Antarctica | Doom Unleashed

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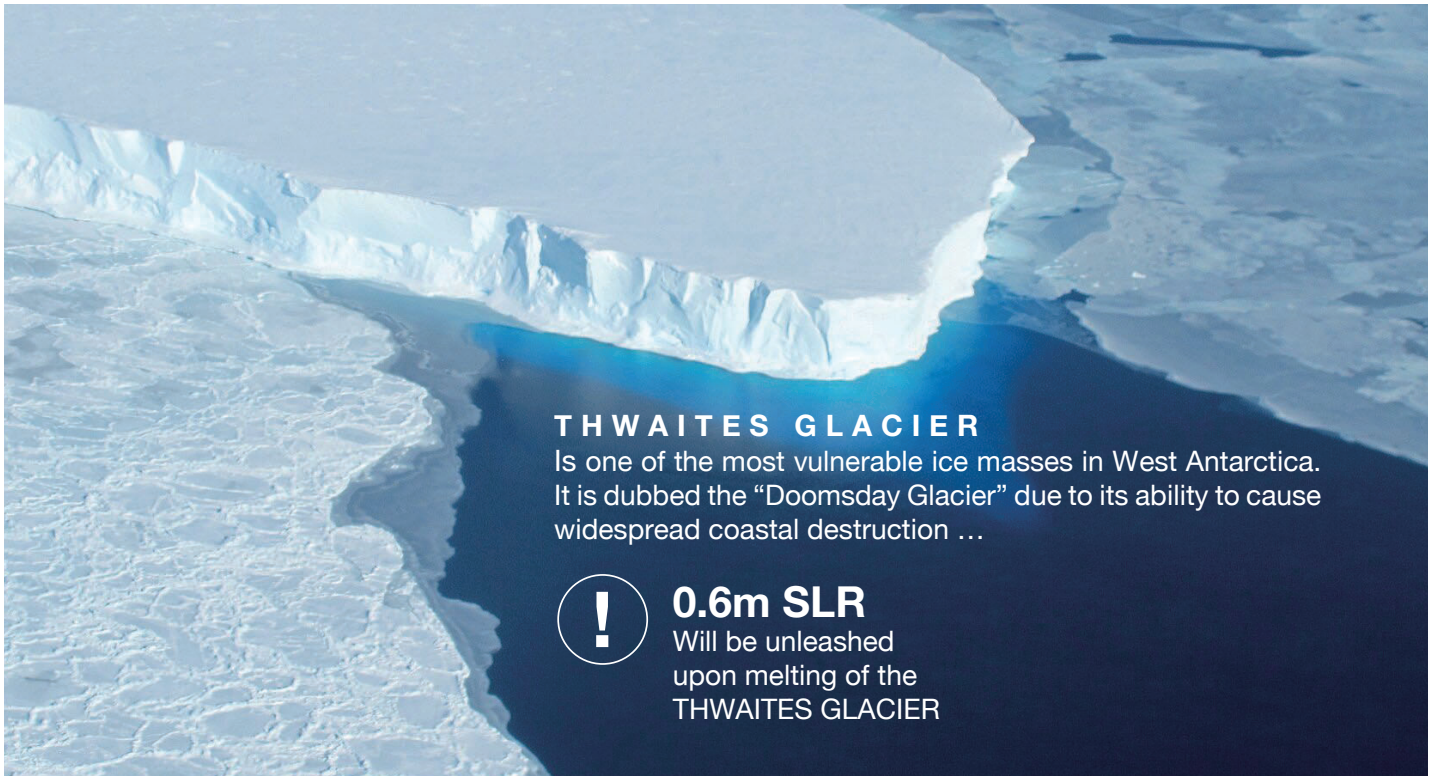

Pay Attention! We never imagined Antarctica ice sheet melt to be so widespread & so soon

Source: CWR; International Thwaites Glacier Collaboration; Naughten et al. (2023), Nature Climate Change (13); ICCI State of the Cryosphere 2023; Stokes et al. (2022), Nature (608); ICCI report "Threshold and Closing Windows" (2015).

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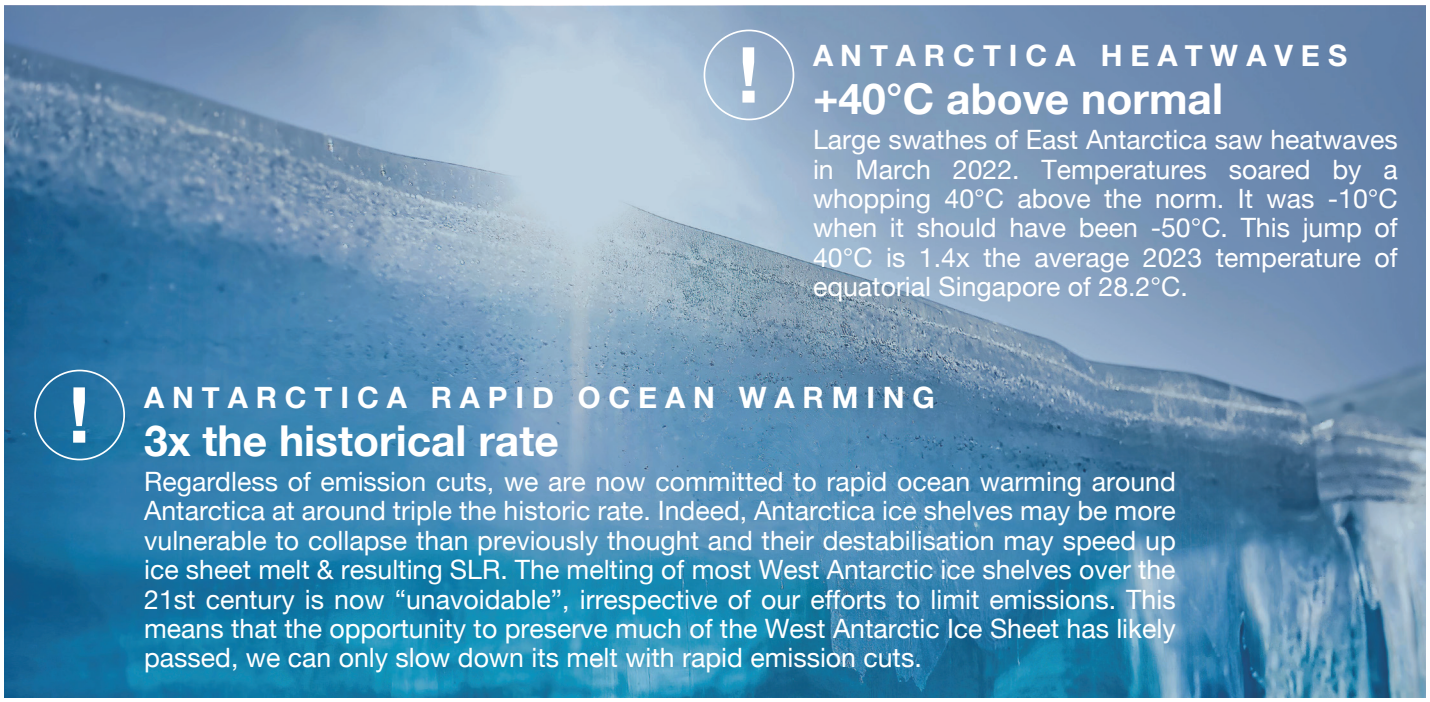
It's getting crazy hot in Antarctica … who knew?!

We never expected Antarctica to melt so fast this century, yet it is. Accelerated surface heating and rapid ocean warming are a double whammy causing widespread melt across the continent too fast and too soon. Recent record heatwaves have been mind-blowing plus new findings from rapid ocean warming are distressing as they have serious implications for ice sheet/shelf melt as well as sea ice. Besides exacerbating SLR, a fast-warming Antarctica will end up disrupting ocean circulation driving vicious warming feedback loops. We cover some of these shocking stats below.



ANTARCTICA HEATWAVES
+40°C above normal

Large swathes of East Antarctica saw heatwaves in March 2022. Temperatures soared by a whopping 40°C above the norm. It was -10°C when it should have been -50°C. This jump of 40°C is 1.4x the average 2023 temperature of equatorial Singapore of 28.2°C.

ANTARCTICA RAPID OCEAN WARMING
3x the historical rate

Regardless of emission cuts, we are now committed to rapid ocean warming around Antarctica at around triple the historic rate. Indeed, Antarctica ice shelves may be more vulnerable to collapse than previously thought and their destabilisation may speed up ice sheet melt & resulting SLR. The melting of most West Antarctic ice shelves over the 21st century is now "unavoidable", irrespective of our efforts to limit emissions. This means that the opportunity to preserve much of the West Antarctic Ice Sheet has likely passed, we can only slow down its melt with rapid emission cuts.

Hotter oceans accelerate melt = vicious cycles triggered

Parts of the West & East Antarctic ice sheets sit above the ocean and so, ocean warming speeds up the melt of the underside of the ice sheet; this basal melt contributes to SLR. New research now shows that the **Thwaites Glacier may be even more sensitive to ocean-driven melting than previously thought – a tidal pumping mechanism that may lead to runaway melt and a likely doubling in SLR is now found**. Observations now also show that ocean waters causing today's alarming rates of ice loss are actually cooler than expected by most models. **These are only adequately captured by the IPCC AR6 *"cannot be ruled out"* scenario.**

As we are now committed to **rapid ocean warming around Antarctica at ~3x the historical rate, we are set to lose all West Antarctica ice shelves by 2100**. Unfortunately, ice shelf melt leads to more heat transported towards them from the oceans, further increasing the melt. **This vicious amplifying cycle will only increase the rate of loss of ice shelves exposing ice sheets to melt, speeding up SLR**. Over in **East Antarctica, ocean freshening under the ice sheet is speeding up peripheral glaciers melt, contributing ~30% more to SLR by 2100**. This means some East Antarctic glaciers are retreating ~25 years sooner. Again, we've underestimated SLR.

In addition, we now know that **melting from Antarctica will slow down abyssal ocean circulation by more than 40% by 2050**. This will cause warming beneath the ice and speed up ice shelf collapse, subsequent irreversible ice sheet loss & SLR. The slow down of abyssal ocean circulation will also result in ocean current changes that are irreversible on century time-scales.

Vanishing sea ice = buffer loss

Hotter oceans also accelerate sea ice loss. Sea ice & ice shelf melt do not contribute to SLR but the **loss of sea ice around Antarctic ice shelves exposes them to greater ocean swell, weakening them to the point where shelf collapse occurs**. The collapse of the ice shelf will destabilise and expose the ice sheet – this melt will contribute to SLR.

Sea ice losses in Antarctica are staggering. During the winter of July 2023, sea ice losses reached "mind-blowing" low levels of 2.77mn km^2 below the 1981-2010 average – **this area of sea ice loss is almost the entire land area of India!**

Sea Ice

Ocean Warming

It's happened before!

There's now empirical evidence that the West Antarctic Ice Sheet collapsed completely during the Last Interglacial Period 130,000 years ago. Ominously, this occurred when global average temperatures were only 1°C warmer than the pre-industrial period. During this time seas were 6-9m higher.

Don't be blindsided because Antarctica is out of sight & out of mind!

If you're shocked by these Antarctica stats, then it's time to pay attention! What's happening in the South Pole matters as fast melting ice can unleash rapid rising seas which will doom our coastal cities & population. Don't forget that SLR can be abrupt – the Thwaites Glacier (with 0.6m of SLR) has in the past two centuries retreated at a rate of over 2.1km/year over a duration of 5.5 months. This is 2x faster than what scientists have observed in the last decade. We still have time, but not much, to deliver deep cuts to slow down this rapid ice melt & rising seas. So don't delay – start by getting on top of ice tipping points and stress test your assets/portfolios to the right levels of SLR.

Tipping Points

SLR Levels

Deep Cuts

Source: CWR; Phys.org article "Hot poles: Antarctica, Arctic 40 and 30 degrees Celsius above normal (19 March 2022); Meteorological Service Singapore 2023 Annual Climate Assessment; Naughten et al. (2023), Nature Climate Change (13); ICCI State of the Cryosphere 2024; Rignot et al. (2024), PNAS (121); Bradley & Hewitt (2024), Nature Geoscience (17); Robel & Seroussi (2022), The Cryosphere (16); Davis et al. (2023), Nature (614); Si et al. (2024), Science Advances (10); Pelle et al. (2023), Science Advances (9); Pelle et al. (2024), JGR Earth Surface (129); Li et al. (2023), Nature (615); ICCI State of the Cryosphere 2023; Lau et al. (2023), Science (382);The International Thwaites Glacier Collaboration; Graham et al. (2022), Nature Geoscience (15); IPCC AR6 WG3 (2022).

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