# THE FATE OF THE WORLD

Bill McGuire

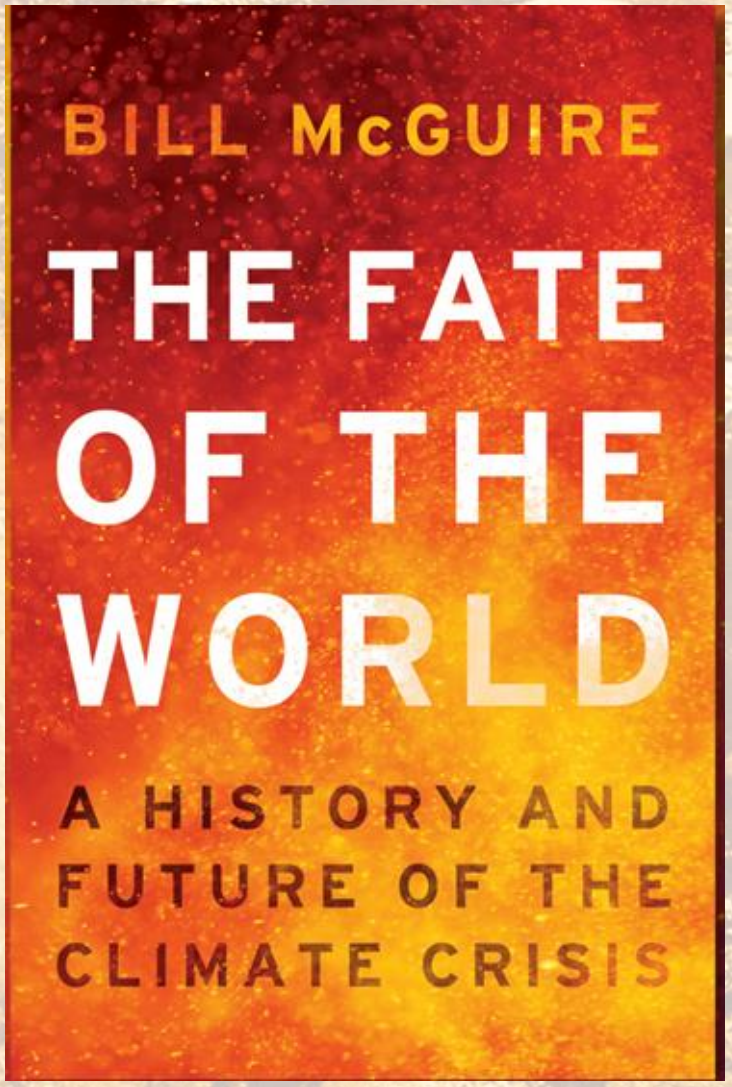





**“If you choose to read this book, you need to be ready for grim truths and tough prognoses”**

Rupert Read, Co-director, Climate Majority Project

# In a nutshell




☹ Over 4.6 billion years, the Earth's climate has fluctuated wildly from ice ball to hothouse

☹ Times of changing climate in the past reveal both causes and consequences

☹ Evidence laid out for us in the rocks, sediments, ice sheets and remains of ancient life

☹ No guesswork involved

☹ How the Earth remembers its past and how it can shed light on today's climate and that to come

# The geological record is never wrong

Analysis of ancient climate change tells us not that we have been here before, but that we have **NEVER** been here before



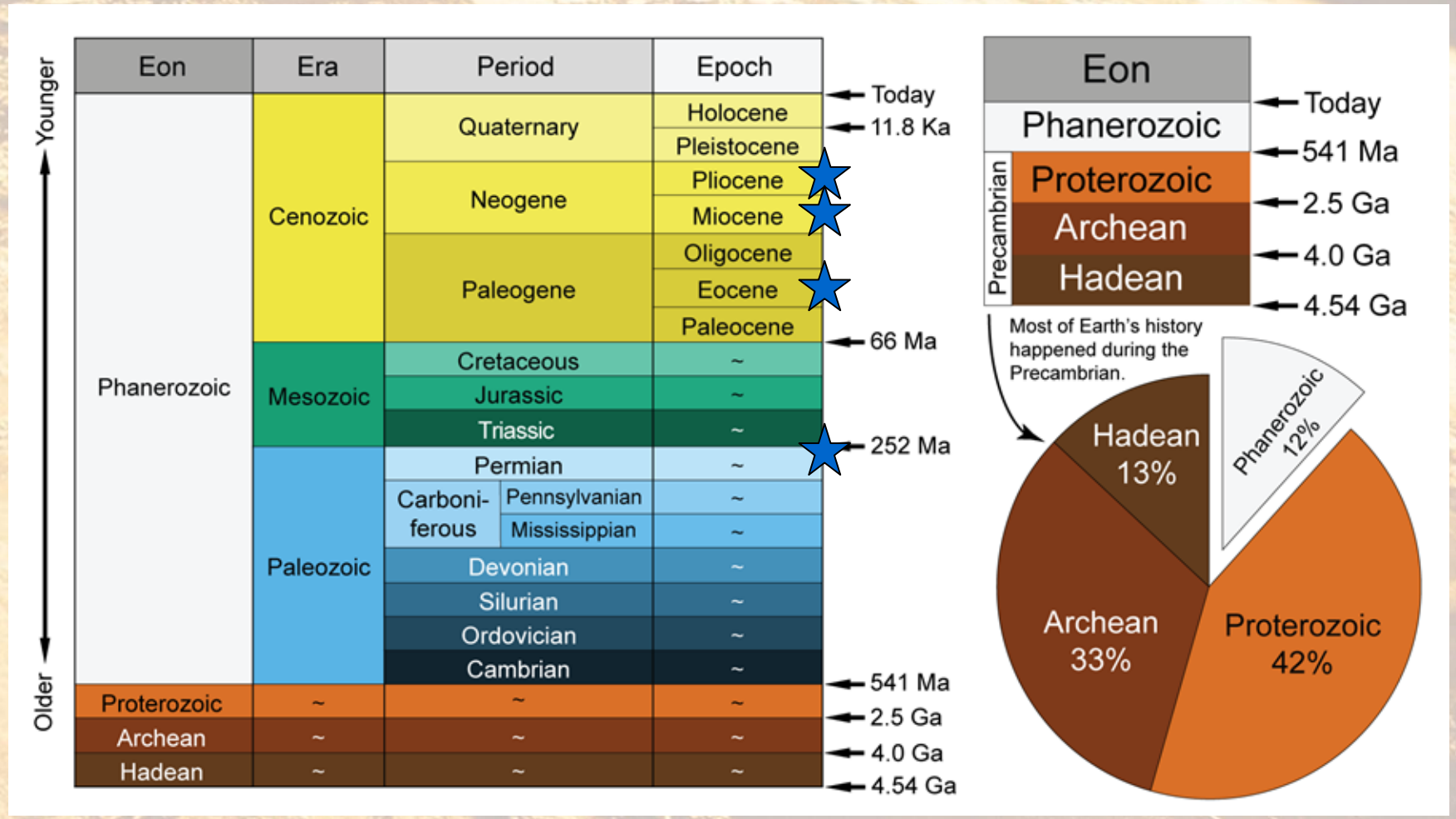
# Where are we now?

- ☹ 2.5 trillion tonnes of $CO_2$
- ☹ 40+ billion tonnes $CO_2$ a year
- ☹ **Weight of 800,000 Titanics**
- ☹ Rate of global heating has doubled over last 20 years
- ☹ 1.5°C within 3 years
- ☹ 2°C by late 2030s if not sooner
- ☹ German Physics & Met societies - heading for 3C rise by 2050
- ☹ We have left the safe space of the Holocene

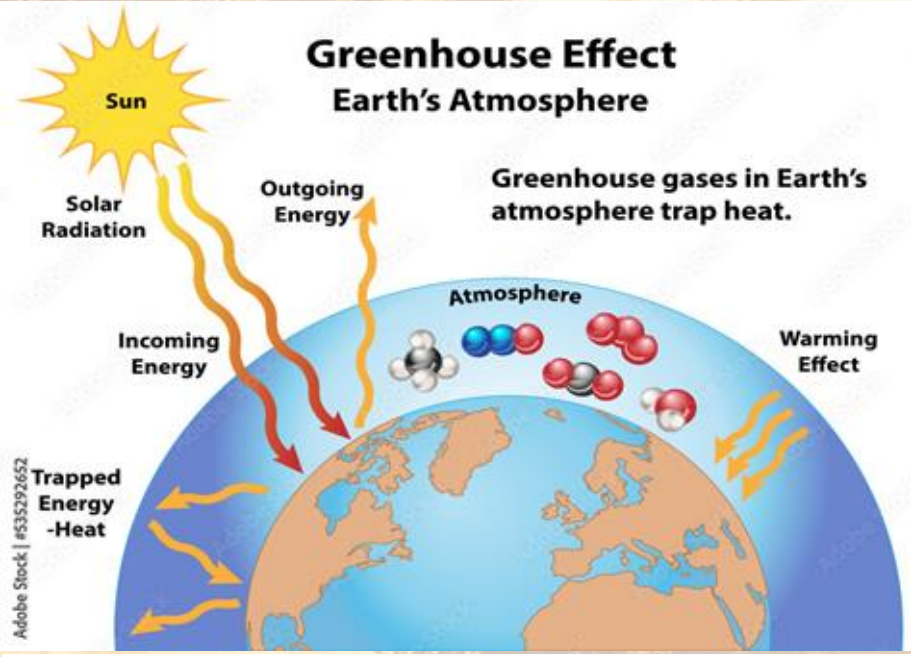


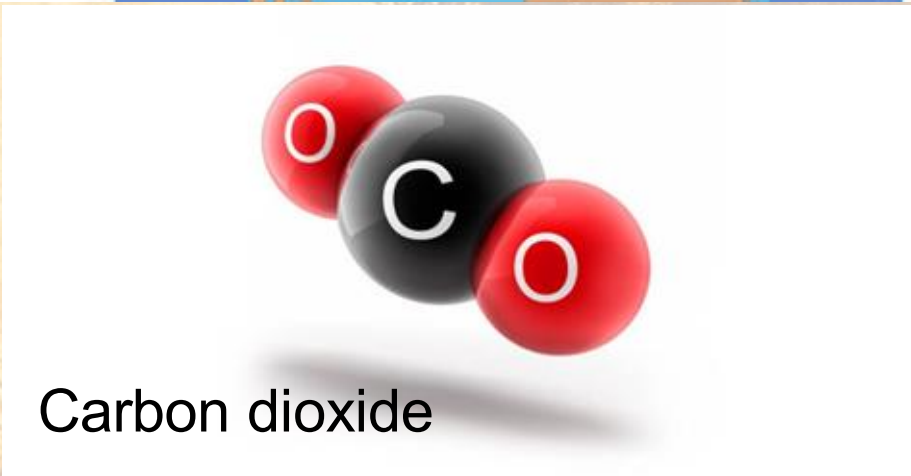

2.8C by 2100?

# Setting the scene



# Earth's twin thermostats



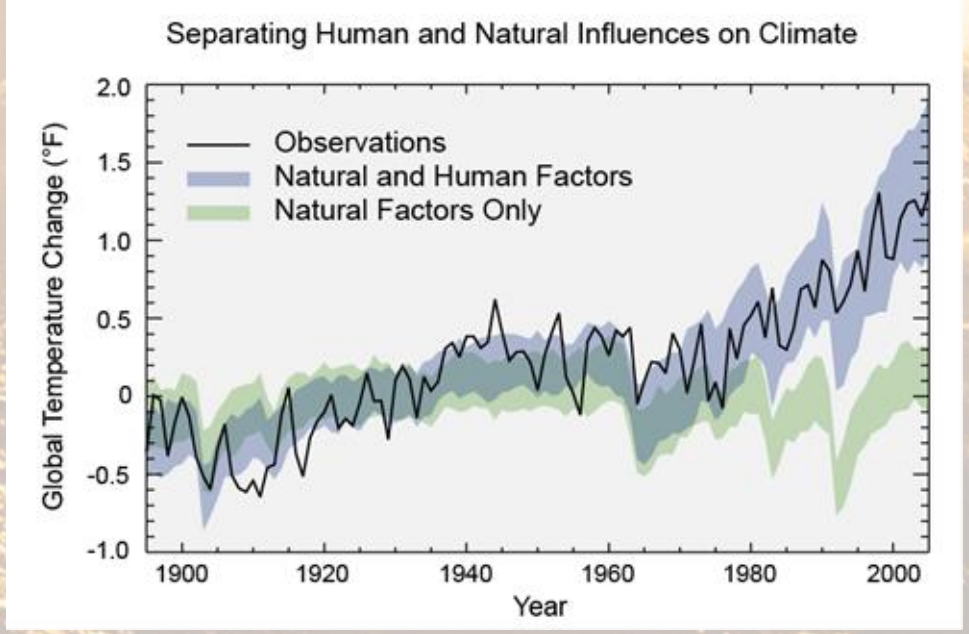

Carbon dioxide

- ☹ Earth's climate has two control knobs
- ☹The Sun supplies the energy that stops the planet being an iceball
- ☹ Greenhouse effect also vital - otherwise world a constant minus 18°C
- ☹ Heat in versus heat out = the Earth's **energy balance**, which is seriously out of kilter and getting more so
- ☹ Growing energy imbalance is what global heating is all about

# Everything under the sun

- ☹ Energy = 2 billion 50 Mt nuclear bombs *every second*
- ☹ Earth intercepts 10,000x total energy needs – but we burn 'ancient sunlight'
- ☹ Drives every major physical & biological process on the planet
- ☹ Output varies by 0.1% over 11 year cycle; longer cycles too
- ☹ Little Ice Age, Roman & Medieval warm periods
- ☹ Other factors, regional extent
- ☹ No contribution to current global heating





# Carbon Planet



☹ Our world contains a staggering 1.85 billion billion tonnes of carbon

☹ Almost all in the core and mantle, the rest in rocks, hydrocarbons, life and the oceans

☹ Just 0.043% of atmosphere is $CO_2$ = 430 ppm

☹ Much higher and much lower levels across geological time

☹ Influenced by volcanic activity, weathering rates, plant life

# Hothouse world

☹ High $CO_2$ levels and a brightening sun → most of last 540 million years saw hothouse conditions

☹ Average global temperature around 20°C (~ 15°C today)

☹ Hyper-thermals – sudden, even hotter, spikes

☹ Five major hyper-thermals in last 300 million years

☹ PTB: Permian – Triassic Boundary event

☹ PETM: Palaeocene – Eocene Thermal Maximum





Late Cretaceous greenhouse

# PTB: The Great Dying

☹ 252 My ago – came close to leaving a lifeless planet

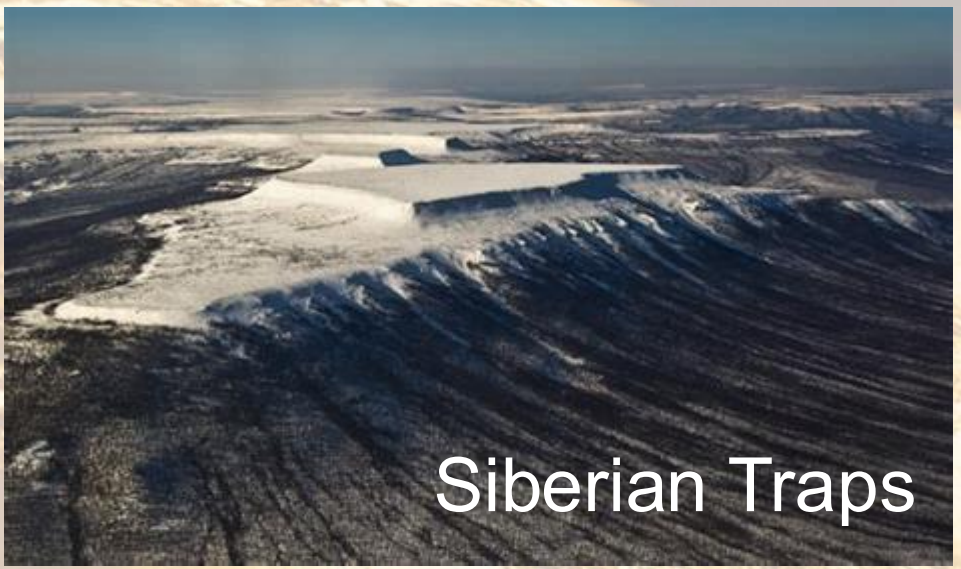
☹ 10°C temperature hike in a few thousand years

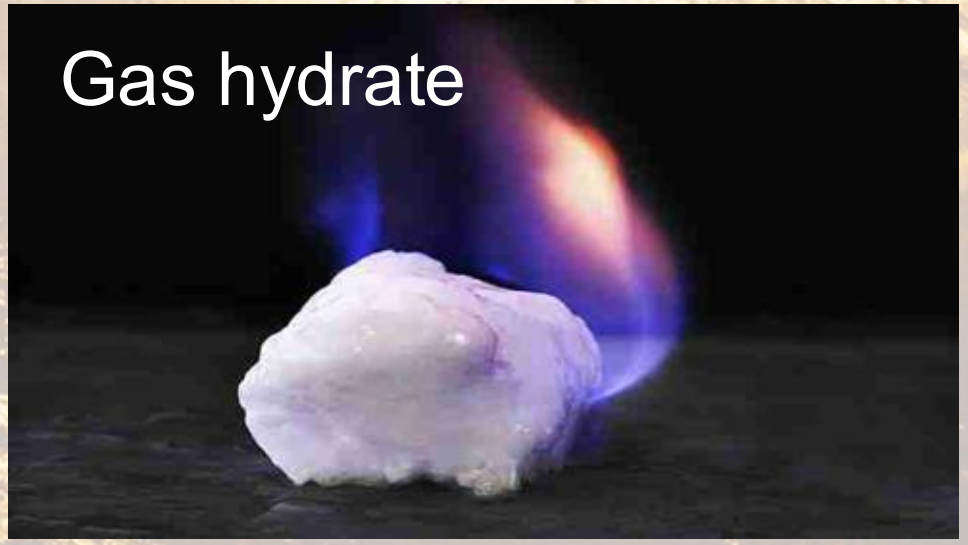
☹ Addition of 100 trillion tonnes of carbon to environment

☹ Lavas covered area size of Australia + submarine gas hydrates

☹ 96% of marine species and ¾ land vertebrates wiped out

☹ **Today $CO_2$ being emitted 14 times faster**



# PETM: palms at the poles





☹ Already very hot 56 million years ago at the PETM

☹ Additional 5°C to 8°C hike in 3,000y

☹ At least 11 billion tonnes of $CO_2$ added = 4.5 times human emissions to date

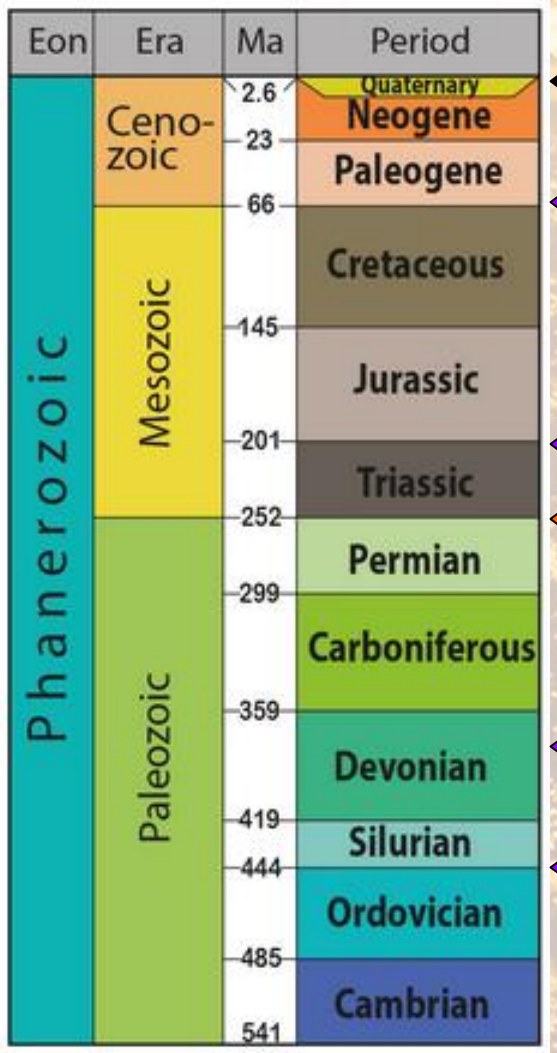
☹ $CO_2$ levels 2,000+ ppm

☹ North Atlantic lava eruptions – 1.5 million $km^3$ + submarine gas hydrates

☹ Extinctions not as severe

☹ **Temperature now rising 10x faster**

# Death by carbon




☹ About 50 mass extinction events in last 540 my – including the big five

☹ Strong link with major hikes in atmospheric $CO_2$

☹ Sourced by huge lava eruptions and/or colossal methane releases

☹ Result in rapid rise in land and sea temperatures, ocean acidification, and ocean anoxia

☹ The first great extermination

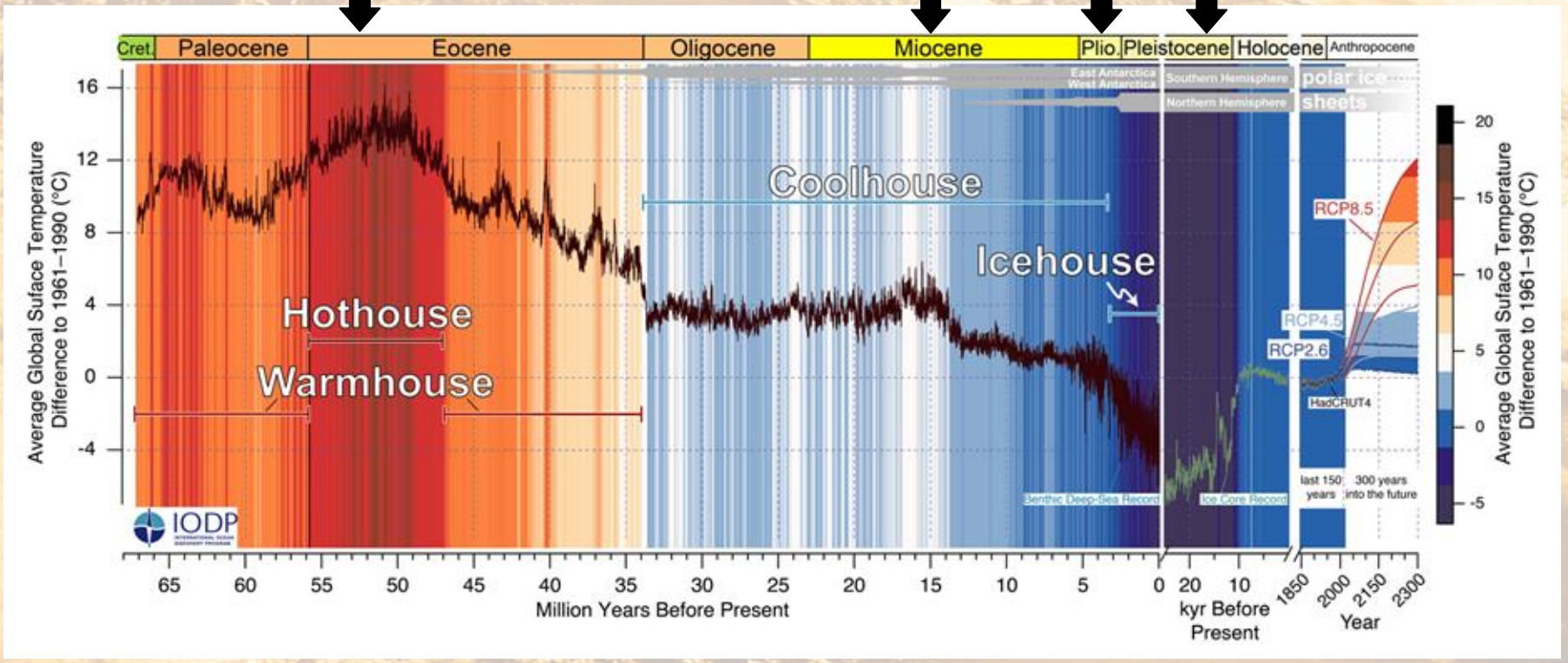
# Turning back the clock

Early Eocene hothouse

Middle Miocene

Pliocene

Eemian




**We are in danger of rewinding the climate clock 50 million years and could reverse a multi-million year cooling trend in two centuries**

# The Pliocene: warmth's last fling







- ☹ Mid-Piacenzian Warm Period of the Late Pliocene (~3My)
- ☹ Climate 2.5°C – 4°C hotter than pre-industrial
- ☹ Sea level 15 – 25m higher
- ☹ Polar regions much warmer
- ☹ Fire ravaged forests rather than tundra at high latitudes
- ☹ Seas warmer, stormier, permanent El Niño?
- ☹ **$CO_2$ levels 330 – 400ppm**
- ☹ Expected to emerge as soon as 2030s

# Meet the Miocene

☹ Miocene Climatic Optimum (17 – 15 my)

☹ **$CO_2$ levels 400 – 600ppm**

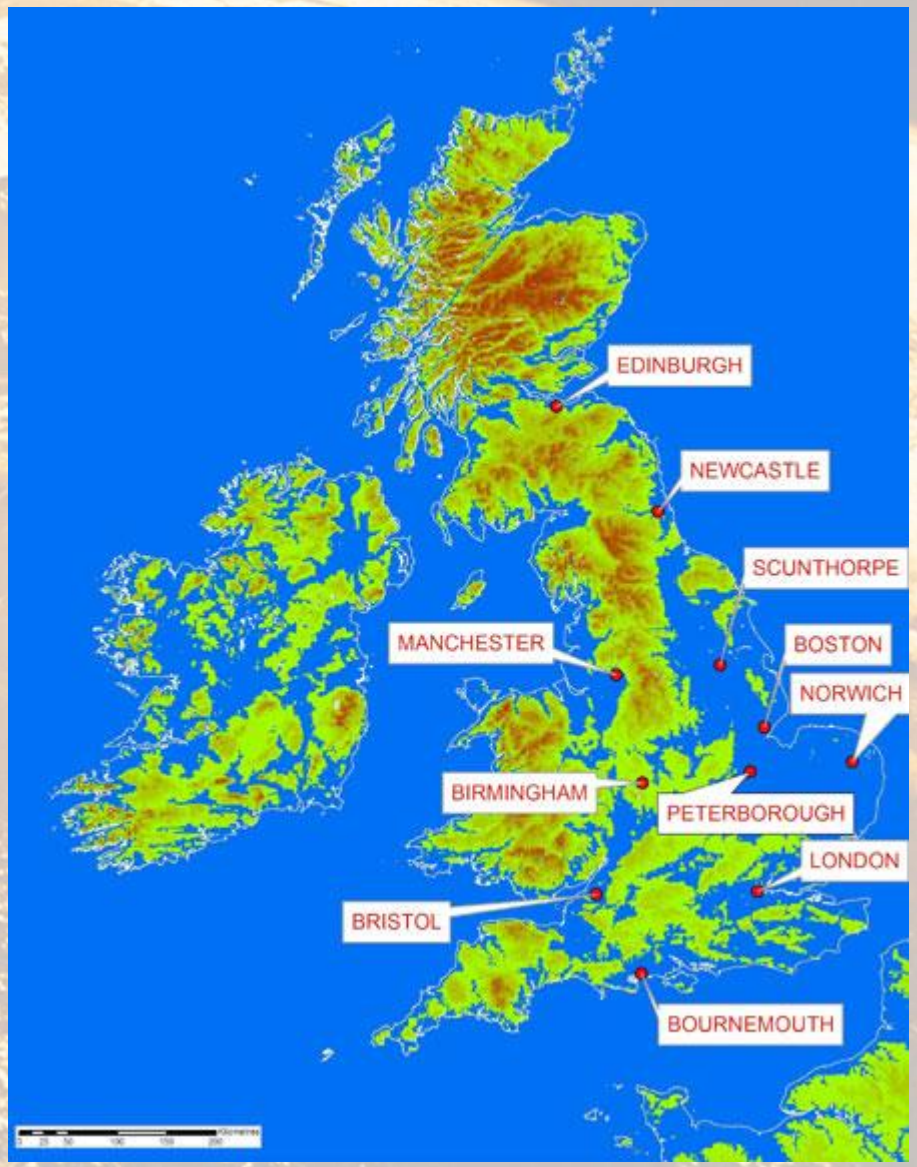
☹ Average temperature 7°C - 8°C hotter than Pre-industrial

☹ Much hotter than expected for moderate $CO_2$ levels

☹ Little ice left in Antarctica – sea level ~50m higher

☹ Land area twice the size of India submerged

☹ UK downsized to an archipelago of thousands of small islands



# Eocene hellhole



☹ 55 my ago - after PETM the planet stayed very hot

☹ $CO_2$ levels were more than 1,000ppm

☹ Global average temperature was 13°C hotter than today

☹ Ice-free world – today would mean ~ 65m sea level rise

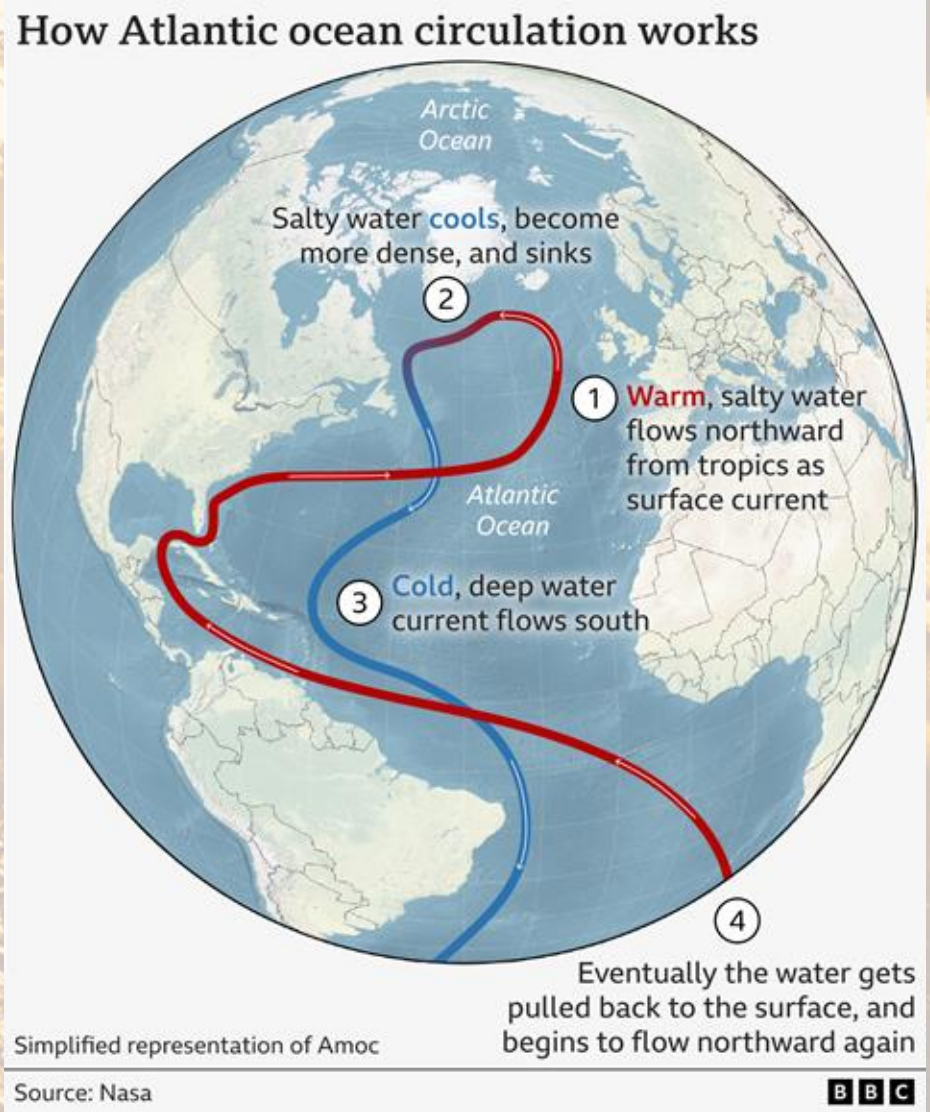
☹ Ecosystems would be devastated

☹ Most of world uninhabitable for humans

☹ **Could begin to emerge as soon as 2100**

# Time of the ice flower

- ☹ Post ice-age thaw halted 12,900 years ago by return of 1200y long cold snap – **Younger Dryas**
- ☹ Shutdown of AMOC due to colossal meltwater release
- ☹ Slowed 15% since mid-19th century – weakest for 1500y
- ☹ 50% slowdown by 2100 – or worse
- ☹ Winter lows – minus 20 London; minus 50 Bergen
- ☹ Farming all but impossible in northern Europe & UK



# So, how are we doing?




- ☹ In 2025 – wind and solar were biggest sources of new energy
- ☹ Also burned record amount of coal, oil and gas
- ☹ 86% global primary energy supply from fossil fuels in 2025 – **5% from wind and sun**
- ☹ China will get just 10% of primary energy from wind and sun in 2035
- ☹ In 2026 **EVs expected to reach 4%** of all vehicles on roads; ~12% by 2035

# Look around you





- ☹ Climate breakdown already driving massive and persistent societal and economic shocks
- ☹ Crop yields and food supplies taking a hammering
- ☹ UK food prices up 50% in last 5 years
- ☹ 4 worst UK harvests in 7 years
- ☹ Global economy growing at slowest pace since 1960s
- ☹ World is already going backwards
- ☹ El Niño could result in $20 trillion hit to global economy

# Grim times





☹ Green policies rolled back

☹ 38 billion+ tonnes of $CO_2$ annually from burning fossil fuels

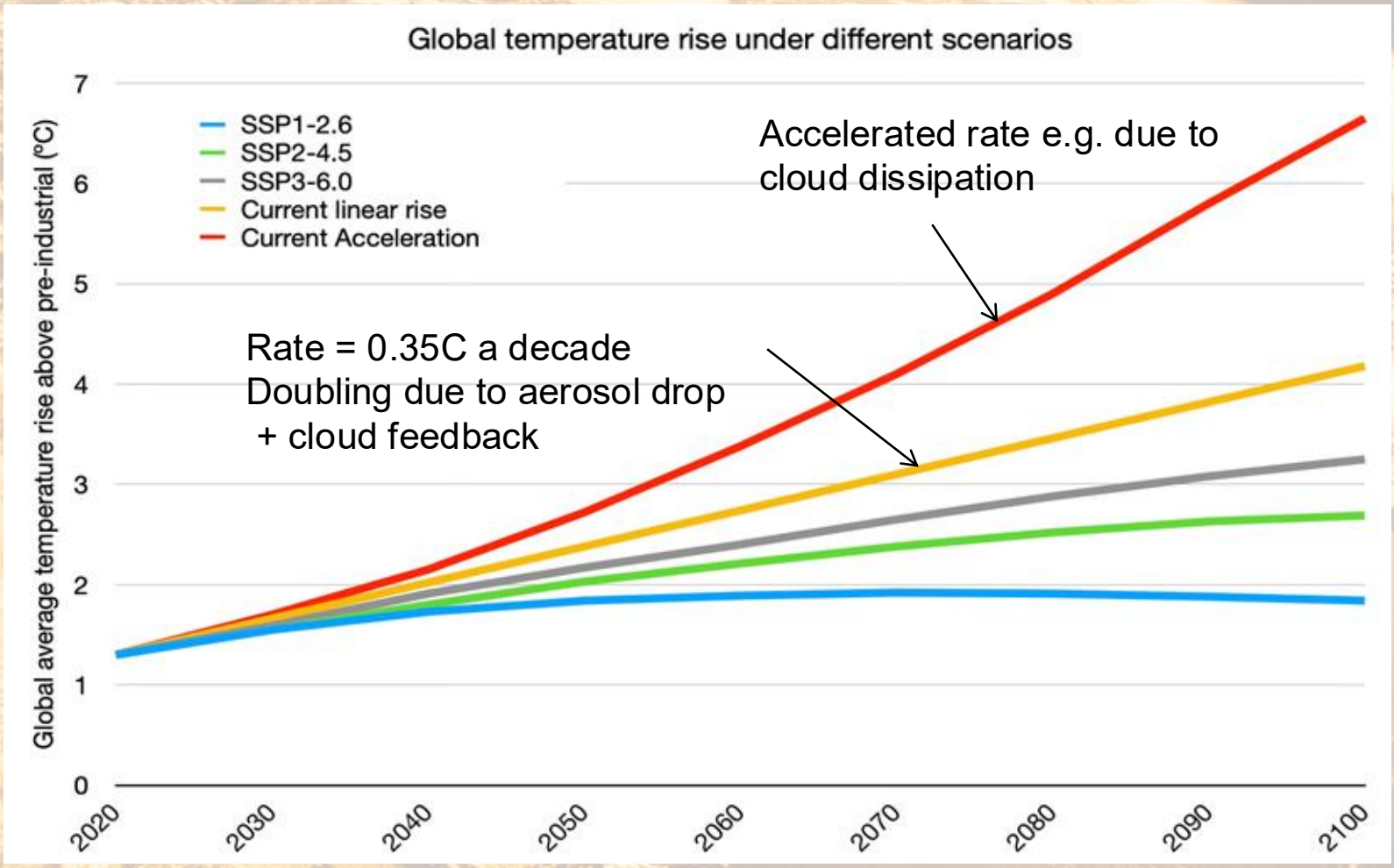
☹ Fossil fuel corporations planning for expansion

☹ Planet now heating at 0.4°C a decade = 1°C every 25 years

☹ Great concern over cloud behaviour driving further acceleration

☹ Where will it all end?

# Back to the future




https://drtomharris.substack.com/p/climate-risk-management-has-conventional

# Pathways to a new world

☹ At current rate, planet will heat by 1°C every 25 years – faster if acceleration continues at recent rate or if satellite data are correct

☹ We have left the safe space of the Holocene and are on cusp of a return to the last interglacial (Eemian)

☹ A reprise of a Pliocene climate is already locked-in – modelling shows it will start to emerge from the 2030s

☹ Path 1: **The hell for leather**

☹ Path 2: **The Damascene conversion**

☹ Path 3: **The bumbling along**

# What no-one wants to hear

☹ 2023: 15,000 scientists sign letter warning of risk of societal collapse

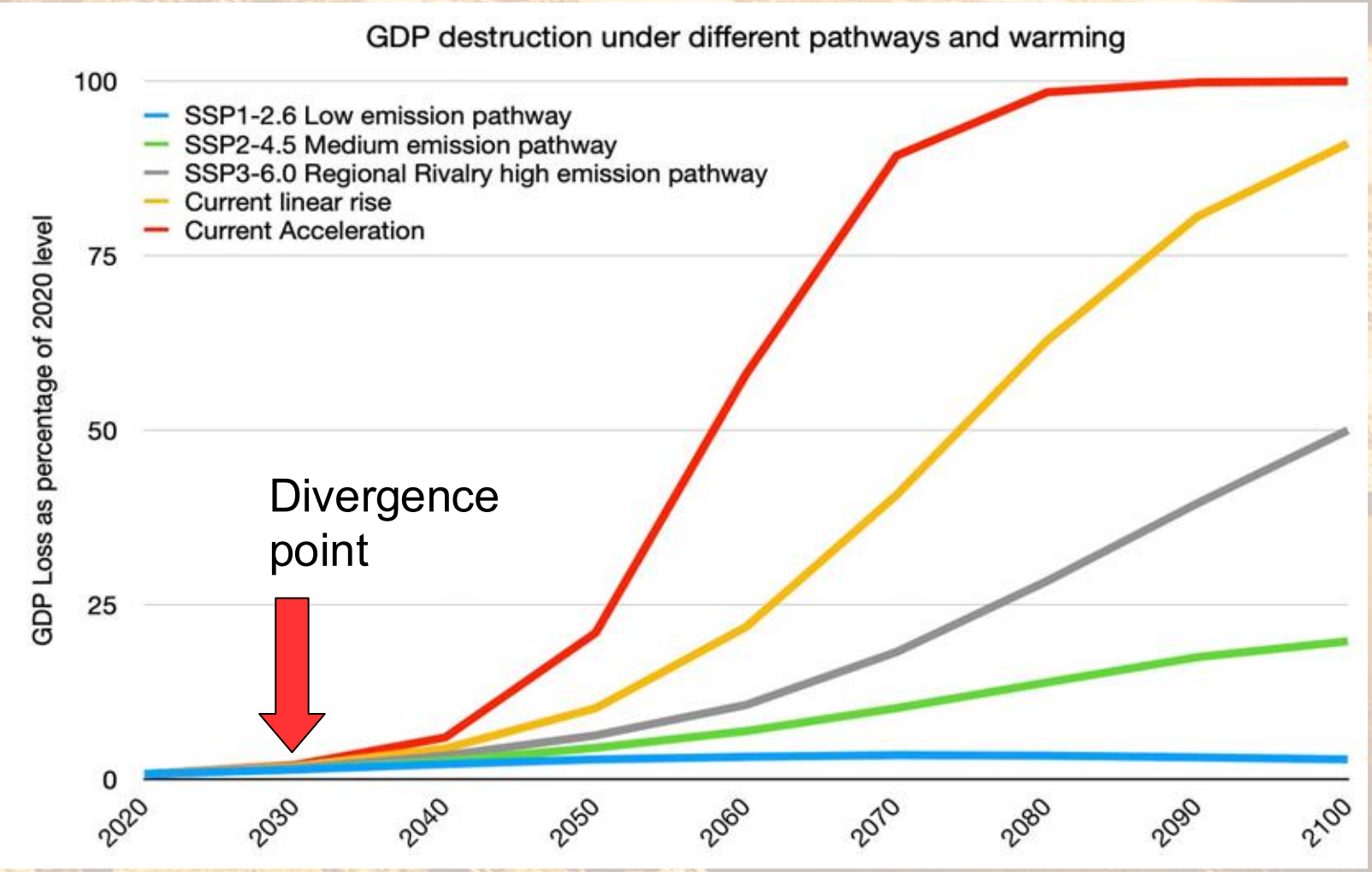
☹ 2020 *Limits to Growth* update: collapse as soon as 2040 for business as usual

☹ 2025 UK Institute of Actuaries/Exeter Uni: 25% fall in global GDP and 2 billion dead by 2050 for 2C rise

☹ 2026 UK JIC report – food shortages and economic collapse may be just years away



# It doesn't look good




https://drtomharris.substack.com/p/climate-risk-management-has-conventional

# What can we do?

☹ Societal failure does not negate action on emissions

☹ Also need to prepare for failure of central control

☹ Plan at local level

☹ Life will still be very bleak and wild west conditions will prevail

☹ Opportunity to build on a hotter world a new global community that lives within its limits as custodians not plunderers

☹ Will we take it?





# Three quotes for our time

☹ “The truth will set you free, but first it will make you miserable” James Garfield, 20th President of the United States

☹ ”Only nine meals separate humanity from anarchy”
Alfred Henry Lewis, early 20th century journalist and writer

☹ “The end of the human race will be that it will eventually die of civilisation” Ralph Waldo Emerson, 19th century American writer and thinker