

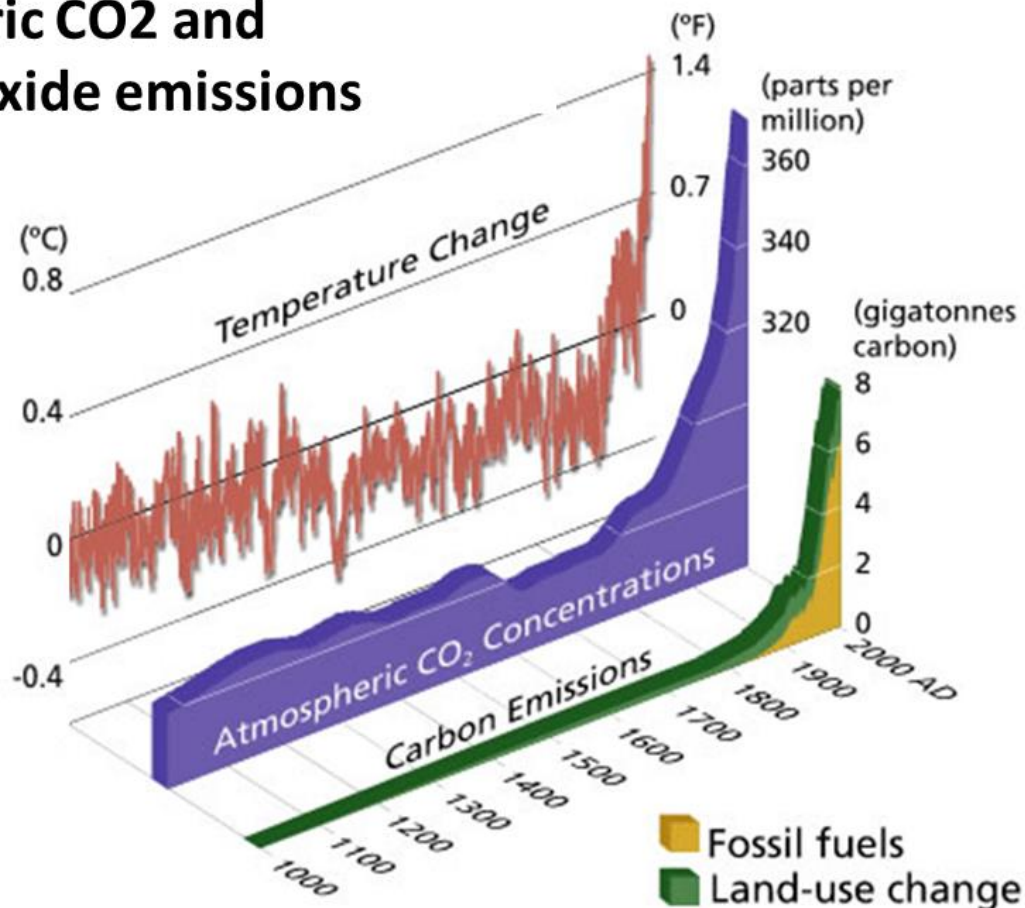
# Climate Change

Ralf Toumi, Grantham Institute

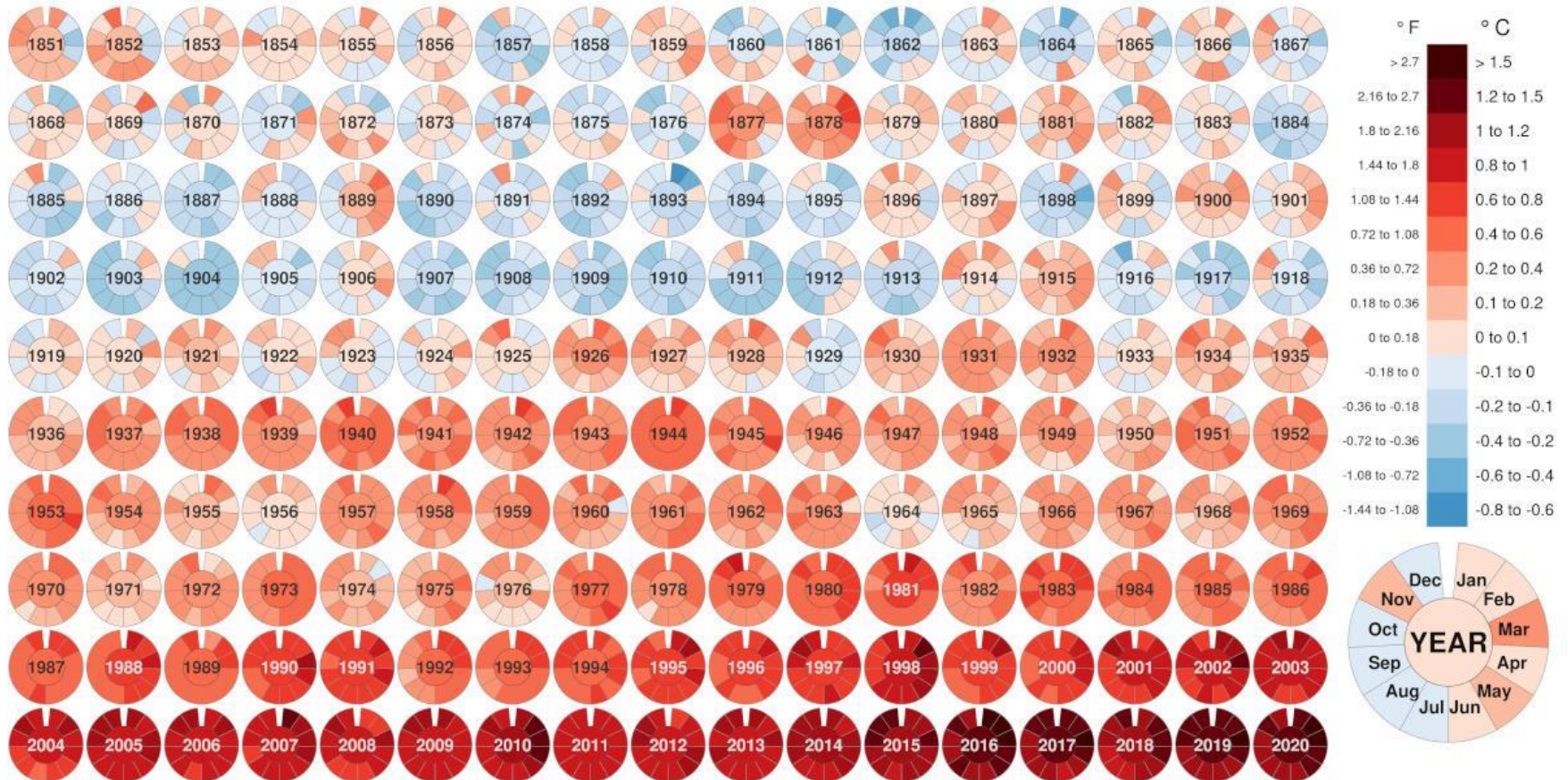
Imperial College  
London



# Past 1000 years of temperature change, atmospheric CO<sub>2</sub> and carbon dioxide emissions



# Monthly global mean temperature 1851 to 2020 (compared to 1850-1900 averages)

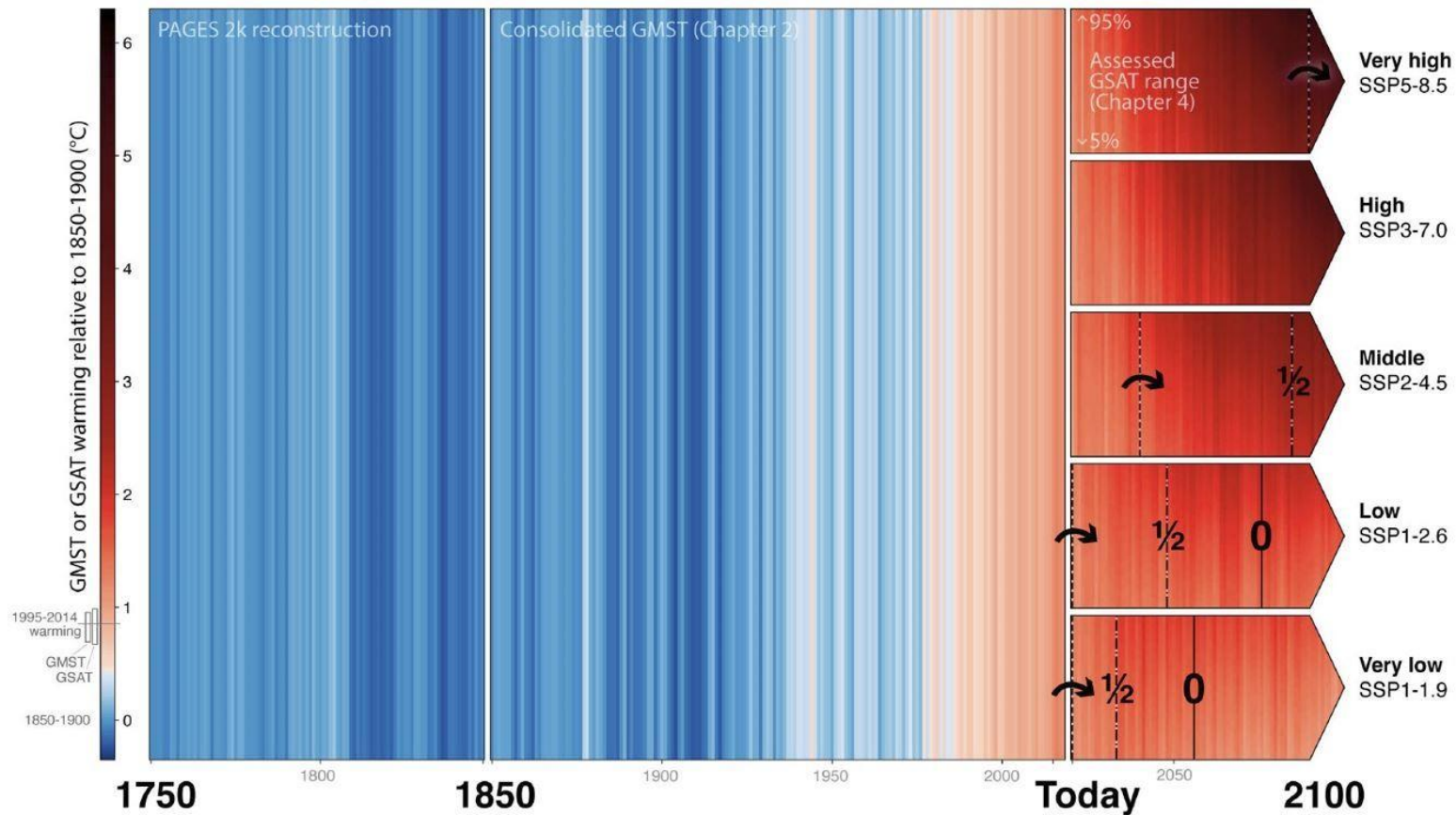


Data: HadCRUT5 - Created by: @neilrkaye

# Historical global-mean surface temperatures

## Possible Futures

CO<sub>2</sub> Emissions:  
↗ Peaking  
1/2 Halving  
0 Net-zero





## Heatwaves

in millions exposed yearly



**Heatwaves**  
millions of people exposed  
to heatwaves/year

**No mitigation**

0 3,000 6,000 9,000 12,000



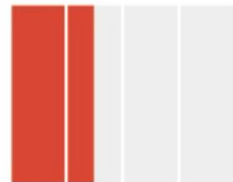
**+5.2°C**



**Paris pledges kept**



**+3°C**



**Emissions capped for net zero**



**+2°C**



# Cropland Decline

in thousands of km<sup>2</sup>



**Cropland decline**  
thousand km<sup>2</sup>

*No mitigation*

*Paris pledges kept*

*Emissions capped for net zero*



**+5.2°C**



**+3°C**



**+2°C**

# Flooding

in millions affected yearly



**Flooding**  
millions of people  
affected/year

0 30 60 90 120

*No mitigation*



**+5.2°C**

*Paris pledges kept*



**+3°C**

*Emissions capped to net  
zero*



**+2°C**

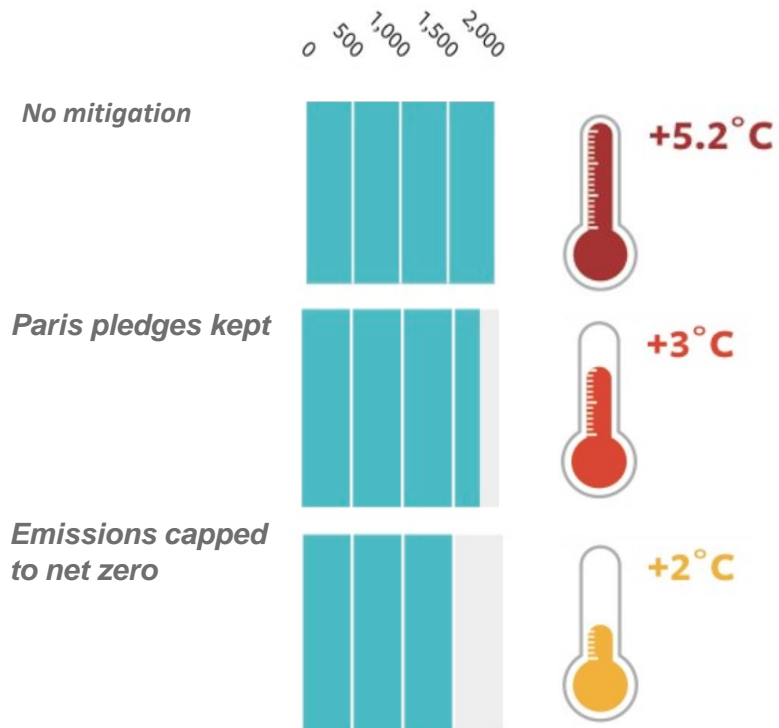
# Water Stress

in millions exposed yearly



## Water stress

millions of people exposed  
to increased water stress





# Physical Basis of Climate Hazard

Three rules of thumb of climate change:

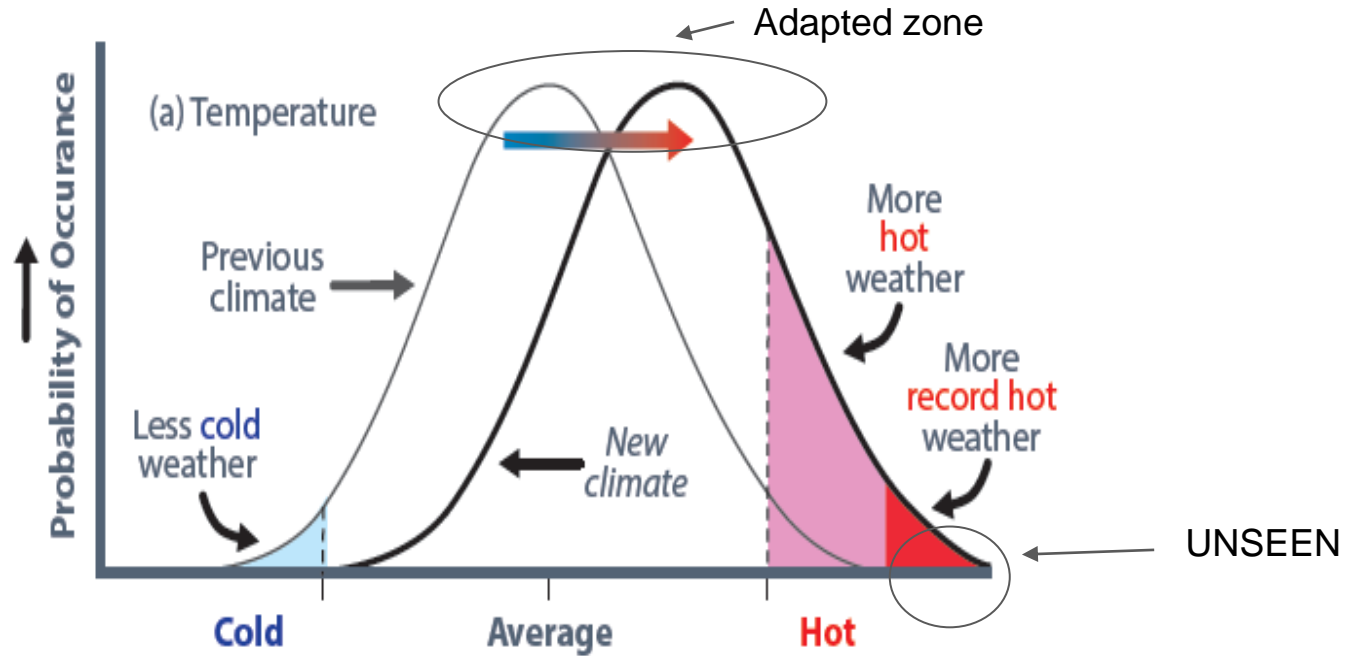
1. Hotter everywhere

1. Warmer = more moisture= wetter= flood

1. Wet regions → wetter  
Dry regions → drier

1. The uncommon becomes common

# Extreme Events: Uncommon becomes common



# Stress Test Background: Solvency II & PRA

The Solvency II SCR is calibrated to enable an insurer withstand a 1 in 200 year event i.e. an extreme stress. It is designed to limit an insurer's probability of ruin over a one year period to 0.5% (value at risk at the 99.5th percentile). In regular stress tests, insurers are supposed to simulate the impact of extreme events on their business models and capital positions.

# The 2022 E&S property hard market

## Expectations

- Rate increases north of 20% will be widespread
- Higher deductibles
- Tighter terms and conditions
- Strong demand as submission flow accelerates
- Capacity shortages in some tier 1 and tier 2 zones
- Capacity crunch in some loss struck areas (commercial residential/hab)
- Carrier retrenchment from MGAs and other parts of portfolio
- Some incumbents that have been conservative will seek growth
- MGAs may see top line growth on reduced capacity as pricing surges

## Drivers

- Significantly higher reinsurance costs for property cat
- Less availability of lower layer/aggregate reinsurance coverage
- Portfolio repositioning by carriers to manage PMLs
- Greater focus on insurance-to value
- Concern over loss creep/inflationary pressures not factored into models
- Move away from emphasis on modeled output in underwriting
- Surge of business through the wholesale channel as admitted market moves away from cat
- Potential for higher capital charges against cat for carriers as ratings agencies respond
- Boardroom level concern about climate change at carriers and how to manage volatility of earnings



# What did COP26 achieve?

**Emissions.** Countries will meet in November (COP27) to pledge further cuts to emissions of CO<sub>2</sub>. **NDCs/pledges consistent ~2C but not 1.5C**

**Coal.** Countries only agreed to "phase down" rather than "phase out" coal after a late intervention by China and India. **Hugely disappointing outcome**

**Developing countries.** Pledge to increase money to help climate change and switch to clean energy. **2009 target for \$100Bn by 2020 missed by >30%**

**Fossil Fuel Subsidies.** Agreement to phase-out subsidies **but no firm dates set**

**Other things:** China-US agreement on clean energy; Deforestation halted by 2030; methane (30% by 2030); financing green technology; **Details unspecific**