Choose Wisely

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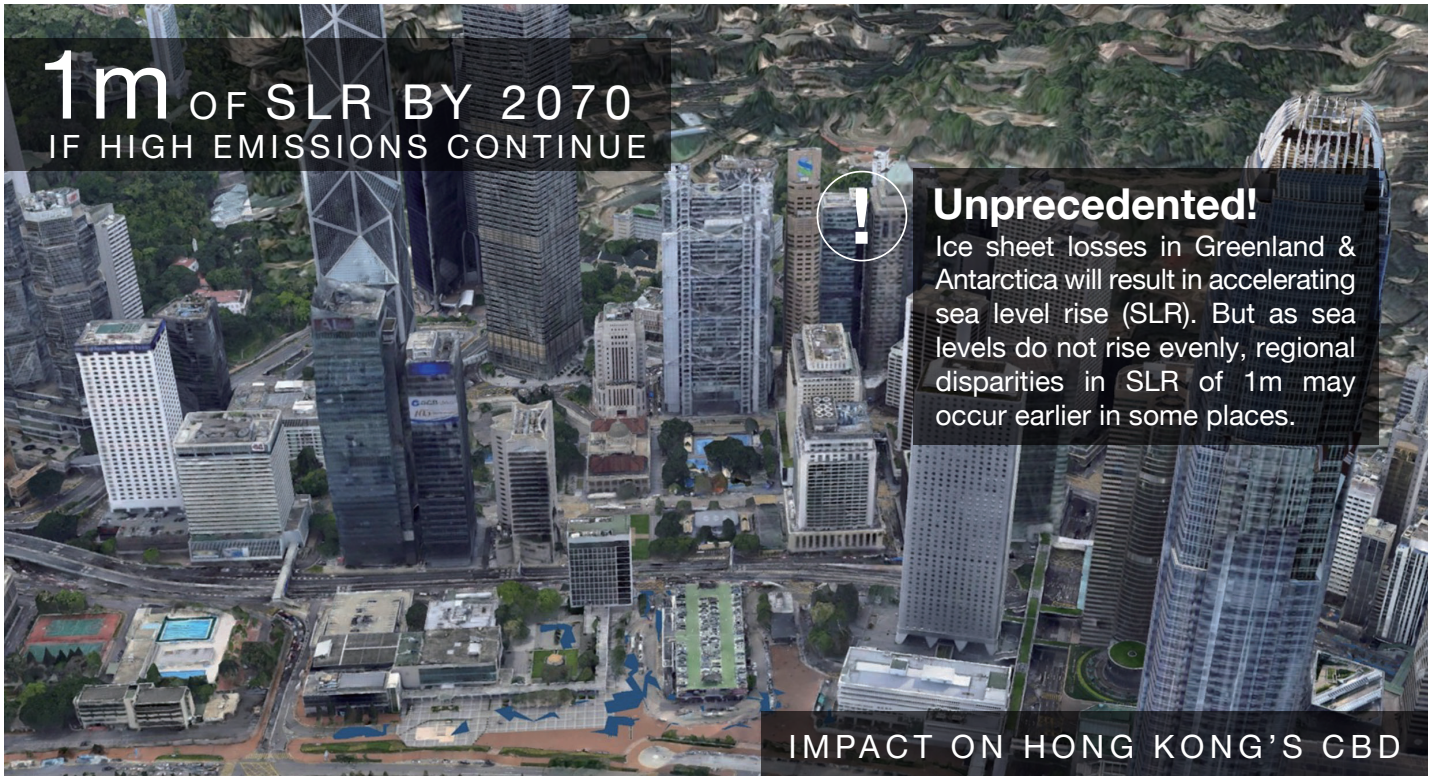
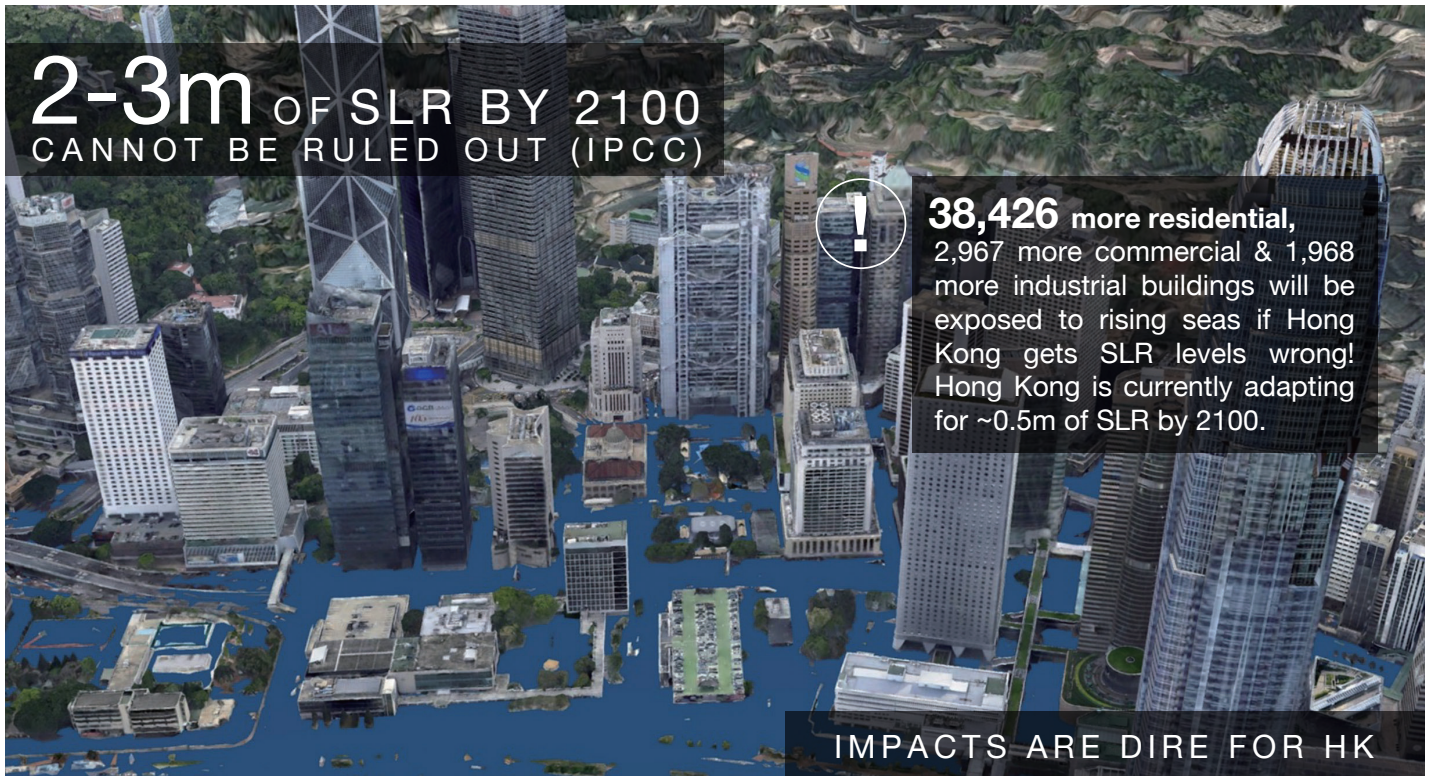


The rate of SLR has doubled & is set to rise unless we cut emissions – so decarbonise or adapt!



Source: CWR stress tests based on IPCC AR6 WG1 (2021) worst-case & "cannot be ruled out" scenarios & astronomical high tide in Hong Kong, Digital Terrain Model (5m) from the Lands Department of Hong Kong, 3D photo-realistic model based on the Planning Department of Hong Kong, ESRI; ICCI State of the Cryosphere 2024; CWR (2022) 8-Factsheet Survival Guide to help Hong Kong Navigate and Survive Rising Seas.

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New since the IPCC AR6! Growing body of research is raising alarm of accelerating & rapid SLR

The IPCC AR6 WG1 released in 2021 warned that sea level rise (SLR) *"Approaching 2-5m by 2100 and 2150 cannot be ruled out due to deep uncertainty in ice sheet processes"*. This very worst-case was included in the Summary for Policymakers to support risk assessment & adaptation planning as 2-3m of SLR can be dire – see previous page.

The cut-off time of research for inclusion in the IPCC AR6 WG1 was 2019. At that time, the lack of published research on ice dynamics meant the scenario was deemed "low-likelihood" causing many to mistake it as an unlikely scenario rather than a scenario that is plausible but based on a few papers. Many policymakers thus thought we didn't have to deal with multi-metre SLR this century. But we know rapid SLR of 3-4m per century is possible, as occurred with ice sheet collapse 14,500 years ago.

Since then, in the past 4-5 years, we've seen unimaginable extreme events in Greenland & Antarctica: both regions are warming faster than projected, throwing off ice melt & SLR projections. Multiple new studies now find Antarctica ice shelves (which help stabilise ice sheets) to be more vulnerable to collapse than previously thought. North Greenland ice shelves are also disintegrating: 35% total volume lost since 1978 & 3 ice shelves have completely collapsed. All these may speed up SLR.

Worryingly, the East Antarctica Ice Sheet & Thwaites Glacier are even more sensitive to ocean-driven melting than previously thought. Sadly, ocean waters causing today's alarming rates of ice loss are cooler than expected by most models. All these, plus more aren't in the AR6 …

Adapting for wrong levels puts people, cities & the economy at risk … so get updated!

Rising seas can sink our futures as it is not just a threat, but a threat multiplier. Accelerating & rapid SLR indicated by some post-AR6 research can outpace existing adaptation efforts, disrupt global trade, trigger mass migration & systemic shocks across financial systems. So, although uncertainties remain as ice science is still evolving, with so much at stake, it's better to be safe than sorry. Know what's happening with ice & SLR to adapt wisely …

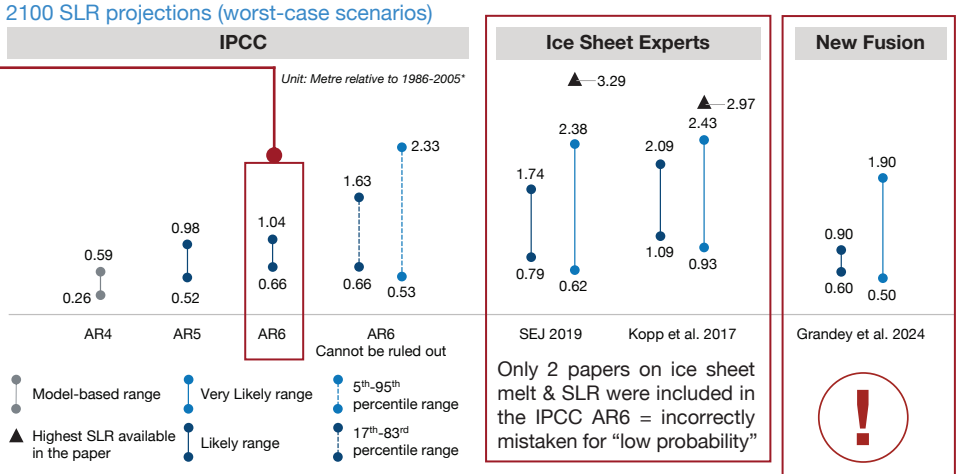
It's worse than we thought! Ice losses & SLR may be underestimated

- ! Greenland Ice Sheet losses now track AR6 worst-case projections *(Otosaka et al. 2023)*
- ! Antarctica is warming 2x faster than global average; 20-50% more than AR6 estimates *(Casado et al. 2023)*

AR6 models do not include:

- ! Widespread "pulsed tidal" intrusions under West Antarctica Ice Sheet = vigorous ice melt *(Rignot et al. 2024)*
- ! Antarctic grounding zones are more sensitive to warmer ocean water intrusion than we'd thought; many areas under the ice sheet may see runaway melt *(Bradley & Hewitt 2024)*
- ! The tidal pumping mechanism of warmer ocean water could potentially double Antarctica SLR *(Robel 2022)*
- ! Vicious amplifying cycle found to increase melt with more heat carried to Antarctic ice shelves *(Si et al. 2024)*
- ! Around 40% of Antarctic pinning points have reduced in size since 2000 *(Miles & Bingham 2024)*
- ! Ocean-driven melt has caused some East Antarctic glaciers to retreat 25yrs sooner. This rapid peripheral glacier melt will contribute ~30% more to SLR by 2100 *(Pelle et al. 2023; 2024)*

2100 SLR projections (worst-case scenarios)



**Note: The metre has been adjusted for "likely", "very likely", and the 17th-83rd percentile, as well as the 5th-95th percentile range.*

Only 2 papers on ice sheet melt & SLR were included in the IPCC AR6 = incorrectly mistaken for "low probability"

New fusion projection method quantifies the "very likely" SLR range of 0.5-1.9m to support risk assessment & adaptation planning.

! Current policy path of 3.1°C = rapid SLR in ~30 years & 2-3m by 2100

DeConto et al. (2021)
"The Paris Climate Agreement and future sea-level rise from Antarctica", Nature.

"…scenarios more consistent with current policies (allowing 3°C of warming) give an abrupt jump in the pace of Antarctic ice loss after around 2060…"

State of the Cryosphere 2023 - Two Degrees is Too High
ICCI

"Once 3°C is passed, ice loss from Greenland & West Antarctica may become extremely rapid. Together with extensive ice loss from parts of East Antarctica … 3m might be passed early in the 2100s, wiping out entire low-lying nations & coastlines…"

Don't ignore ice! Take action now to urgently decarbonise & adapt

- ☑ The NGFS (a group of 138 central banks/ supervisors) recommends using "current policies" as the base case.
- ☑ Face reality! As pledging is not the same as doing, our actual emissions path is worse than the current policy path of 3.1°C! As CO_2 levels are still rising, "current emissions" is arguably the "real base case".
- ☑ Get on top of the latest science post-IPCC AR6. Greenland & Antarctica ice sheet losses today + ocean warming stats are shocking! These are key SLR drivers.
- ☑ Adjust SLR levels to the "real base case" for stress testing, adaptation planning + revise transition strategies.
- ☑ Given fast-evolving climate science on ice dynamics, the IPCC AR6 recommends adaptation planning today to be transformative, rather than incremental to avoid maladaptation.

Current Path | Deep Cuts | Permafrost | Tipping Points | Ocean Warming | Greenland | Antarctica

Source: CWR; IPCC AR6 WG1 (2021); ICCI State of the Cryosphere 2024; Lin et al. (2021), Nat. Commun. (12); Casado et al. (2023), Nature Climate Change (13); Otosaka et al. (2023), Earth Syst. Sci. Data (15); Millan et al. (2023), Nat. Commun. (14); Pelle et al. (2023), Sci. Adv. (9); Pelle et al. (2024), JGR Earth Surface (129); Bradley & Hewitt (2024), Nat. Geosci. (17); Robel et al. (2022), The Cryosphere (16); Davis et al. (2023), Nature (614); Morlighem et al. (2024), Sci. Adv. (10); Gomez et al. (2024), Sci. Adv. (10); Rignot et al. (2024), PNAS (121); Si et al. (2024), Sci. Adv. (10); Miles & Bingham (2024), Nature (626); IPCC AR4 WG1 (2007); IPCC AR5 WG1 (2013); Bamber et al.(2019), PNAS (116); Kopp et al. (2017), AGU (5); Grandey et al. (2024), Earth's Future (12); Deconto et al. (2021); Nature (593); ICCI State of the Cryosphere 2023; NGFS Scenarios Portal; UNEP Emissions Gap Report 2024; NOAA; IPCC AR6 WG2 (2022).

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