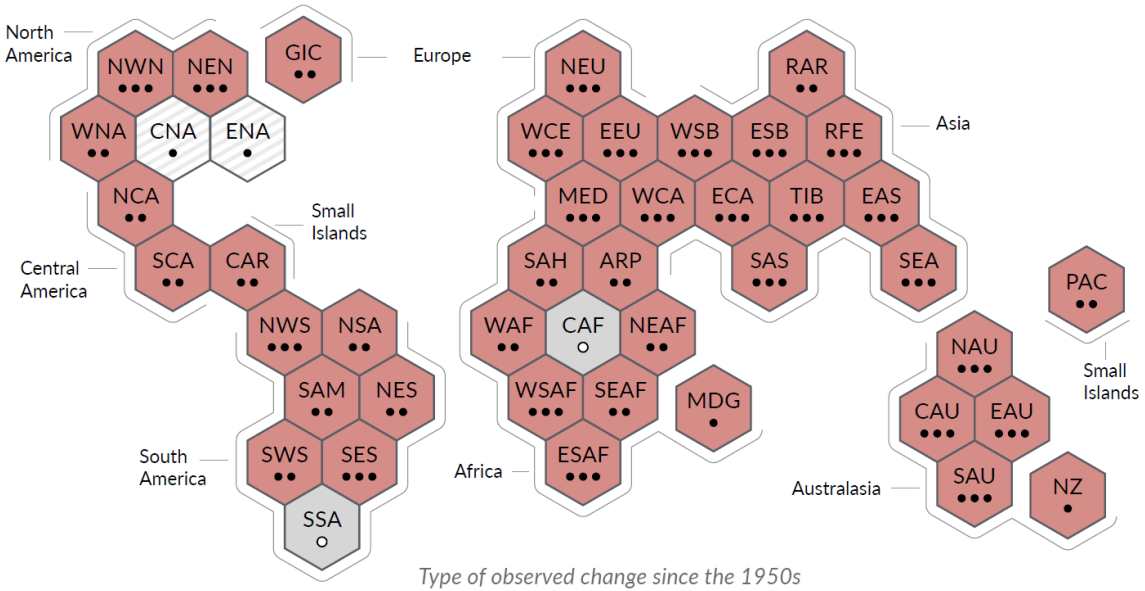
- Increases in the frequency and intensity of hot extremes, marine heatwaves, and heavy precipitation, agricultural and ecological droughts in some regions, and proportion of intense tropical cyclones, as well as reductions in Arctic sea ice, snow cover and permafrost.
- With further global warming, every region is projected to increasingly experience concurrent and multiple changes in climatic impact-drivers...
- Low-likelihood outcomes, such as ice sheet collapse, abrupt ocean circulation changes, some compound extreme events and warming substantially larger than the assessed very likely range of future warming cannot be ruled out and are part of risk assessment.



Source: The Intergovernmental Panel on Climate Change

IPCC 6th Assessment Report - Summary for Policymaker

The International Panel on Climate Change (IPCC) - UN body for assessing the science related to climate change. The panel consists of 195 member countries and the reports are ratified by all of them. The IPCC Reports play a crucial role in underpinning discussions at the UN Climate Summits (incl. COP26)

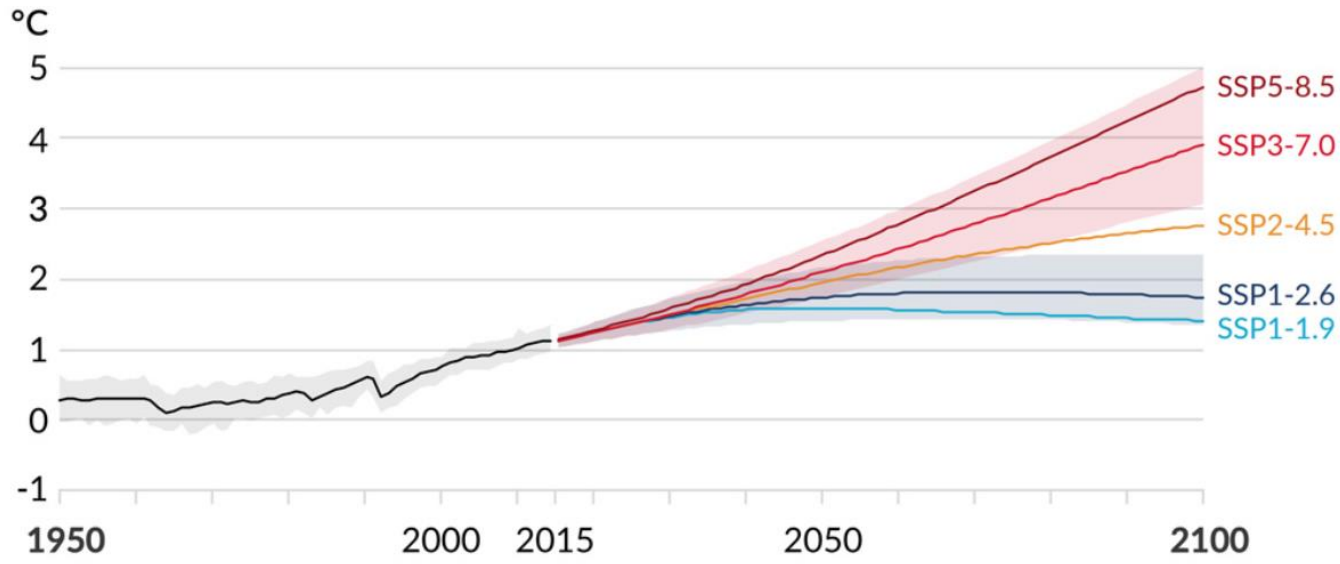


Type of observed change since the 1950s

Observed change in **hot extremes** and confidence in human contribution to the observed changes (3 points as highly confident)

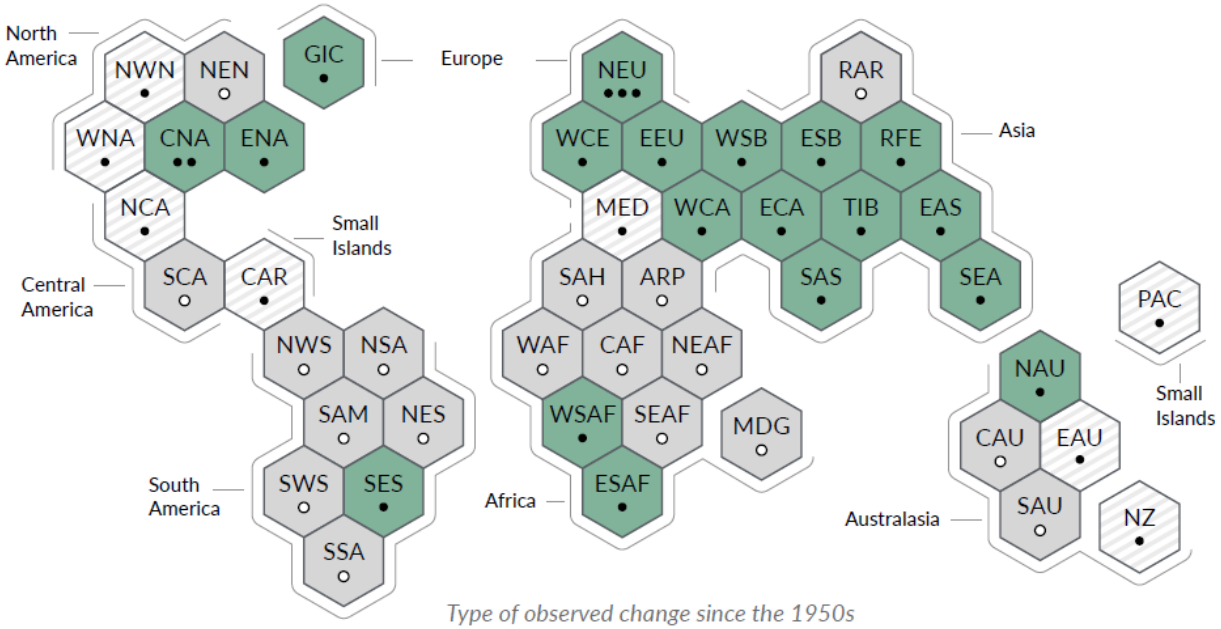
In the past 70 years, **Western Europe, Central Asia, and Eastern Asia have faced the greatest climate change impacts** of heat, precipitation, and drought.

The UNFCCC's climate scenarios show **that only low or very low emissions pathways** will be able to keep global warming **below 2°C** and aligned with the Paris Agreement.



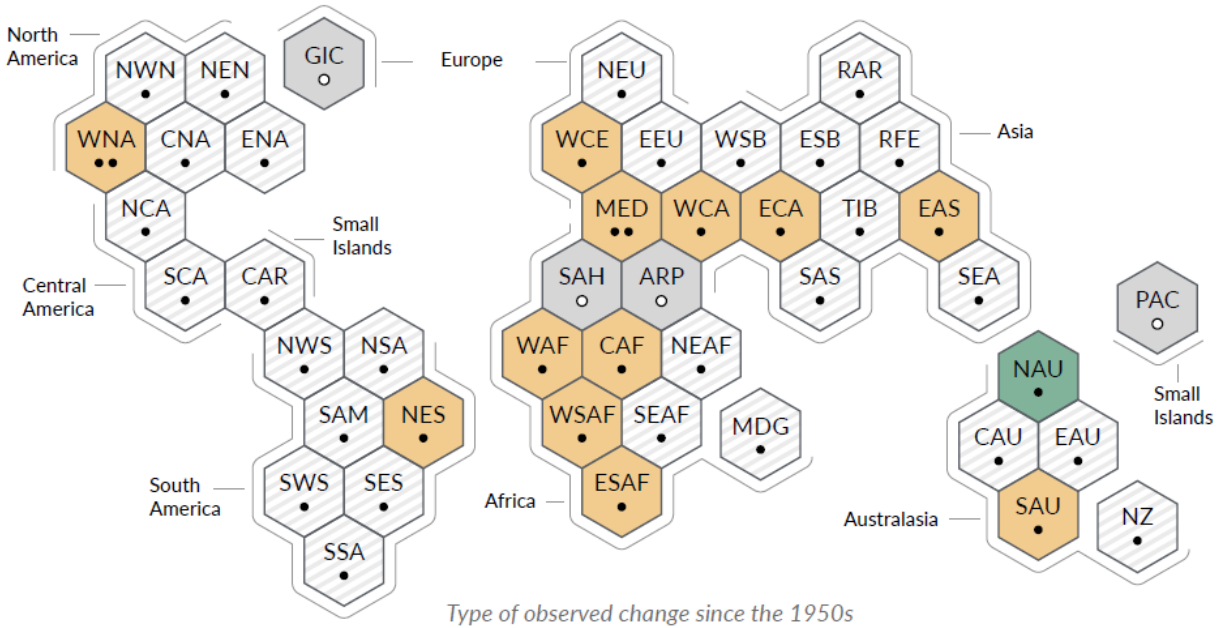
Global surface temperature changes relative to 1850-1900, degrees C, under the five core emissions scenarios used in AR6.
Source: IPCC (2021) Figure SPM.8a.

IPCC 6th Assessment Report - Summary for Policymaker



Observed change in heavy precipitation and confidence in human contribution to the observed changes in the world's regions

Observed change in agricultural and ecological drought and confidence in human contribution to the observed changes in the world's regions

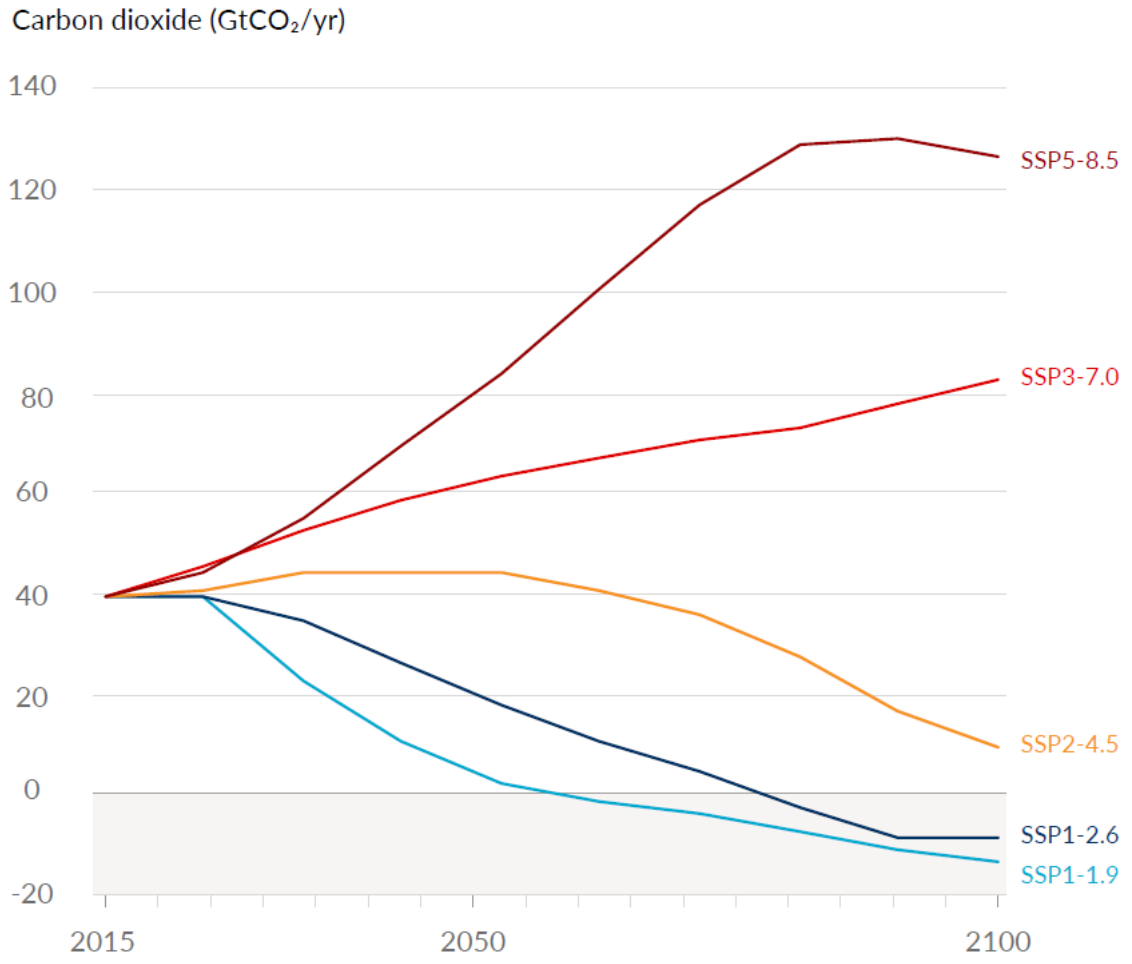


IPCC 6th Assessment Report - Summary for Policymaker

Possible Climate Future under the Shared Socioeconomic Pathways (SSP)

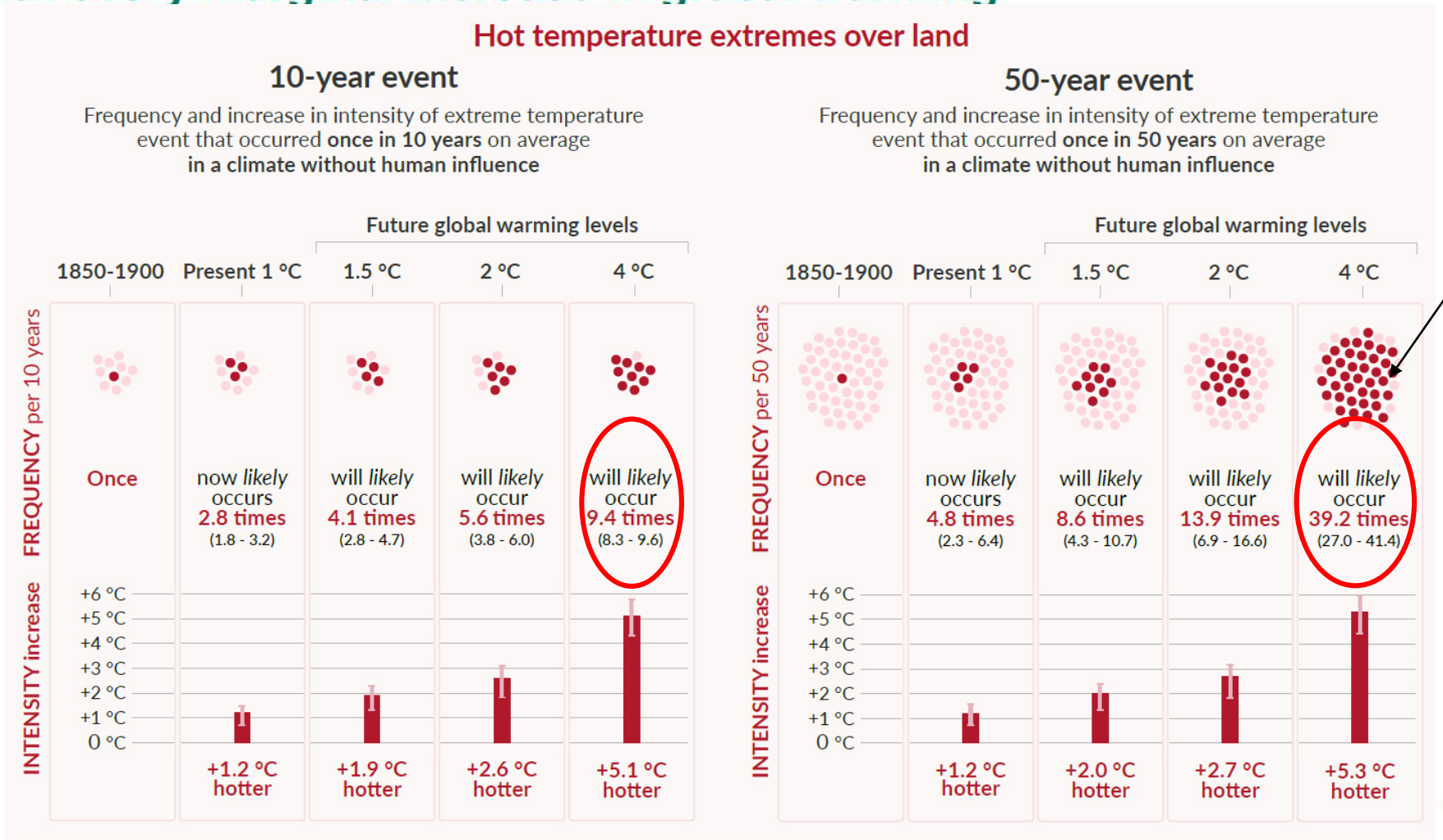
- **A world of sustainability-focused growth and equality (SSP1)**;
- A world broadly follow their historical patterns (SSP2);
- A fragmented world of "resurgent nationalism" (SSP3); and
- A world of rapid and unconstrained growth in economic output and energy use (SSP5)

Scenarios	GHG emissions	CO2 emissions compared to current level	Net zero?	Remarks on CO2 emission
SSP5-8.5	Very High	Roughly double by 2050	✗	
SSP3-7.0	High	Roughly double by 2100	✗	
SSP2-4.5	Intermediate	Remains until the middle of the century	✗	Not reaching net zero by 2100
SSP1-2.6	Low	Net zero around 2075	✓	Net negative emissions afterward
SSP1-1.9	Very Low	Net zero around 2050	✓	Net negative emissions afterward



IPCC 6th Assessment Report - Summary for Policymaker

Projected Physical Climate Changes are Larger in Frequency and Intensity with every marginal increase in global warming

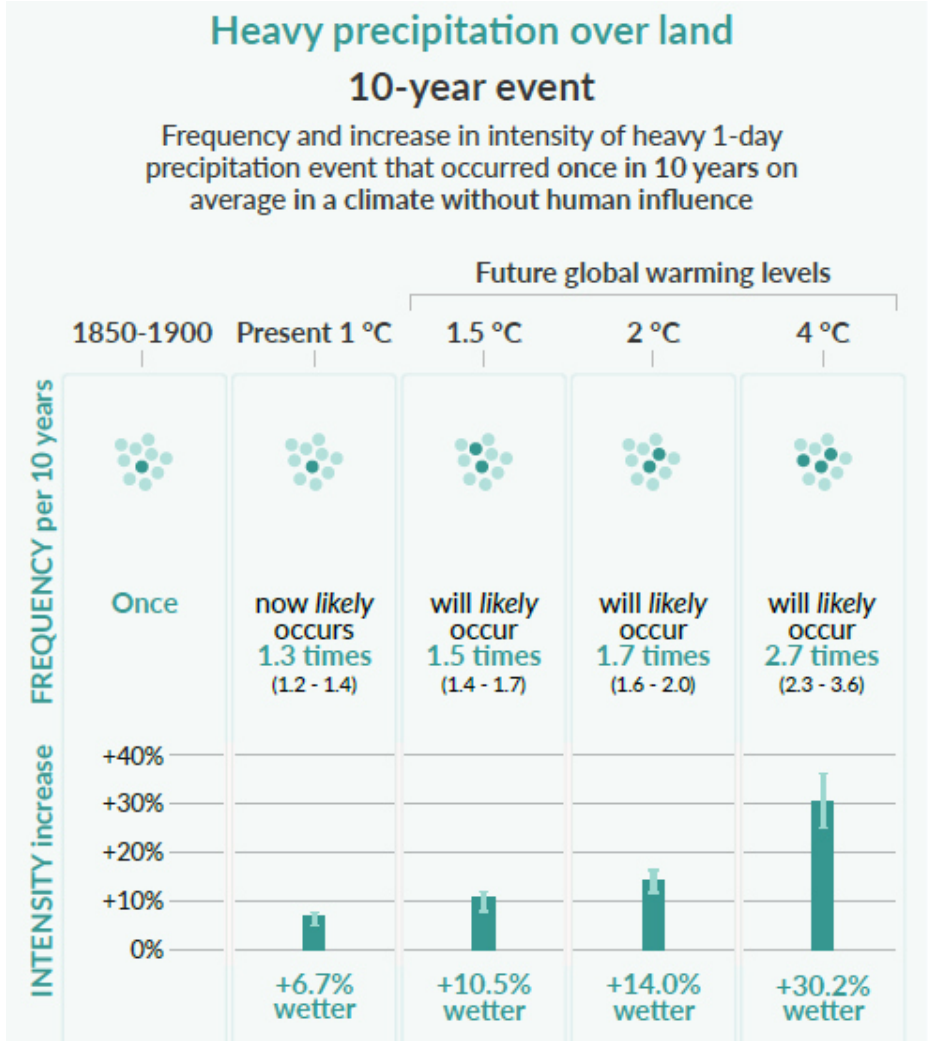


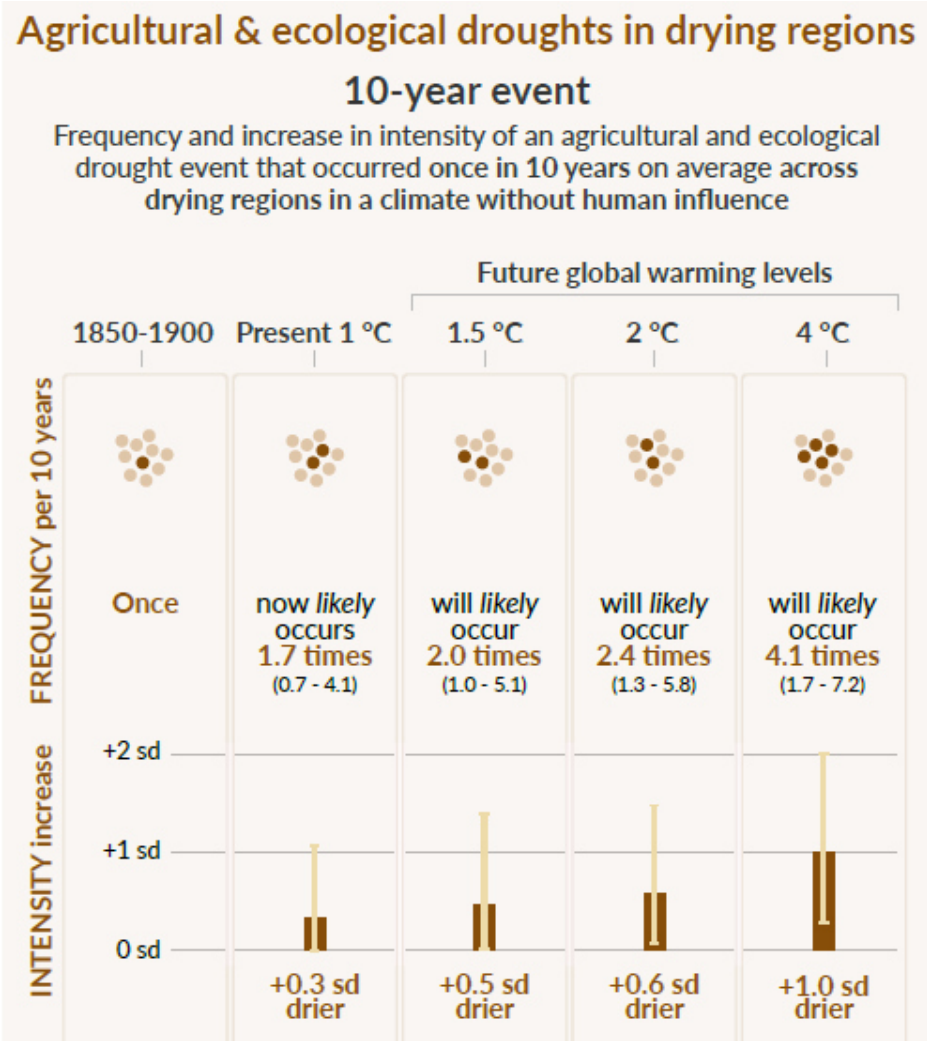
50-year extreme events will be more frequent and intense

Source: IPCC (2021)

IPCC 6th Assessment Report - Summary for Policymaker

Projected Physical Climate Changes are Larger in Frequency and Intensity with every marginal increase in global warming



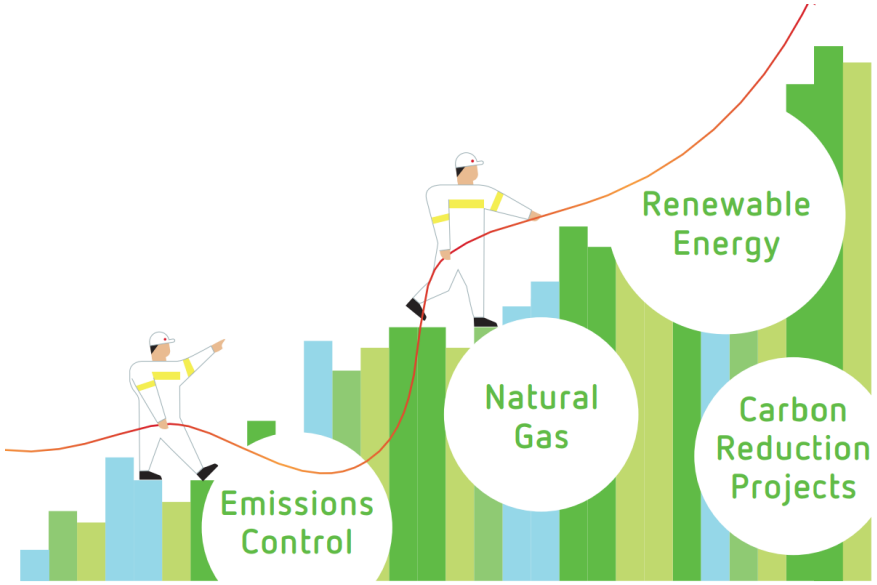


Decarbonization Efforts of HK Electric

HK Electric's Journey of Decarbonization

In November 2020, the Chief Executive further announced in her policy address the target for Hong Kong to achieve carbon neutrality before 2050 with schedule to update the Action Plan in 2021.

As electricity generation is among the largest carbon-emitting sectors locally, HK Electric keenly supports this global and national vision to minimise carbon emissions. We look forward to the updated Action Plan which will set the direction for the city's long-term decarbonisation strategy.



Decarbonizing our generation portfolio

- **Switching from coal to natural gas** provides a clean, reliable and cost-effective way to reduce carbon emissions. We are progressively phasing out coal-fired generation at Lamma Power Station (LPS) in favor of highly efficient gas-fired combined-cycle technology.

- In **2022**, we will commission the Offshore LNG terminal and a new another **gas-fired unit L11** after **L10** which was commissioned in 2020.

- **By 2023**, when the other new **gas-fired units L12** is in operation, gas-fired power will account for around **70% of the total output** from LPS, resulting in a **reduction of absolute carbon emissions by approximately 40%** compared with 2005.

- **Beyond 2023**, we have capacity to develop additional gas-fired units within the existing site at LPS. It is possible for us to **achieve 100% gas-fired electricity output** in the **next decade** subject to the development of Hong Kong's decarbonization strategy.

The Offshore LNG terminal will enhance the security of our fuel supply and help mitigate the pressure of rising fuel costs associated with coal to gas transition for power generation

Renewable Energy

Current Installed Capacity

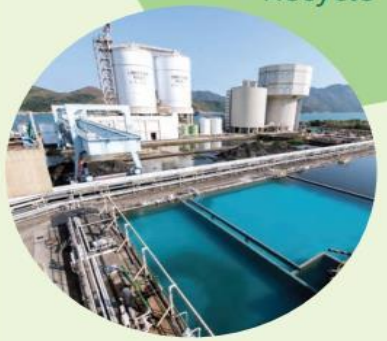
- 0.8 MW Lamma Winds Turbine since 2006
- 1 MW solar power in Lamma Power Station since 2010

Ongoing Projects

- Feed in Tariff scheme and the RE Certificate Scheme
- Exploring local large scale projects, e.g. a 150 MW offshore wind farm by 2027

Reducing our Carbon Footprint & EE&C Improvement

Adopting **"4R" practices –** Reduce, Reuse, Recover and Recycle



- **Reduce fresh water consumption**
  Rainwater and plant processing water are collected for reuse to help cut down on fresh water used

- **Save energy**
  "Overtime Buttons" are installed for manually operating air-conditioning supply after office hours
- **Promote biodiversity through plantations**
- **Reduce paper consumption by digitising work processes**
- **Reduce food waste and donate surplus food**

Effective **management of by-products** such as ash and gypsum from power generation

Ash storage silos
Ash is collected for industrial use

Phasing out petrol vehicles in our fleet and replacing them with **electric vehicles** to minimise roadside emissions

Promotion of Electric Vehicle

- Provide free EV charging service on Hong Kong Island
- Render a one-stop free service to assist customers in implementing EV charging solutions
- Completed the replacement of all operational sedan cars with EVs or hybrid vehicles in 2020.
- Working with transportation sector to implement charging facilities for electric buses at Hong Kong Station Bus Terminus and Central Ferry Bus Terminus.

智慧用電 smart power
電動車充電方案
EV CHARGING SOLUTION

Resilience Measures

Strengthening Climate Resilience

Reliable and Affordable Power Supply

HK Electric is helping bolster the climate resilience of our operations and our city's power supply

Supply Performance in 2020

>99.9999%

record-high supply reliability rating; >99.999% for the 24th year in a row since 1997

<0.5 minute

unplanned customer minutes lost; <1 minute for 12 consecutive years since 2009

Climate Resilience Measures

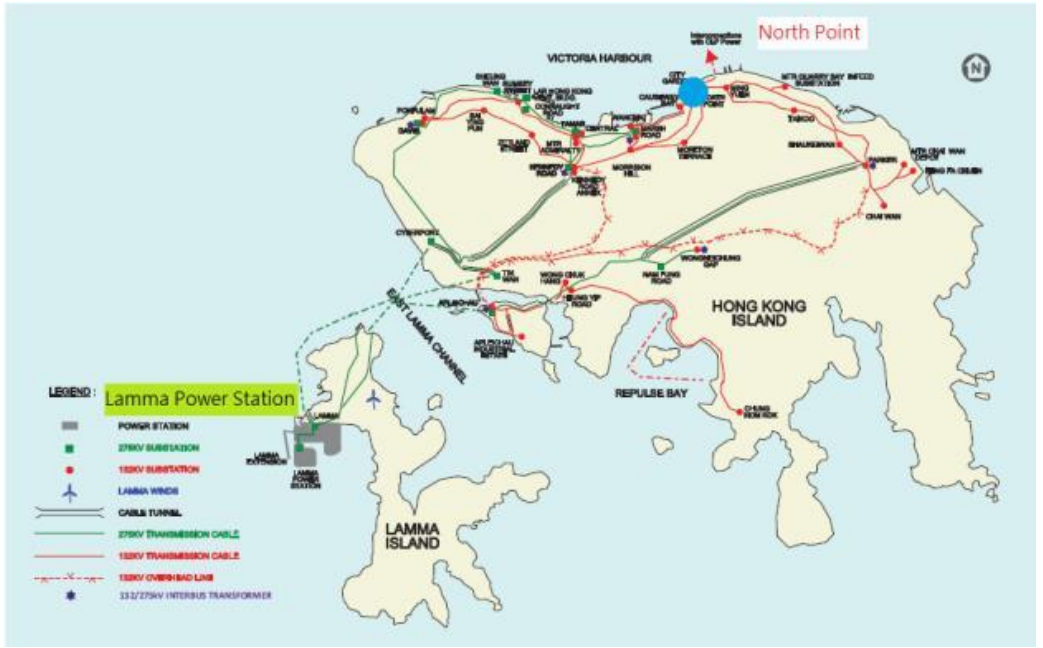
Longer periods of higher ambient temperature	▸ Stringent requirements on reliability for new generation, transmission and distribution facilities and equipment in high ambient temperature ▸ Conversion of 11-kV open-ring distribution feeders to 22-kV closed ring feeders that have more margin and greater resilience against high ambient temperature
Stronger typhoons; more powerful thunderstorms	▸ Underground and submarine cables for nearly our entire transmission network ▸ Typhoon emergency teams on standby to undertake operations and repairs for different severity levels ▸ Dedicated IT reporting platform with mobile applications for effective coordination of emergency response ▸ Decentralised storage of critical spares
Rising sea levels; more erratic rainfall	▸ Anti-flooding systems at LPS and higher ground-level design standards for new generating units ▸ Flooding alarms, bund walls and sump pumps at substations subject to flooding risk from storm surge ▸ Stringent anti-flooding requirements for new substations vulnerable to storm surge ▸ Advice for property managers in commercial and residential buildings on installing anti-flooding systems in their switch rooms with high flooding risk

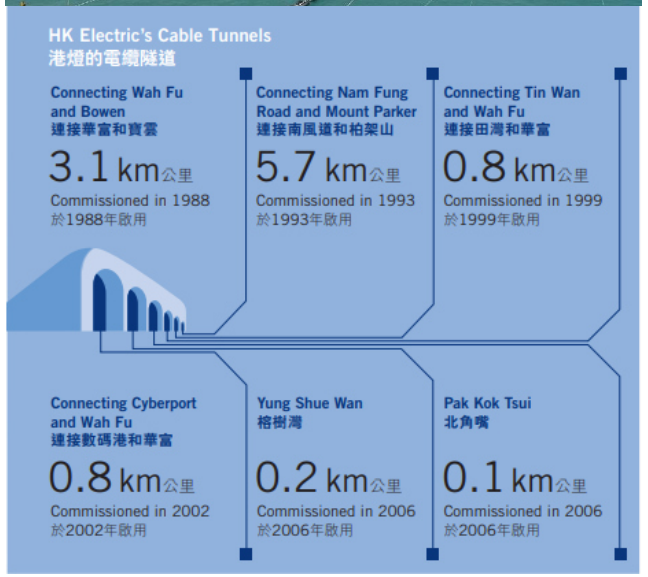
Flooding

- Anti-flooding for substation vulnerable substations to storm surge
- Typhoon Mangkhut has caused flooding in a substation
- Anti-flooding system to protect substations building
  - automatic sump pumps
  - flood gates
  - 2-stage flooding alarms
  - CCTV system

Strong Typhoons

- The use of underground cables and submarine transmission cables in the transmission system ensures supply reliability in inclement weather such as typhoon.
- To burying the cables directly underground, six dedicated cable tunnels have been built to house the transmission cables.





Thank You