CLIMATE CHANGE & RESILIENCE

Climate hell is almost here!
Are we ready?

Lam Chiu Ying

2026.2.13

We are on a highway to climate hell
with our foot on the accelerator.

11.7.2022

Antonio Guterres, UN Secretary-General

We need an exit ramp off the highway to climate hell

2024.6.5

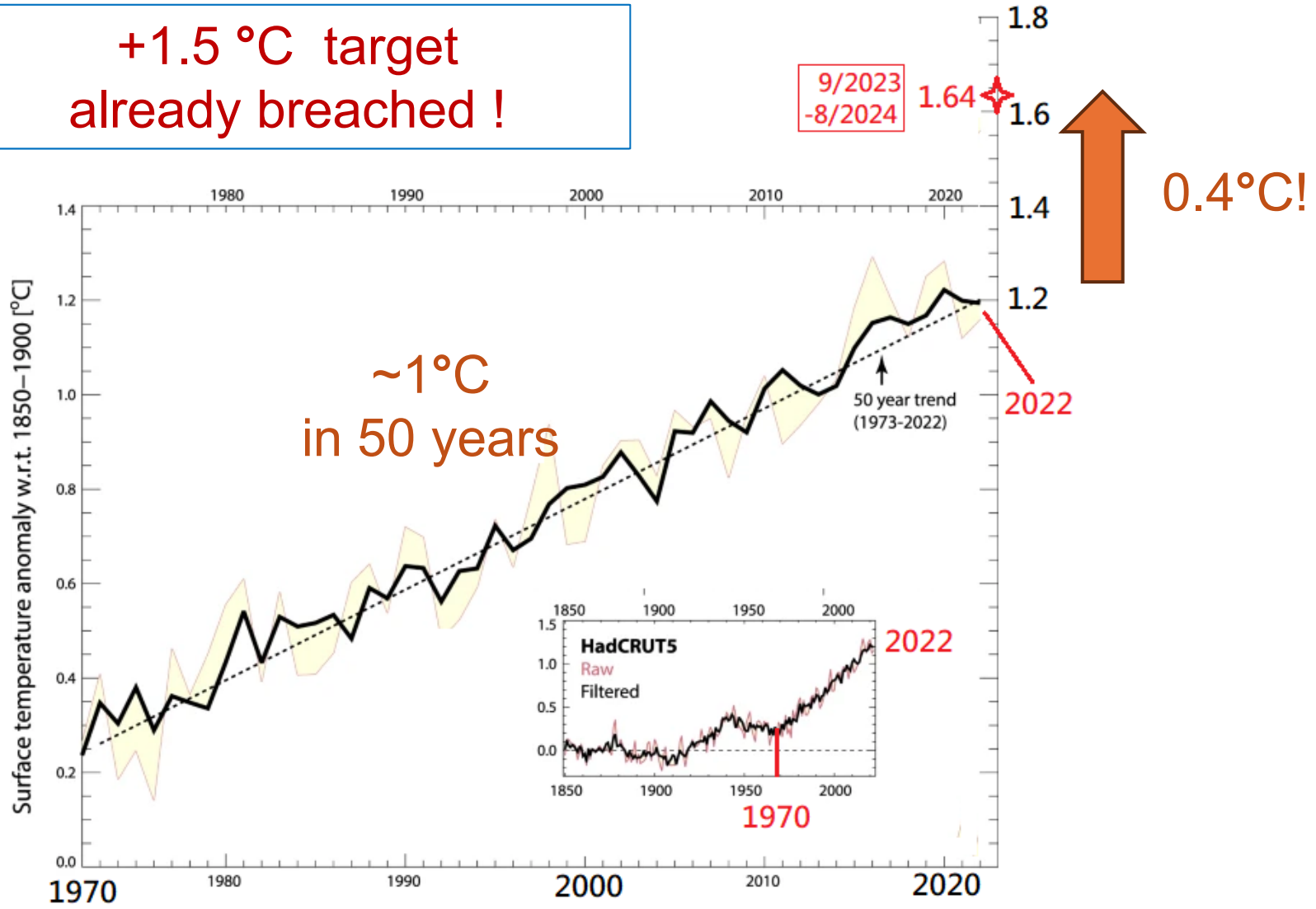
Around the world, people **are** paying a terrible price.

2024.10.24

On the heels of Guterres' 2022 speech

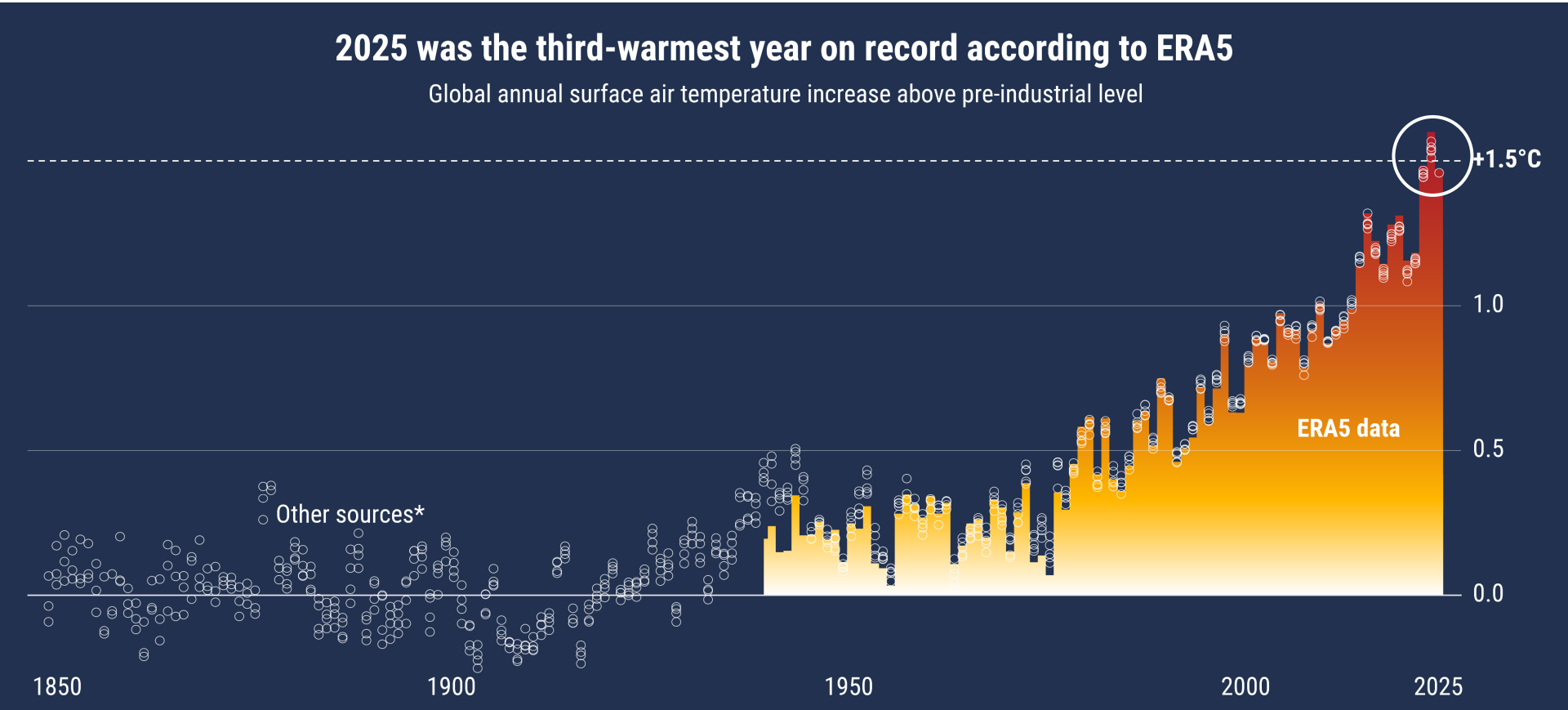
2023-2024 – hot beyond belief

+1.5 °C target
already breached !



Samset, B.H., Zhou, C., Fuglestvedt, J.S. *et al.* Steady global surface warming from 1973 to 2022 but increased warming rate after 1990. *Commun Earth Environ* **4**, 400 (2023). https://doi.org/10.1038/s43247-023-01061-4

Mean temperature 2023-2025
+1.5ºC above pre-industrial level
Mean temperature 2024 +1.6 ºC

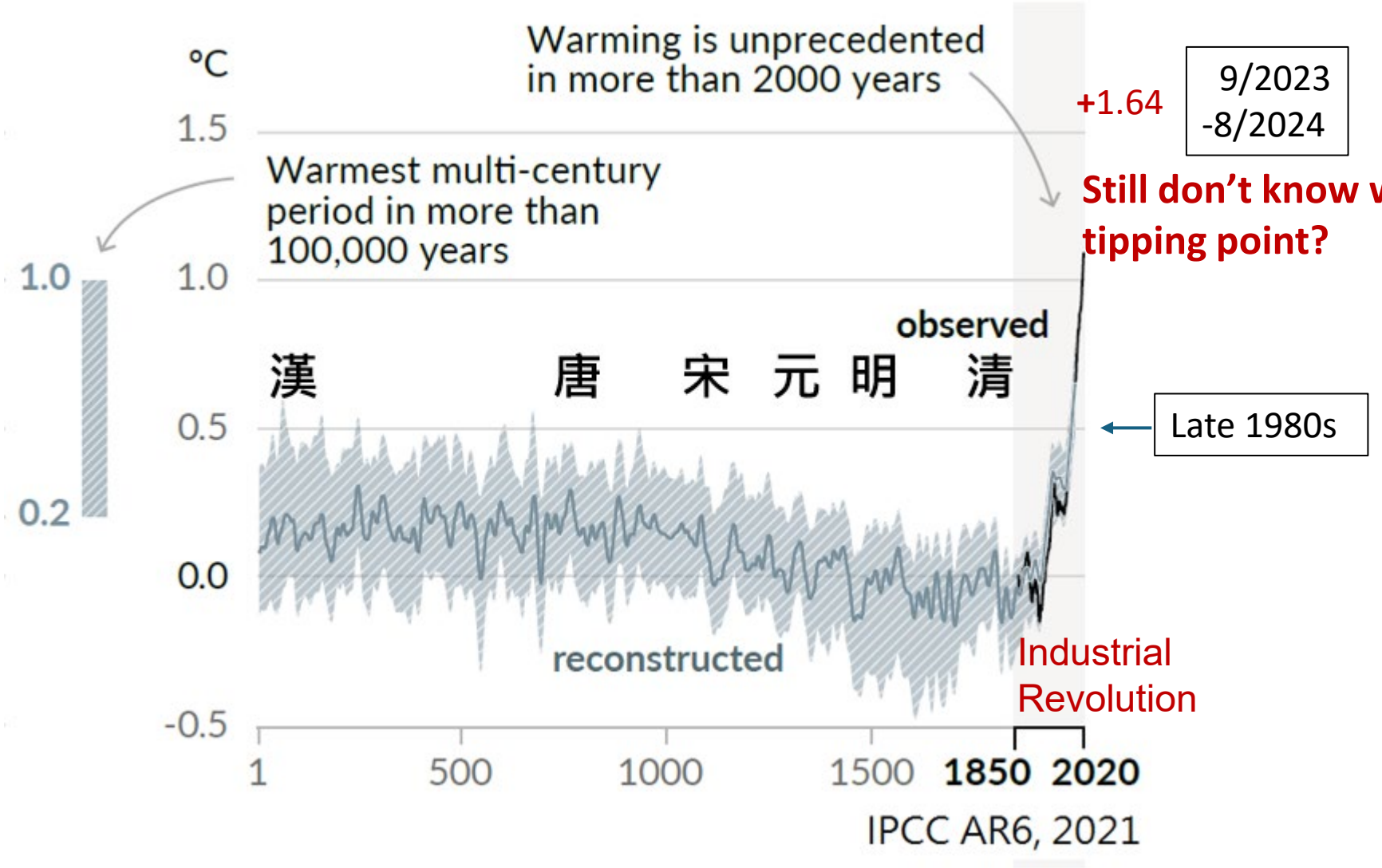


***Other sources** comprise JRA-3Q, GISTEMPv4, NOAAGlobalTempv6, Berkeley Earth, HadCRUT5. Data for 2025 are only available for ERA5 and JRA-3Q.
Reference period: pre-industrial (1850–1900) • Credit: C3S/ECMWF

PROGRAMME OF THE EUROPEAN UNION
Copernicus Europe's eyes on Earth
Climate Change Service
IMPLEMENTED BY ECMWF

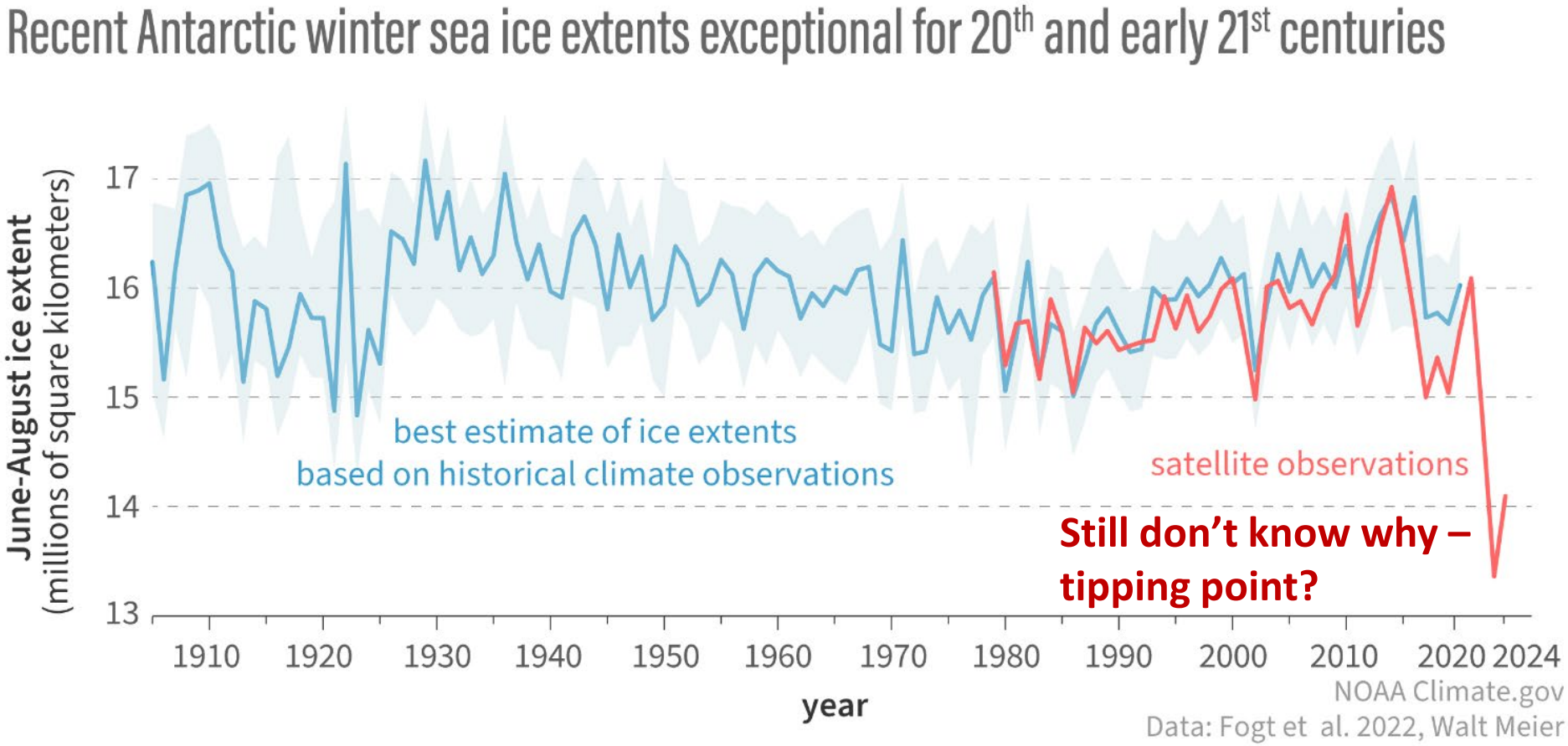
Abrupt Climate Change Accelerating

IPCC AR6, 9 August 2021
Warming unprecedented in 2000 years



Alarming signal from the icy world

Abrupt drop in global sea-ice extent
→ rising sea-level & runaway warming



Bad omens 2025

Impact on EVERYTHING
and hitting all countries

- Extreme weather
- Rising sea-level
- Drought & floods
- Wild fires
- Heat waves
- Air pollution
- "Disasters"
- Insurance costs
- Ecological disruptions
- Ocean acidification

- Water scarcity
- Food shortage
  - farming
  - fishing
- Diseases
  - Vector-borne
  - Zoonotic
- Mental illness
- Malnutrition
- Famines
- Displaced people
- Conflicts & wars

- Tourism impacts
- Water transport
- Supply chain disruptions
- **Vulnerable cities**
- Business risks
- Unstable prices
- Hardship of the poor
- Amplified social inequity
- Social unrest

How to manage this situation?

Climate Change Responses
Disaster Risk Management

Mitigation
Reduce the magnitude of climate change

GEOGRAPHY
No escape

Adaptation
Build resilience

Hong Kong Vulnerabilities

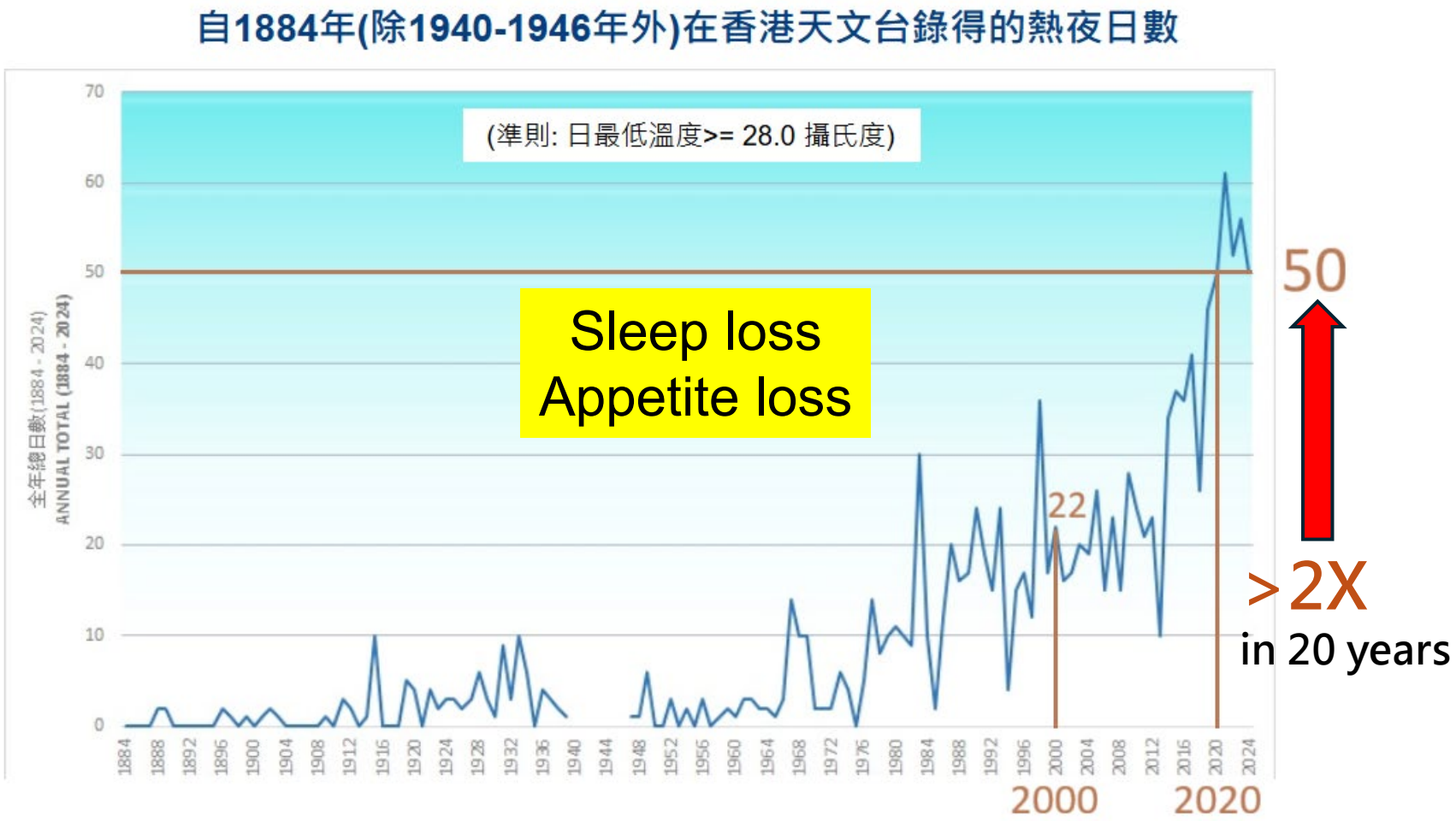
Visible Extreme Weather

Engineers can handle it, given money.


Invisible Extreme Weather
HEAT

Hot nights

Rapid increase since the 2000s

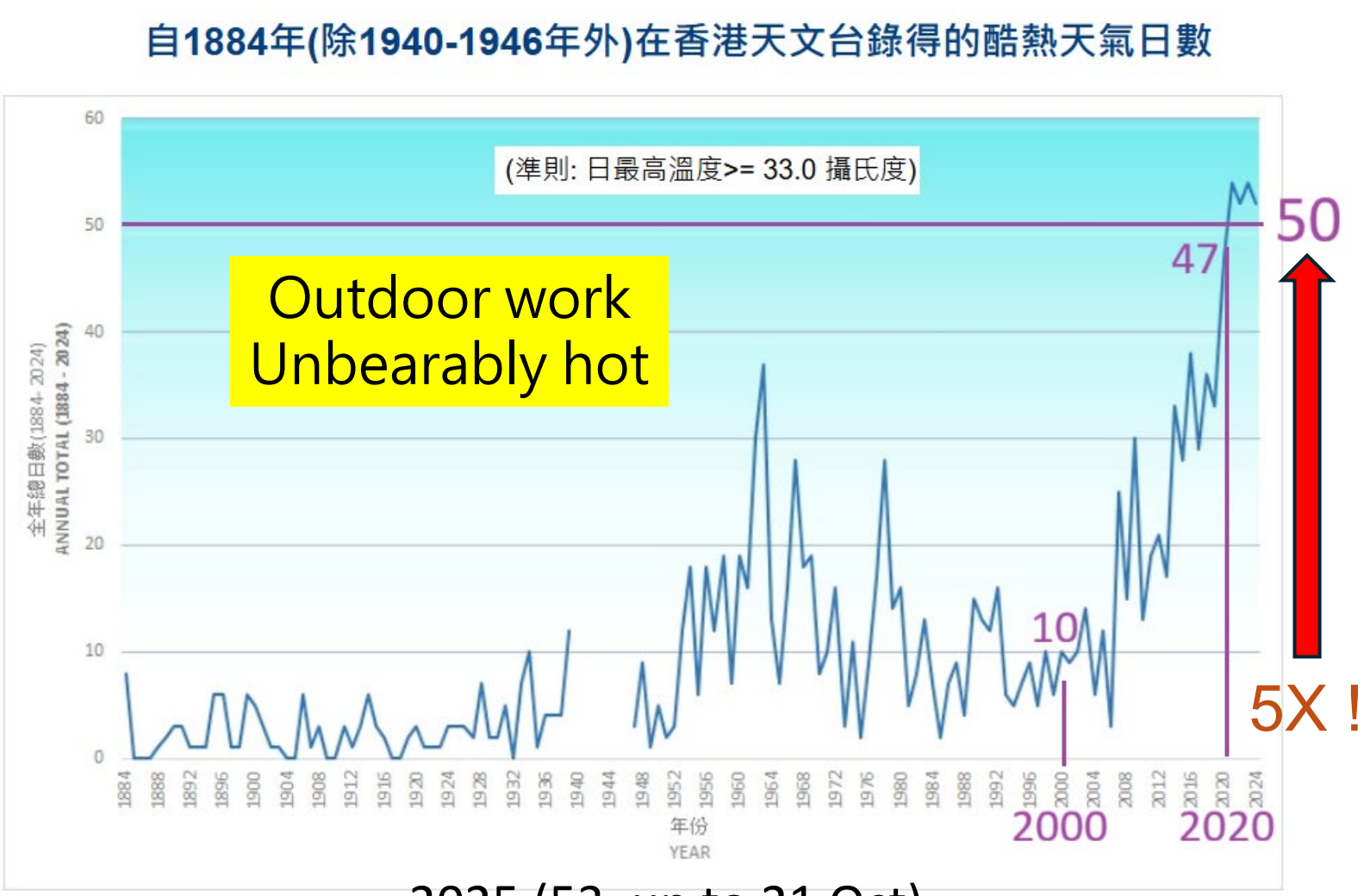


2025 (54, up to 21 Oct)

Very Hot Days

Rapid increase since the 2000s

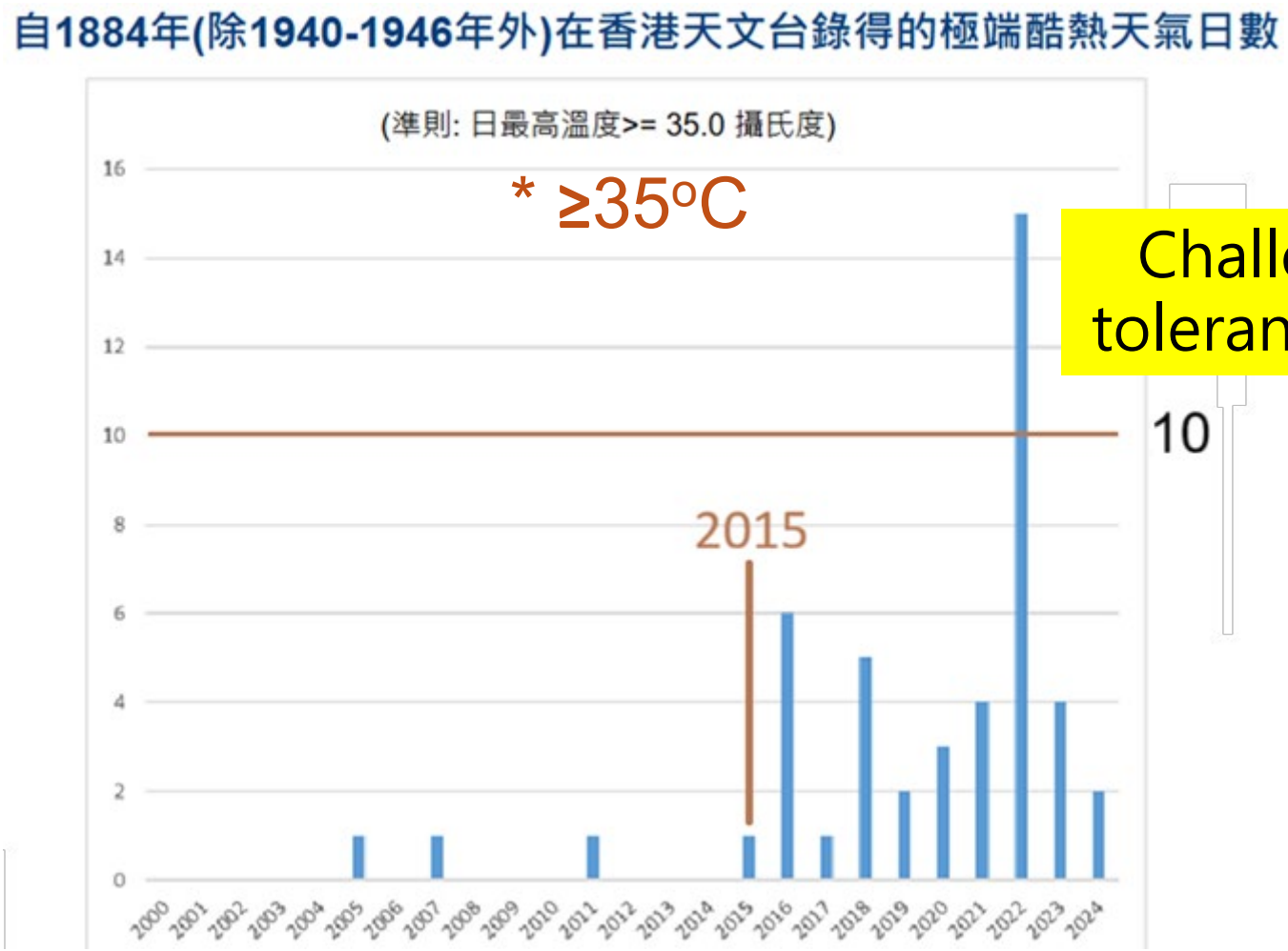
Very Hot Weather Warnings first issued in 2000



2025 (53, up to 21 Oct)

Extreme hot days* becoming new normality

Happening every year since 2015



2025（ 4, up to 21 October ）

Resilience through engineering

to withstand extremes plus projected changes

incl. wind, rain, heat, sea-level rise

- Building codes
- Rain flood defence
- Slope safety
- Roads & railways

- Sea-walls
- Overtopping waves
- Storm surge
  - Protect old towns
  - New towns?

My main concern:

extreme sea-level in storm surge

Extreme sea-level

Standard for major infrastructure projects
200-year return period (c.2000)

Victoria Harbour ~ 4.5 m
Deep Bay ~ 5 m

Extreme Sea Level (mPD)
Valid for circa 2000

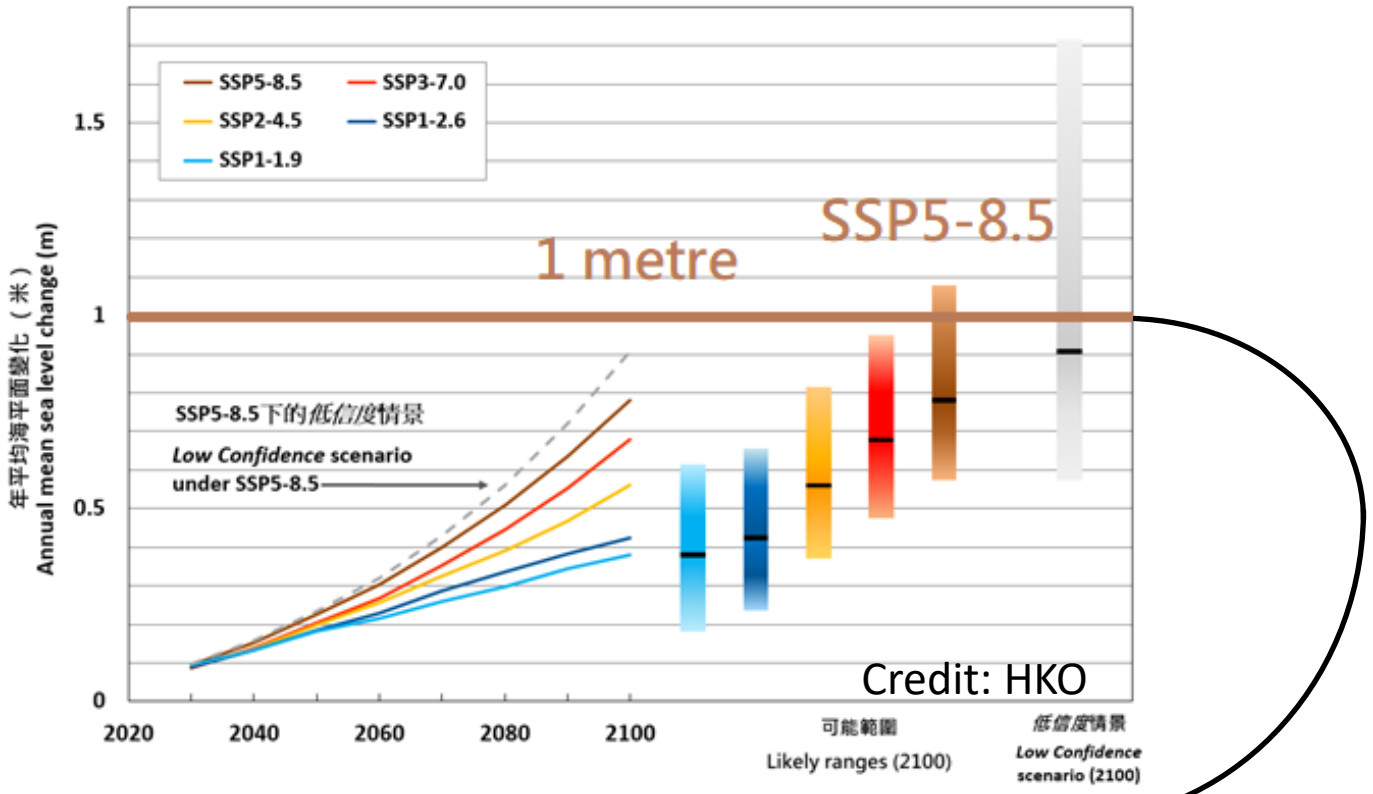
Return Period (years)	Tsim Bei Tsui*	Victoria Harbour* (North Point)	Victoria Harbour^ (North Point)	Tsim Bei Tsui^^
2	3.07	2.82	2.89	3.14
5	3.31	3.03	3.10	3.38
10	3.52	3.21	3.28	3.59
20	3.74	3.38	3.49	3.85
50	4.09	3.66	3.82	4.25
100	4.41	3.91	4.12	4.62
200	4.78	4.19	4.49	5.08

* Source: PORT WORKS DESIGN MANUAL CORRIGENDUM No. 1/2022
Data 1954-2019 (66 years) and adjusted to MSL of AR6 base years (1995-2014)

^ Source: 香港地方志
Data including historical typhoons since 1874 and adjusted to MSL of 1986-2005

^^ Inferred by adding to column 2 the difference between columns 3 & 4

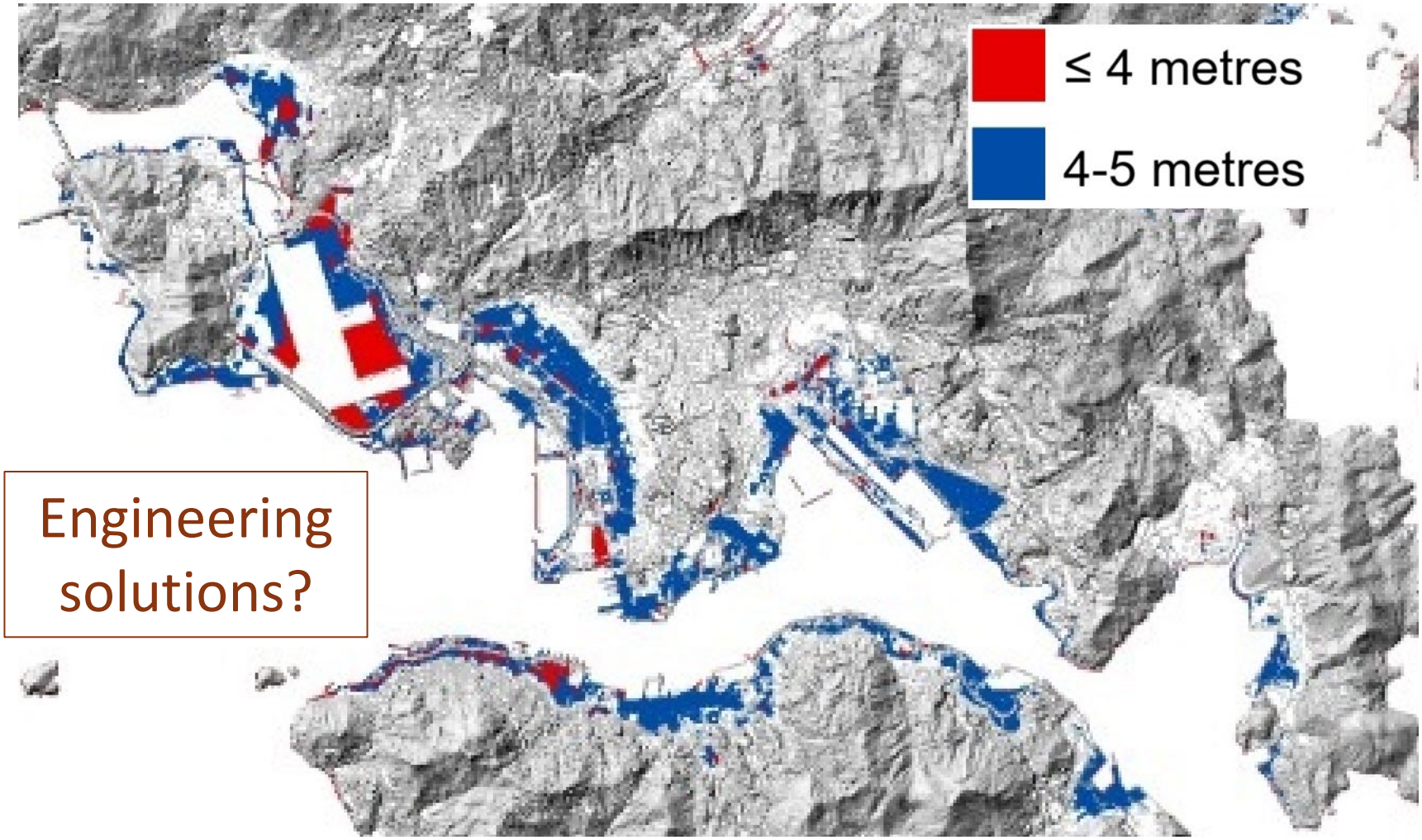
Projected mean sea-level rise under climate change
~1 m by 2100



IPCC: for major infrastructure planning,
adopt the upper-bound figure.

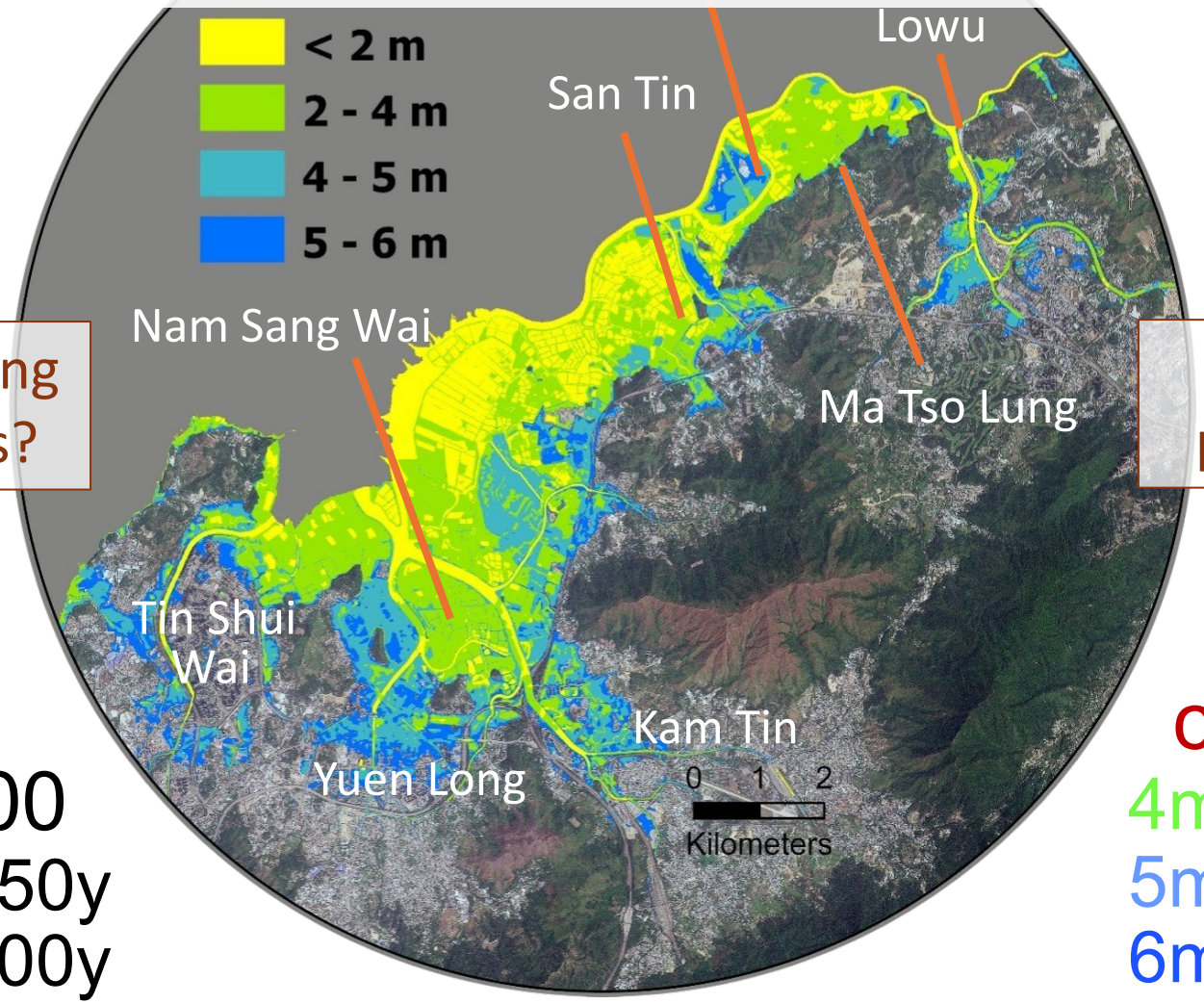
Singapore government has adopted **1.15 m** MSL rise by 2100
and an extreme sea-level of **5 m** as a reference for planning.
https://www.nccs.gov.sg/singapores-climate-action/coastal-protection/

Need to protect the harbour front against 5.5 m at 2100



Engineering solutions?

Building an Innovation & Technology Park
on wetland practically at sea-level ?
CREATING NEW VULNERABILITY



Engineering solutions?

Town planning?

c. 2000
4m < 50y
5m < 200y

c. 2100
4m < 2y
5m < 50y
6m < 200y

Spring Tide HHW 2.7 m

Credit: Jiao

Spring Tide HHW ~3.7 m

Resilience against secondary disasters

City: energy, information, data and computing

- Electricity supply
- Water supply
- Gas supply
- Sewerage system
- Radio broadcasts
- Telephone system
- Internet system
- Banking incl. ATM
- Systems supporting
  - Public services
  - Businesses e.g. supermarket, restaurants

鄭州暴雨｜遇斷網支付寶停擺

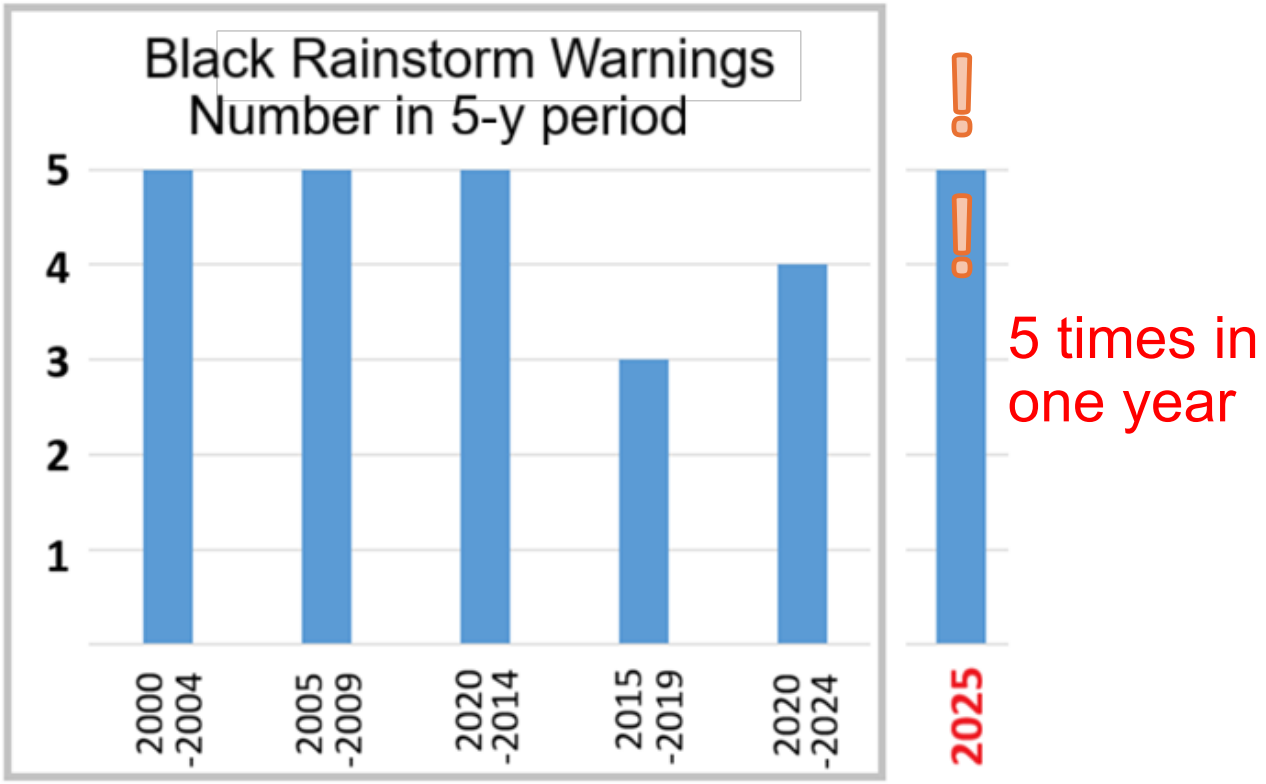
市民：重回以物易物「原始生活」

Zhengzhou 2021

High-level oversight + Comprehensive planning

Resilience via disaster preparedness

Original design of rainstorm warning: once a year



Drainage & slope works: limited by $ constraint

Disaster preparedness: planning & mobilisation

HEAT

Outdoor workers: nowhere to escape to

Grassroots workers: no bargaining power

Challenging heat tolerance limits

→ injuries, illness, death

Hong Kong Special

global warming + heat island + high rent

New phenomenon
- indoor heat stroke

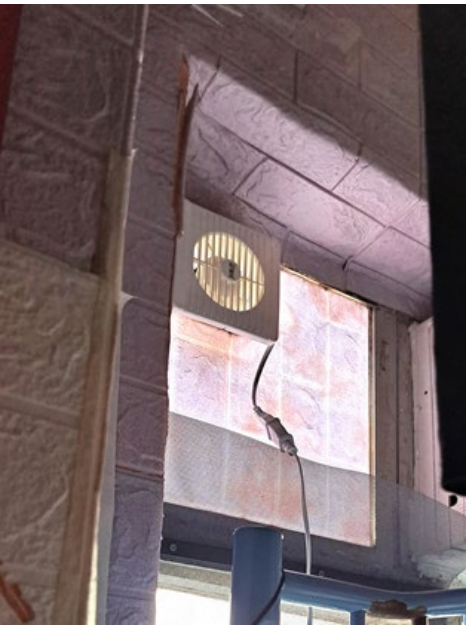
Cramped space:
Hot + humid + stale air + bacteria/fungi

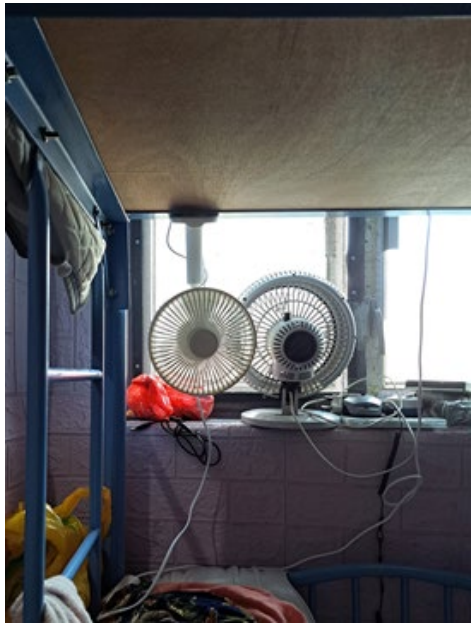
The poor, the old, the sick, the lonely

Threats to life, health and mental well-being

Disaster preparedness against HEAT

- Resolve ventilation issue
- Provide anti-heat means
- Advertise ways to seek help
- Mobilise resources (govt, civil society, business, etc.)
- Jockey Club project

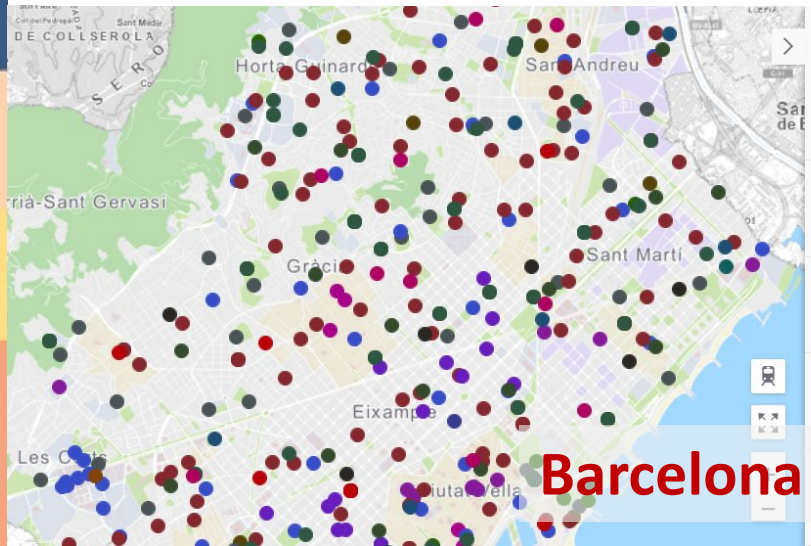


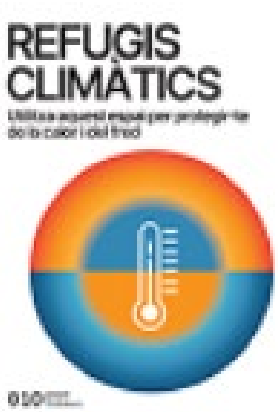


Disaster relief in HEAT

- Govt heat shelters
  - number, location, facilities, arrangements
- Civil society
  - should provide many more heat shelters
  - visits to those stuck at home

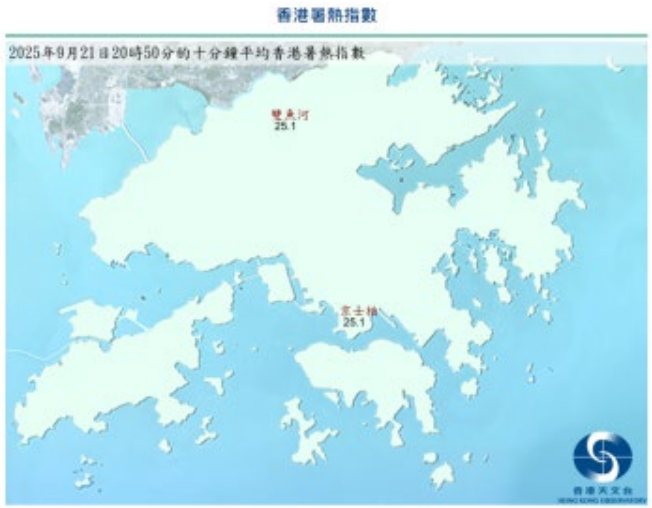
Toronto braces for 'dangerously hot' heat wave as officials open over 500 cooling spaces

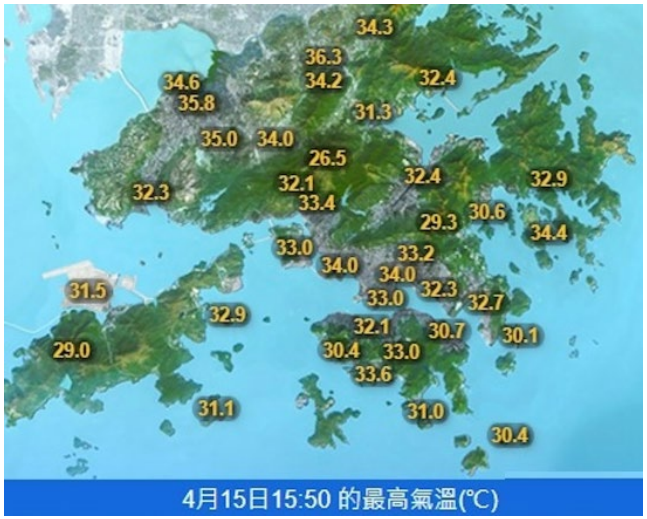




Barcelona 409 spaces

Disaster preparedness against HEAT
for outdoor workers





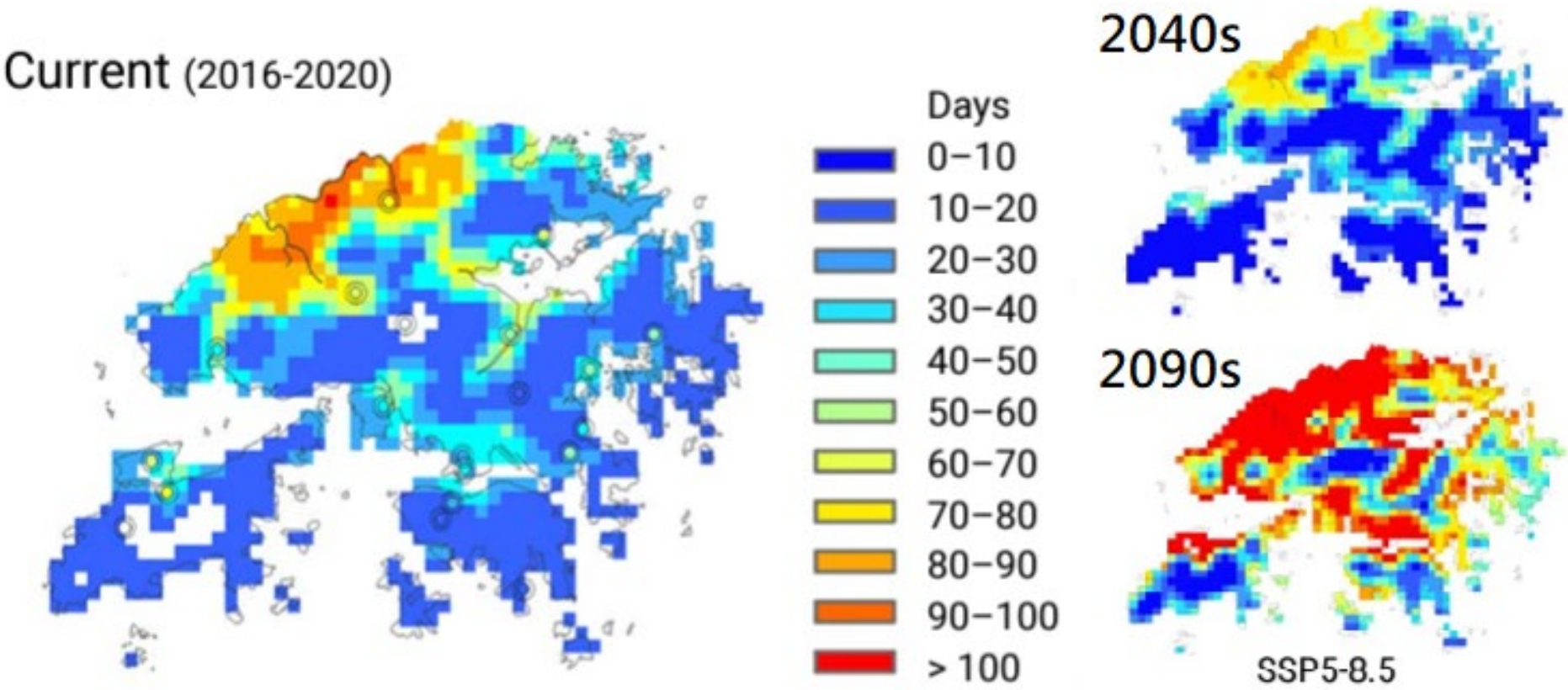
- Review:
  - Protection means
  - Heat stroke = work injury?
  - Insurance for workers under extreme heat?
- “Heat stress at work” warning
  - Regional differences?
  - Individual work sites?
- After issuance of warning
  - Enhanced inspections by Labour Department?

Very hot days

Exceeding 3 months in all urban sites by 2100

(IPCC AR5)

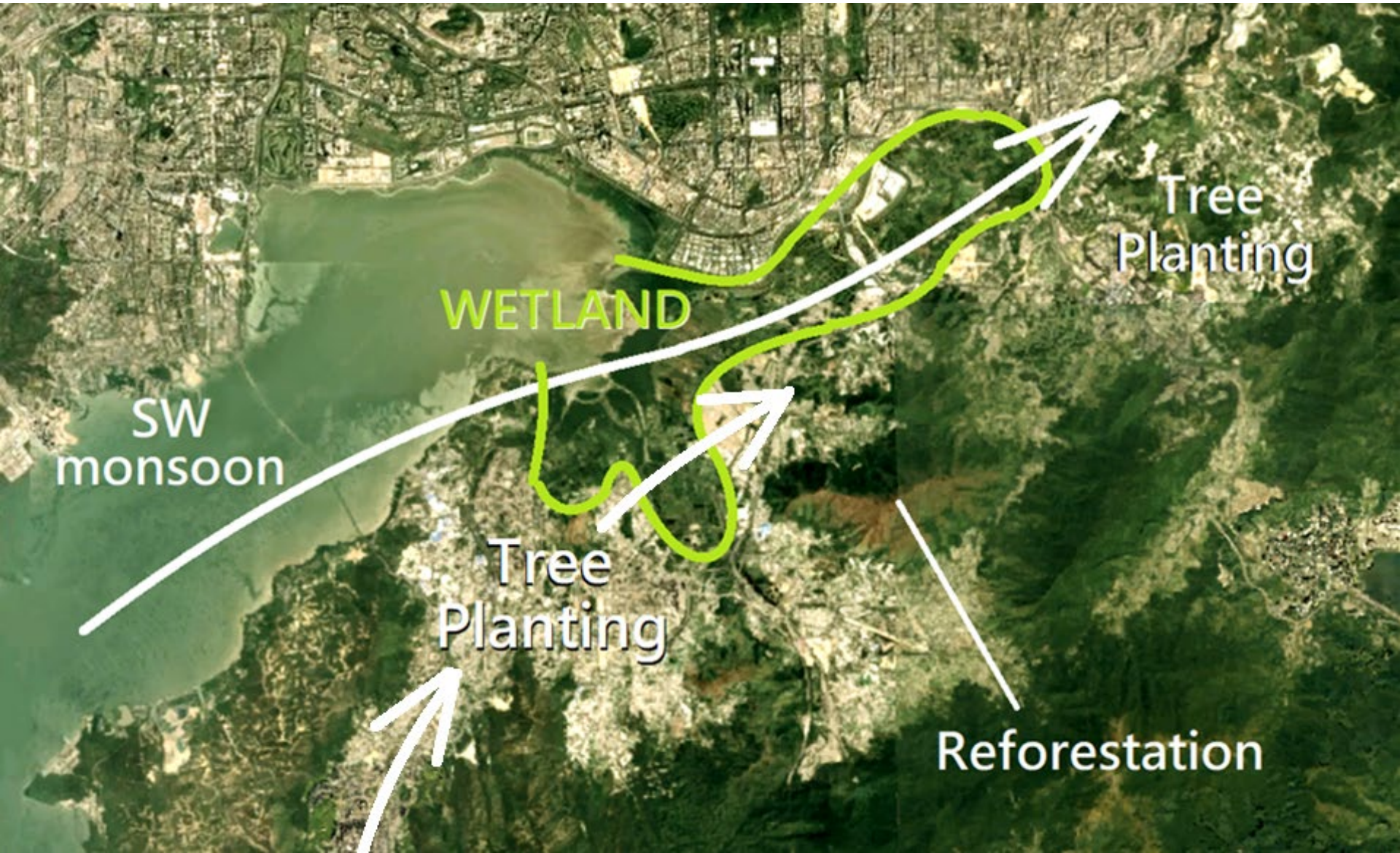
Worst in the Northern Metropolis



Source: Prof. Jimmy Fung, HKUST

*Latest HKO projection ≥ 5 months (IPCC AR6)

Reducing the heat in Northern Metropolis?
Keep wetlands + plant trees!



“Development” vs Climate Change

- Be guided by science
- Engineering alone not affordable
- Enhance disaster preparedness
- Don’t create risks that have not existed before (such as increasing exposure and vulnerability)

ACTION REQUIRED

town planning with a precautionary principle, to avoid future regrets and costly works later

RESILIENT CITY

to cope with stress, damage and losses

arising from climate change and energy transition

- Climate-sensitive town planning
- Early warning system
- Disaster preparedness
  - Contingency plans
  - Public education
  - Neighbourhood support
- Disaster relief
- Disaster rehabilitation

- URGENT: Coping with heat
  - The poor, the old, the sick, the lonely
  - Outdoor workers
- Appropriate housing
- Transition Nightmare
  - Employment issues
  - Energy poverty

2022 heat wave in Europe killed 61,000 people.

What could we do to help them survive?

Insulation Ventilation Low-cost cooling
Cooling Centres ???

Holistic system urgently needed
to enable **the poor** to cope with HEAT

UN appointed its first Global Chief Heat Officer in 2022