Welcome to this week's presentation & conversation hosted by the **Canadian Association for the Club of Rome**, a Club dedicated to intelligent debate & action on global issues.

The views and opinions expressed in this presentation are those of the speaker & do not necessarily reflect the views or positions of CACOR.

The Rapidly Deteriorating Global Climate Emergency and What Must Be Done.

Our speaker today is Peter D. Carter, MD, a retired family and emergency physician with a background in environmental health protection policy, who is now director of the Climate Emergency Institute. He has been an expert reviewer for the IPCC and is co-author of Unprecedented Crime: Climate Science Denial and Game Changers for Survival.

DESCRIPTION: We live in the age of abrupt and accelerating collapse. According to NOAA's The Power of Greenhouse Gases, "We are committing Earth, and ourselves, to climate chaos for thousands of years." Dr. Carter will present the latest trends and indicators of unprecedented climate system, ecological and biodiversity collapse. Today's evidence reinforces the Club of Rome's Case for a Planetary Emergency Plan: "We are living beyond the carrying capacity of the planet, putting human systems on a collision course with natural systems.... The stability of these systems—commons on which we so fundamentally depend—is now at risk." Peter will then discuss what must be done to mitigate the hell on Earth we are bequeathing all the world's children...and any future generations.

The presentation will be followed by a conversation, questions, & observations from the participants.

CACOR acknowledges that we all benefit from sharing the traditional territories of local Indigenous peoples (First Nations, Métis, & Inuit in Canada) and their descendants.

Website: canadiancor.com
Twitter: @cacor1968
YouTube: Canadian Association for the Club of Rome
2023 Nov 15 Zoom #171

CLIMATE EMERGENCY INSTITUTE

The Health and Human Rights Approach to Greenhouse Gas Pollution

An Intensifying Global Climate Emergency and What Must Be Done

Peter D. Carter

Climate Emergency Institute, Victoria, BC

on the territory of the lək̓ʷəŋən-speaking peoples (Songhees & Esquimalt)

Deepening Climate Catastrophe Denial

1.5°C is out of the question

The Dire Climate Emergency

1.5ºC = Globally disastrous

2.0ºC = Globally catastrophic

In 2023, global emissions are increasing as fast as ever

“We are committing Earth, and ourselves, to climate chaos for thousands of years.”

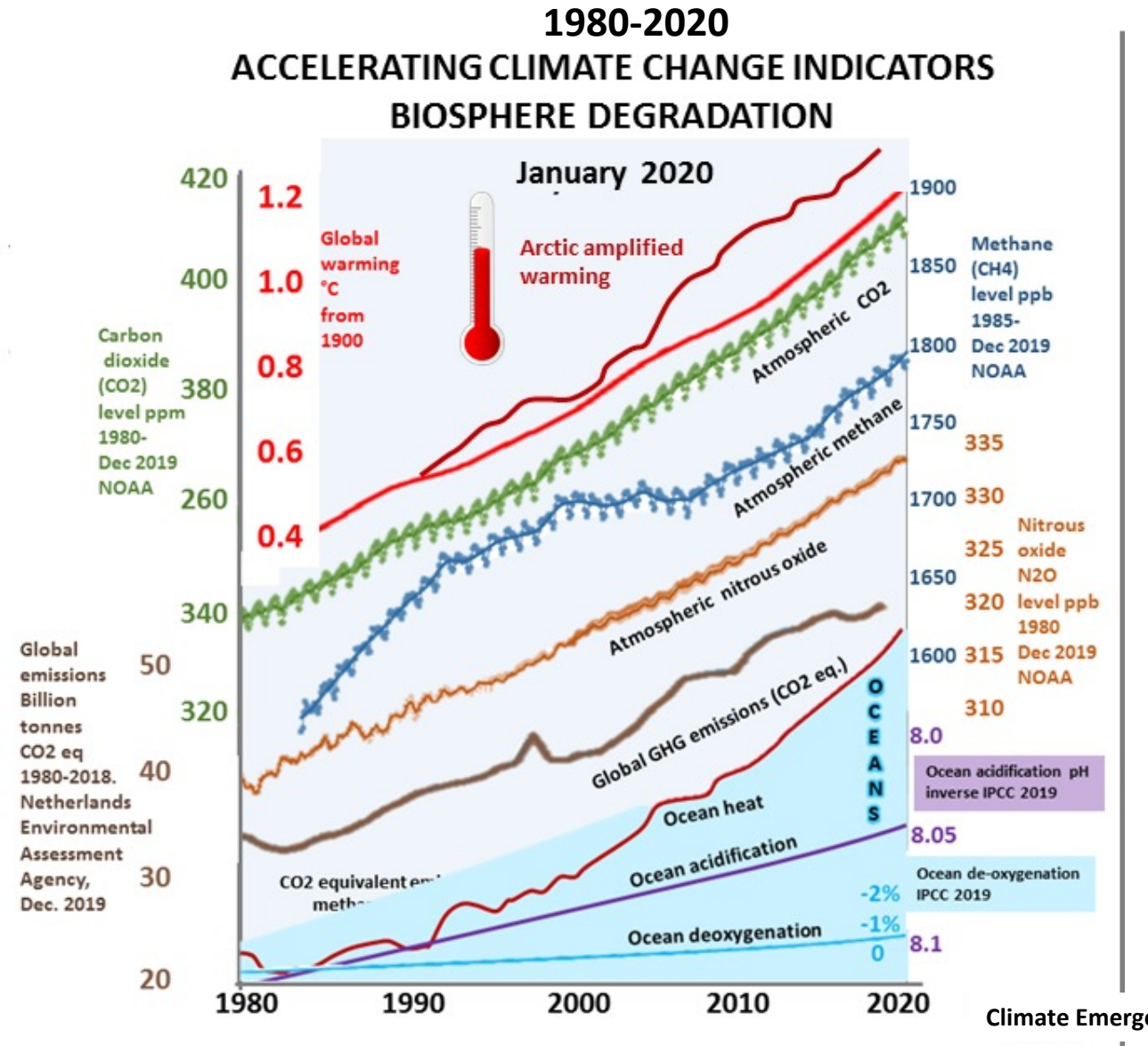
— NOAA Power Greenhouse Gases, May 2023

IPCC 6th Assessment, Working Group 2 (Impacts) 28 February 2022 Press release

- **“This report is a dire warning about the consequences of inaction.”**
- **“The world faces unavoidable multiple climate hazards over the next two decades with global warming of 1.5°C.”**
- **“Any further delay in concerted global action will miss a brief and rapidly closing window to secure a liveable future.”**

Multiple climate change indicators:
Rapid trend to climate breakdown and biosphere collapse

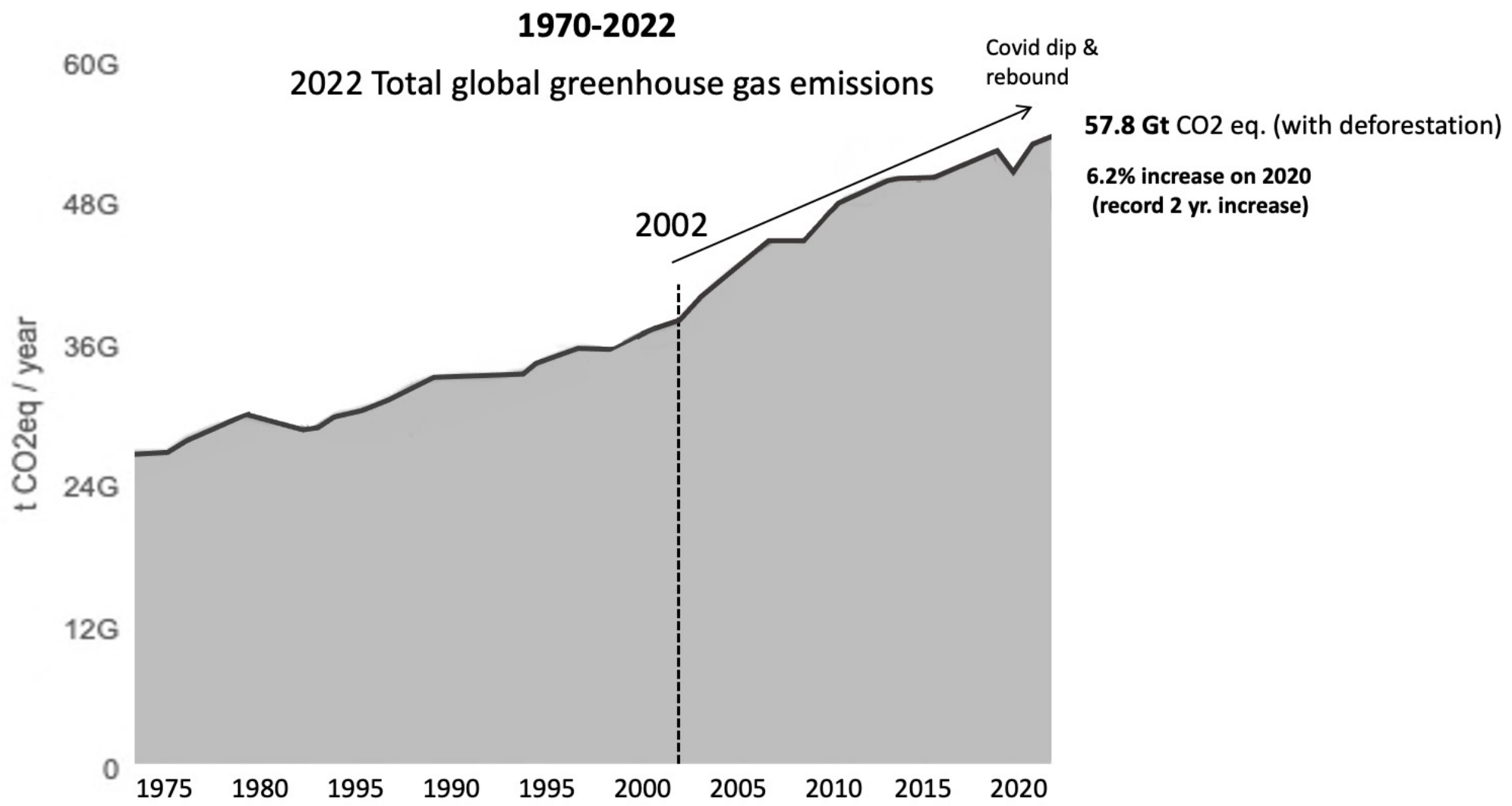
Everything is getting worse — faster



Climate Emergency Institute

EDGAR – Emissions Database
15 September 2023

2022: Global Greenhouse Gas Emissions Record High Increasing As Fast As Ever



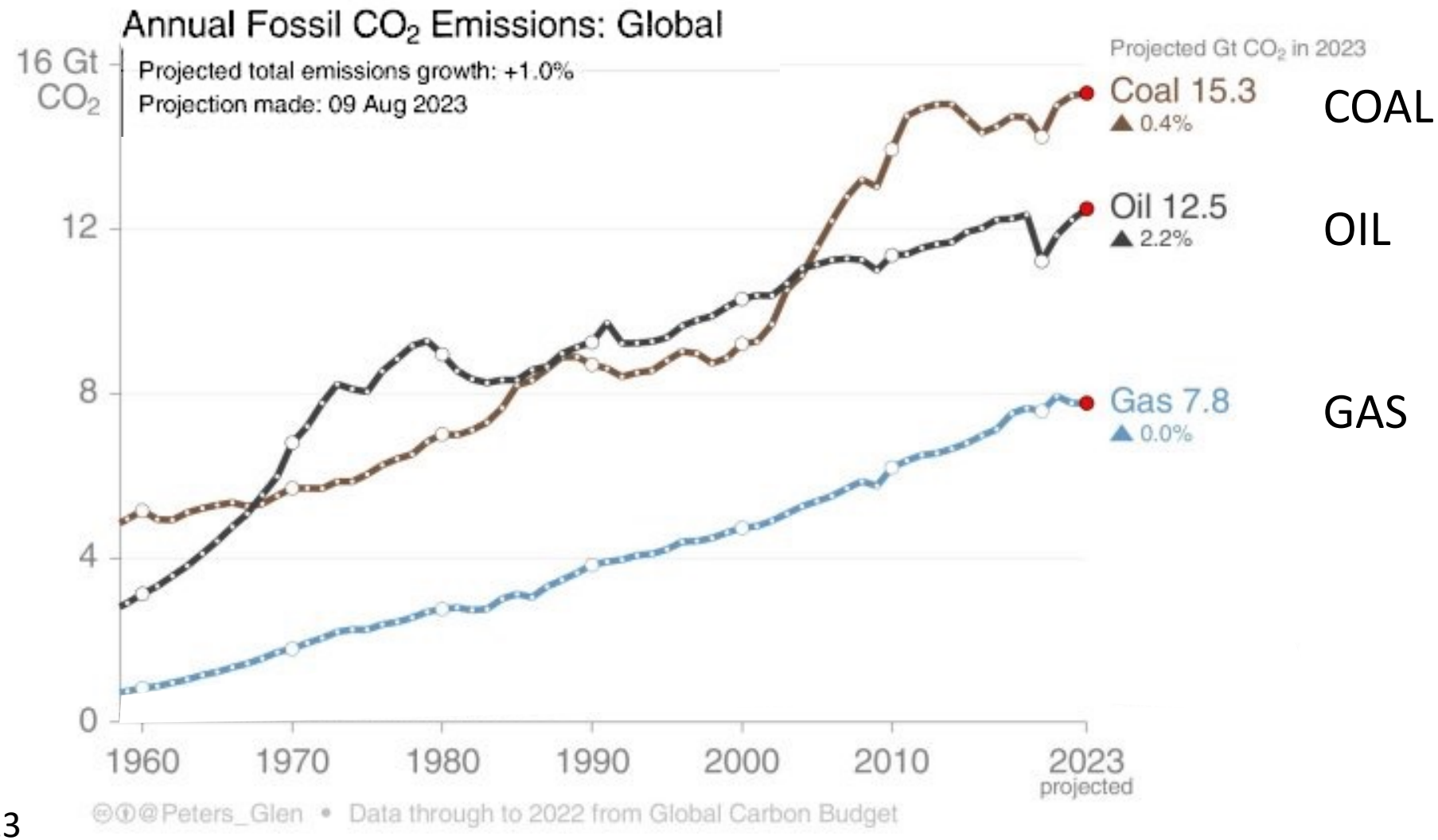
from EDGAR - Emissions Database for Global Atmospheric Research Publications Office of the European Union, 15 Sept. 2023,

Peter Carter, Climate Emergency Institute

The Defining Indicator

Global fossil fuel CO2 emissions will reach a new high in 2023, increasing 1%

Coal increasing



COAL

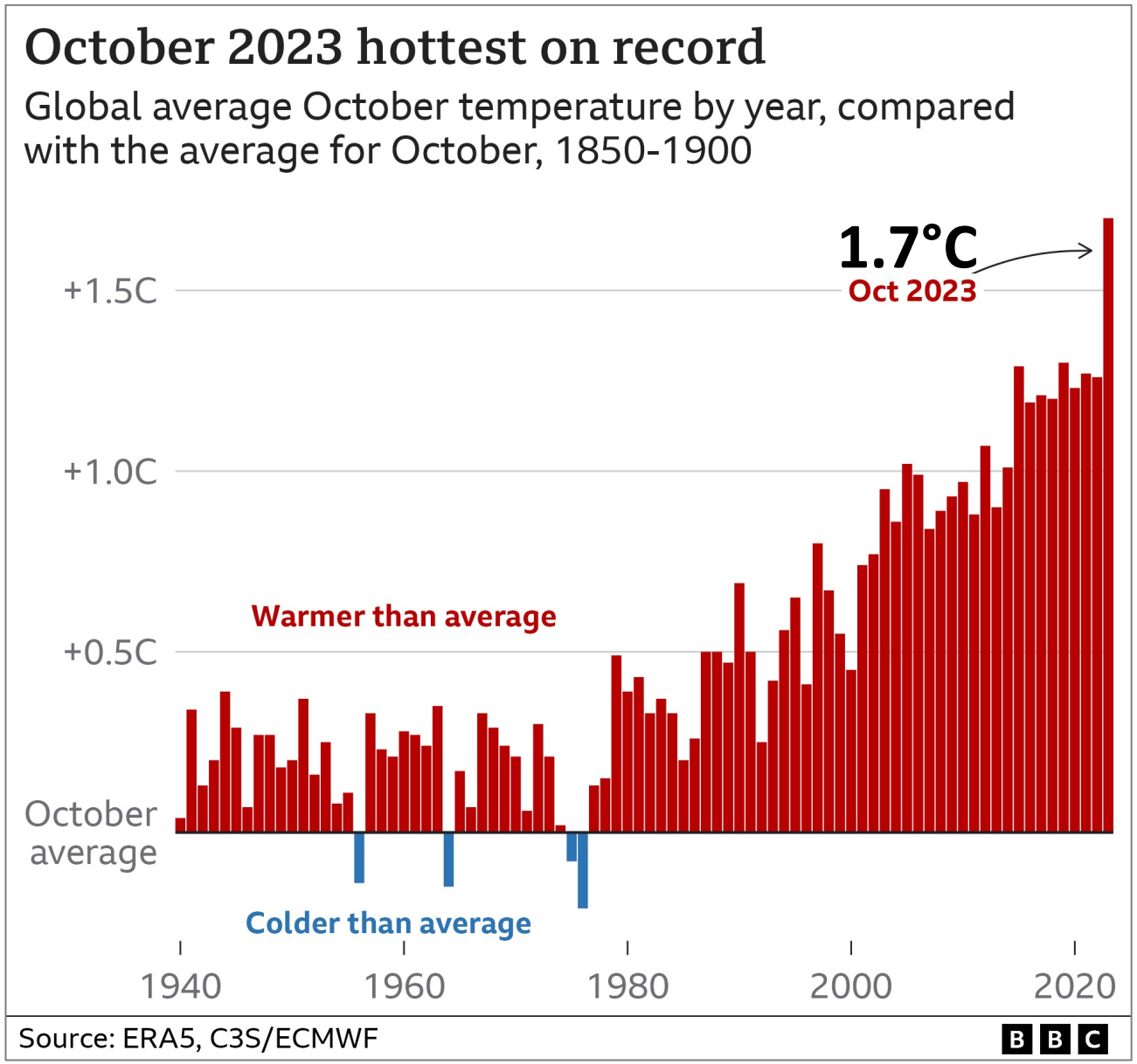
OIL

GAS

CICERO 19.10.23

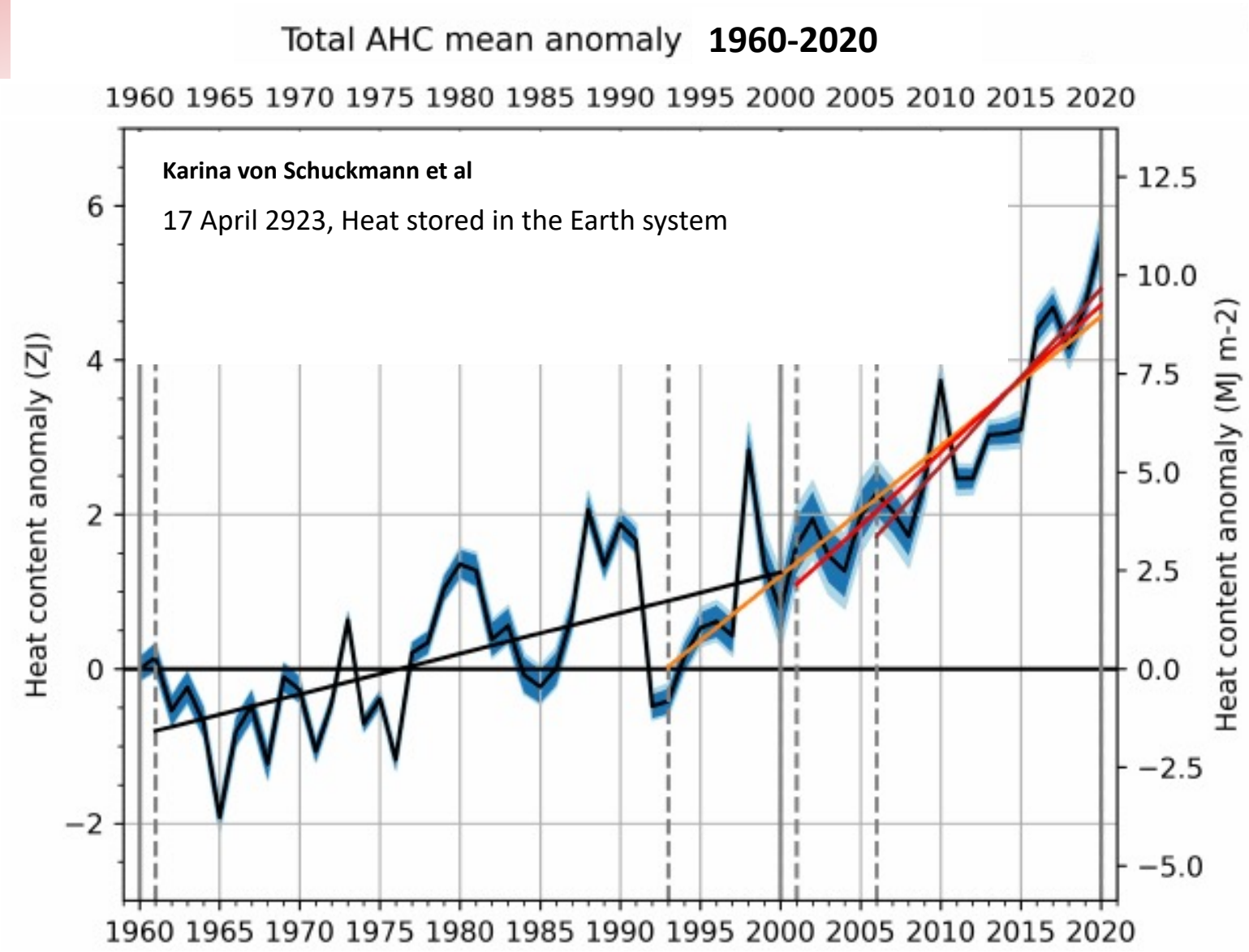
October 2023

Record October — Record highest warming



Accelerating increase in atmospheric heat

Why global warming is accelerating

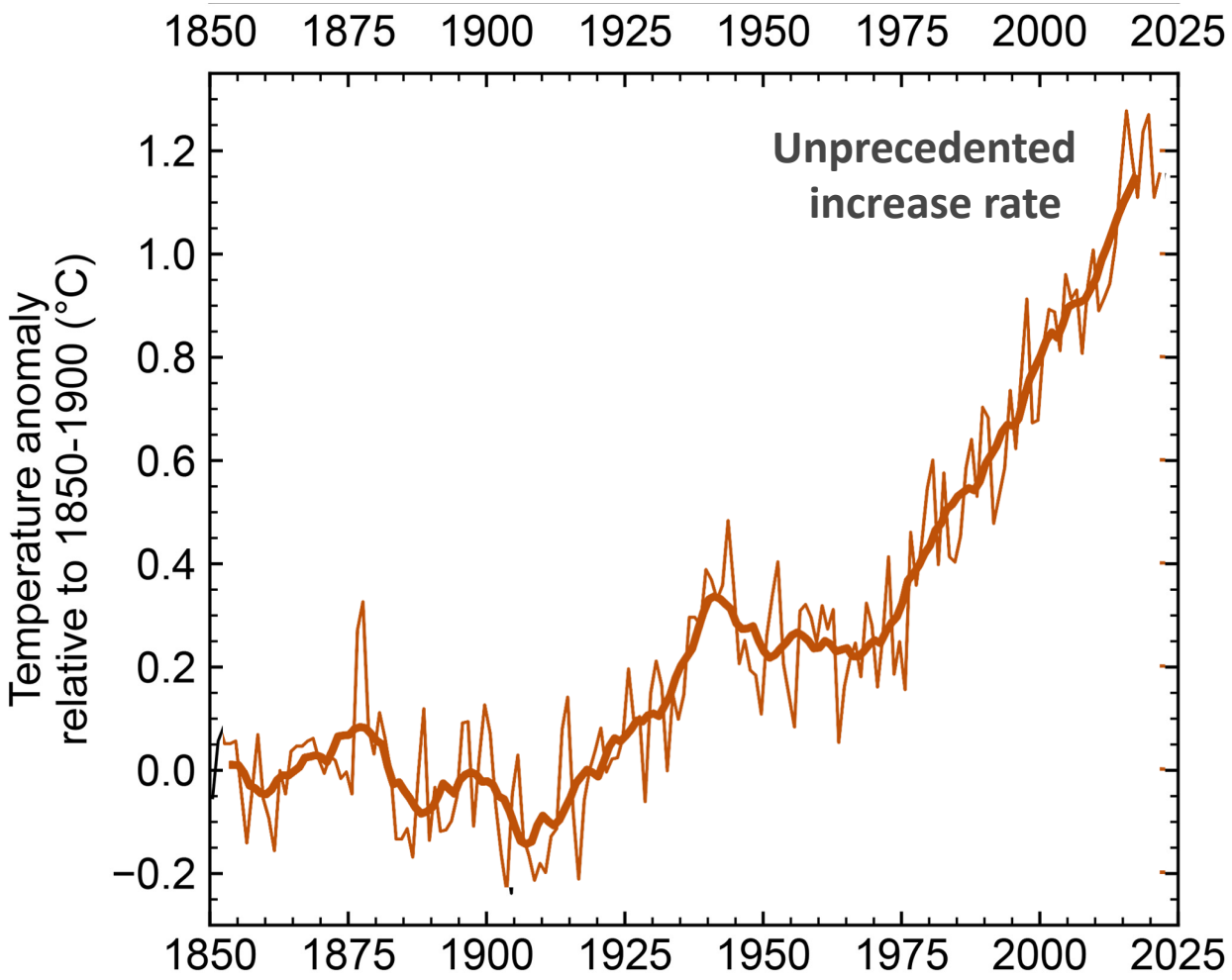


Accelerating increase of global surface temperature

from 1980-2022

driving extreme weather events

Update to IPCC indicators (2019)
8 June 2023

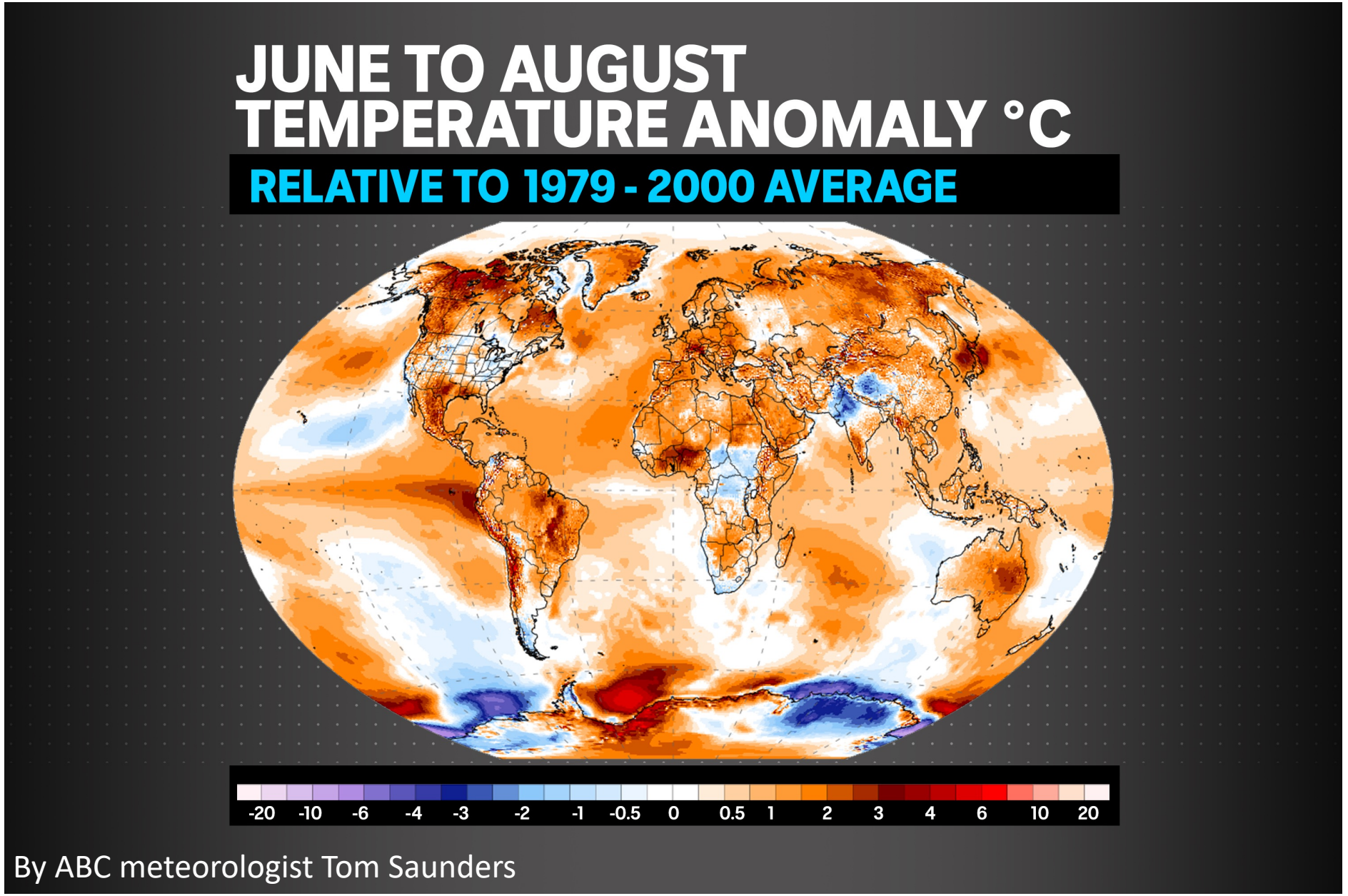


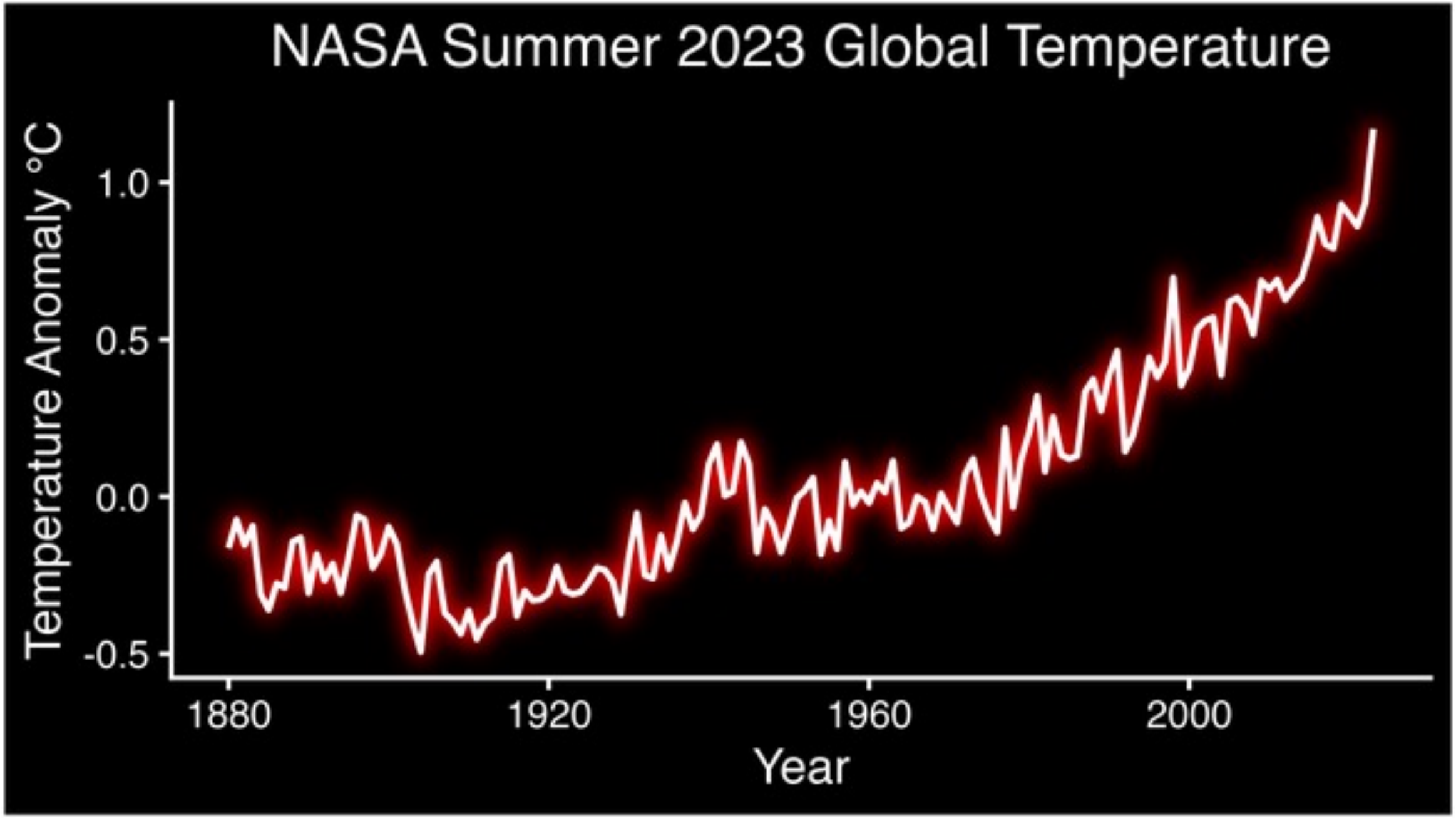
Unprecedented increase rate over past 10 years

Over the 2013–2022 period, human-induced warming has been increasing at an **unprecedented rate** of over 0.2°C per decade.

8 June 2023, Indicators of Global Climate Change 2022: Annual update of large-scale indicators of the state of the climate system and human influence, Piers M. Forster et al

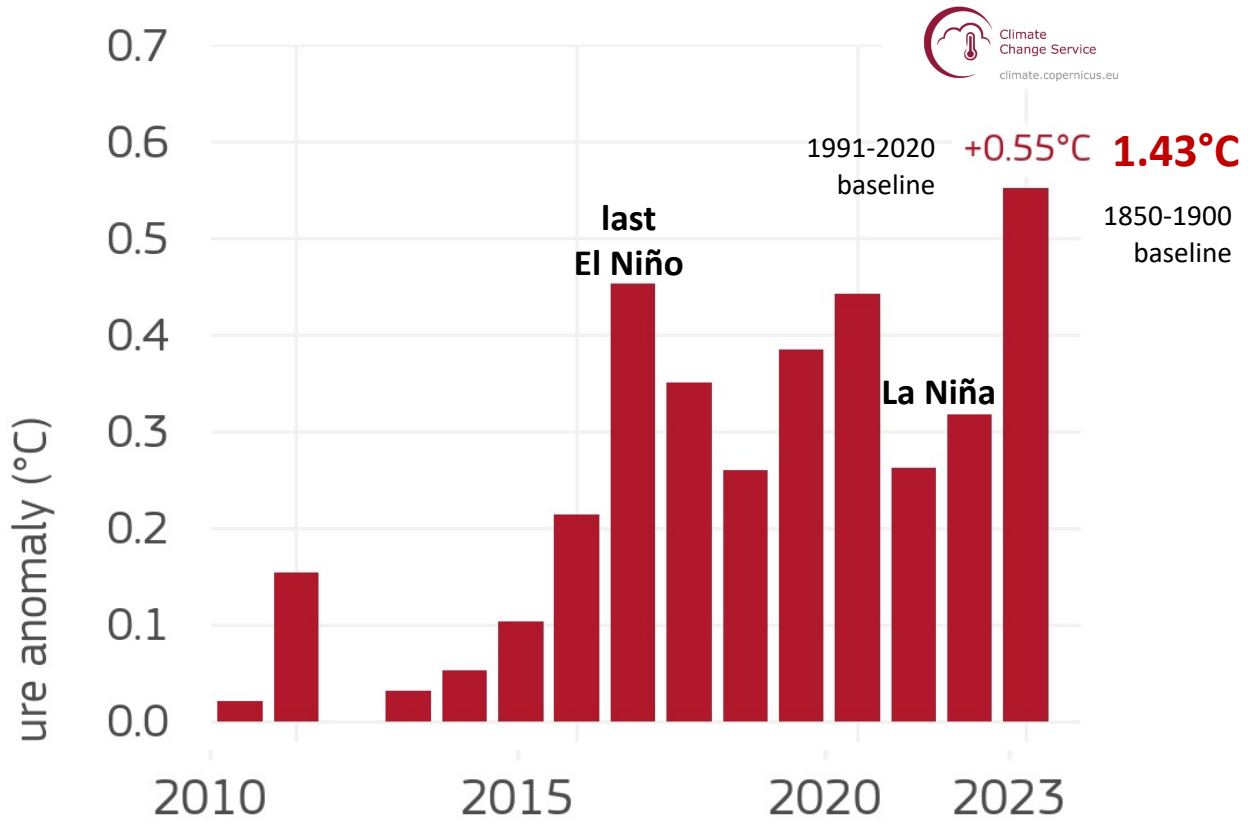
2023: Hottest Summer On Record




NASA Summer 2023 Global Temperature
Temperature Anomaly °C
1.0
0.5
0.0
-0.5
1880
1920
1960
2000
Year

This year so far is 1.43°C higher than 1850-1900 pre-industrial level

The El Niño – Southern Oscillation has a huge effect on global surface temperature



https://climate.copernicus.eu/surface-air-temperature-october-2023

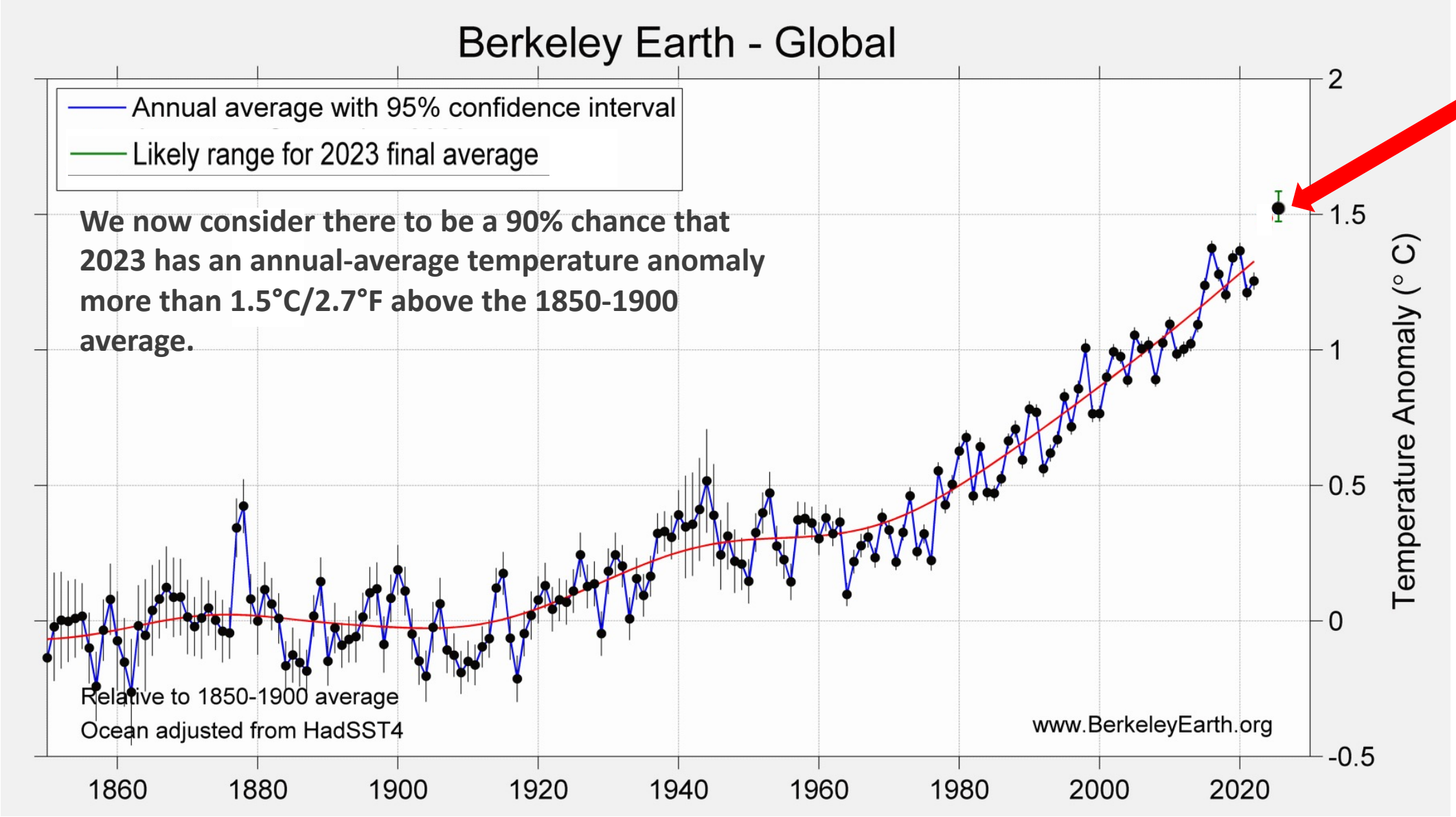
PROGRAMME OF THE EUROPEAN UNION

Copernicus Europe's eyes on Earth

IMPLEMENTED BY ECMWF

Peter Carter, Climate Emergency Institute

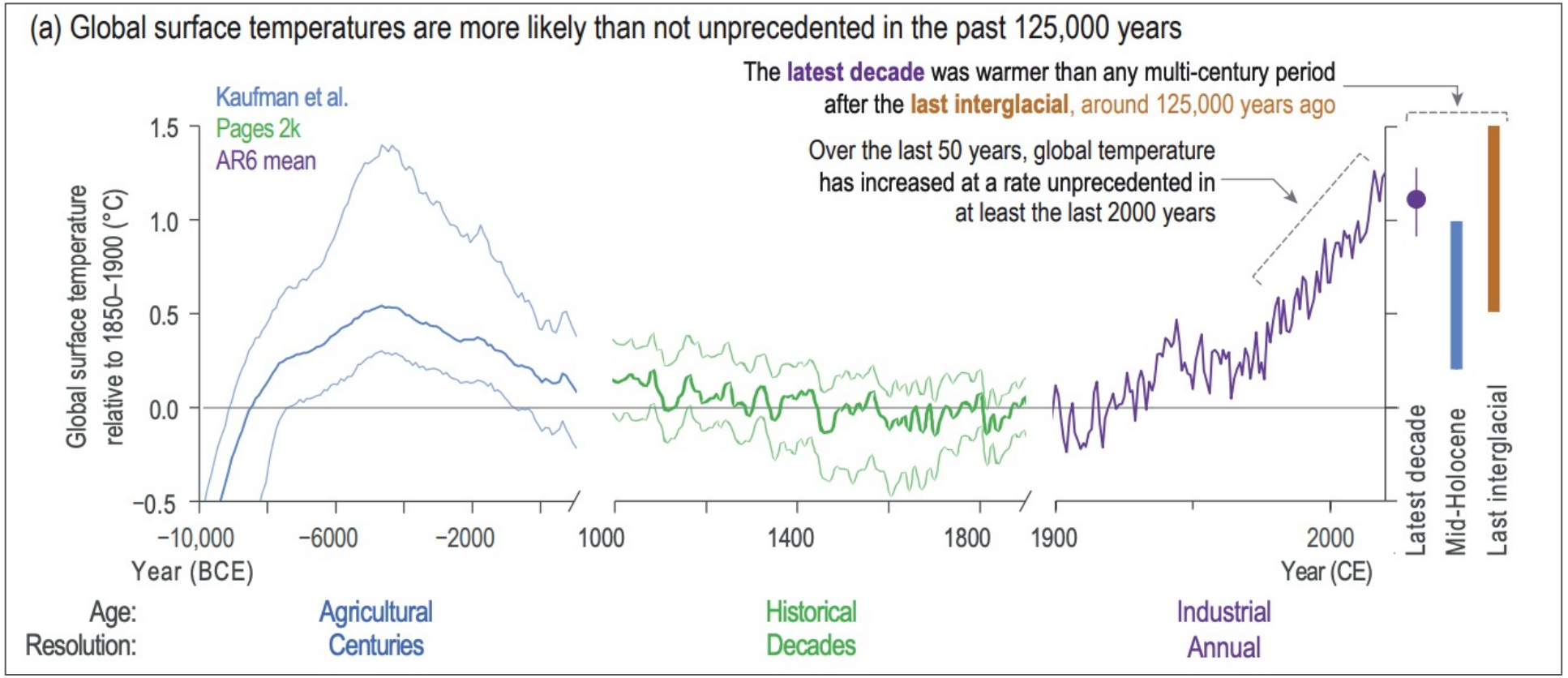
2023 will be a new record temperature year and reach 1.5°C



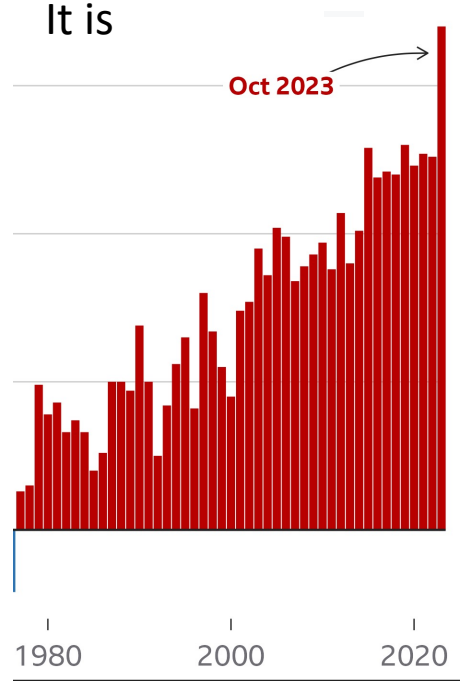
IPCC AR6: “Global surface temperatures are more likely than not unprecedented in the past 125,000 years”

Changes in surface temperature IPCC, AR6, WGI, Figure 2.11.

Temperature data graphs from IPCC AR6 data 2019



It is

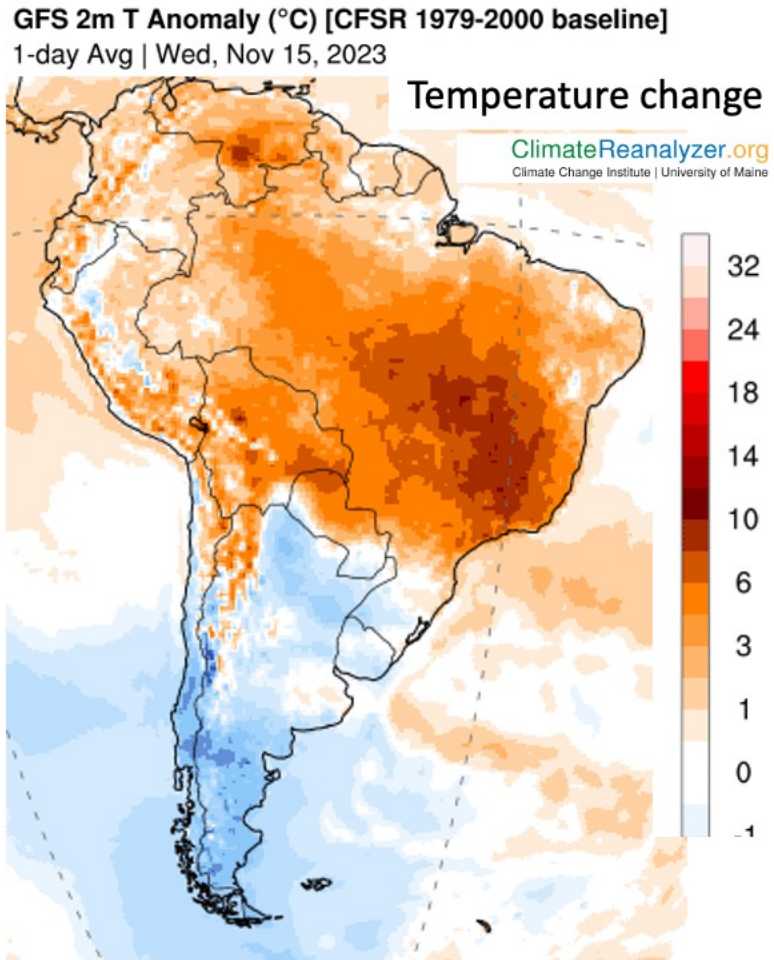


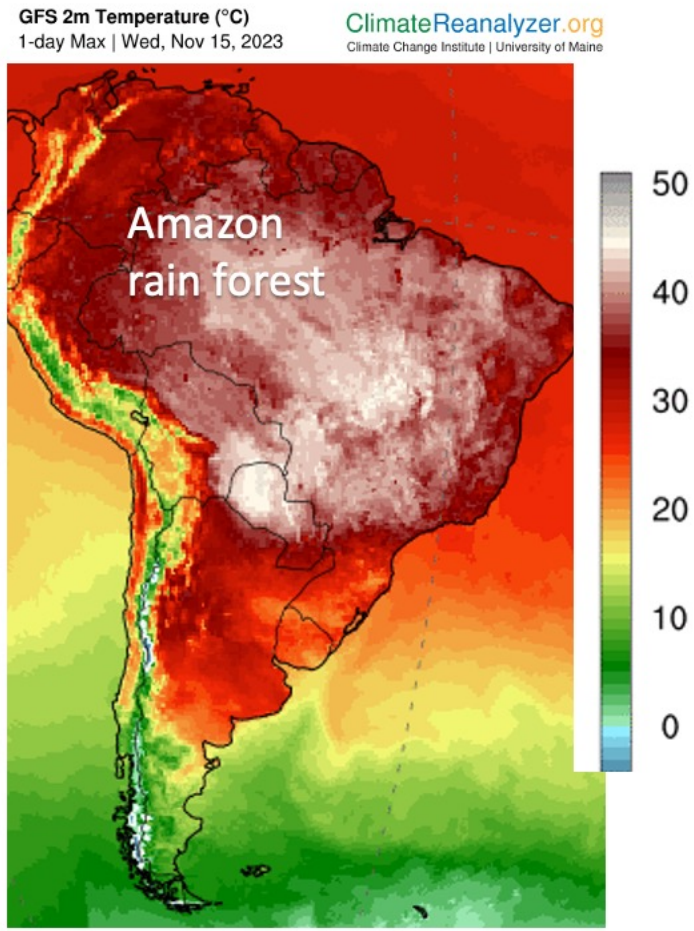
https://www.usnews.com/news/world/articles/2023-11-07/this-year-virtually-certain-to-be-warmest-in-125-000-years-eu-scientists-say

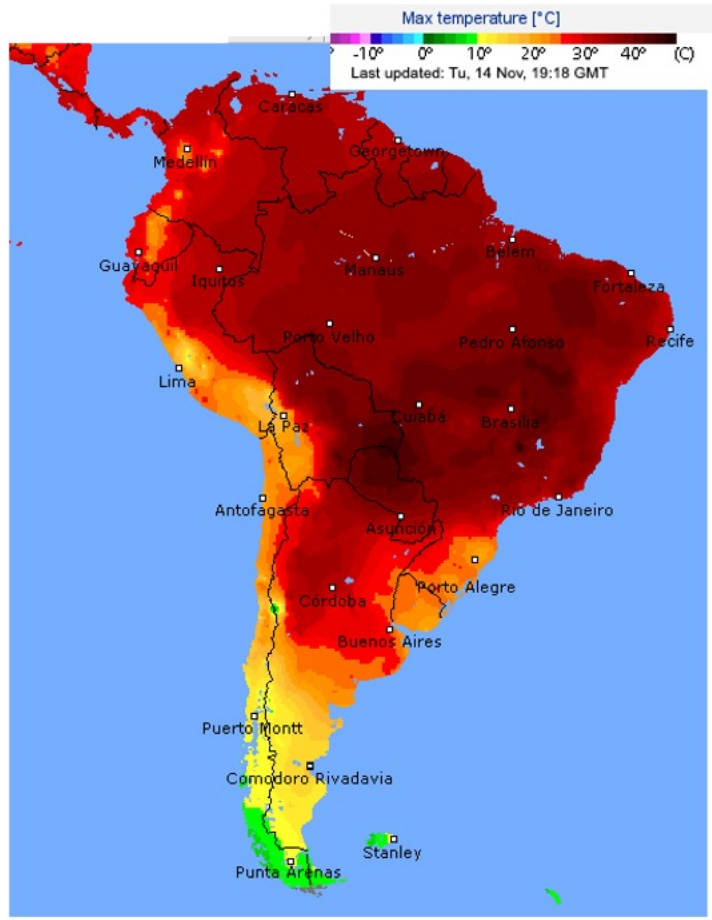
Brazil: Health warnings as country gripped by unprecedented 'unbearable' heatwave- in their Springtime

BBC, 14 Nov. 2023

Red alerts have been issued for almost 3,000 towns and cities across Brazil, which have been experiencing an unprecedented heatwave.
Records have been broken in areas including the city Rio de Janeiro - where temperatures felt as high as 52°5C.
More than a hundred million people have been affected by the heat, **more than a month before their summer**







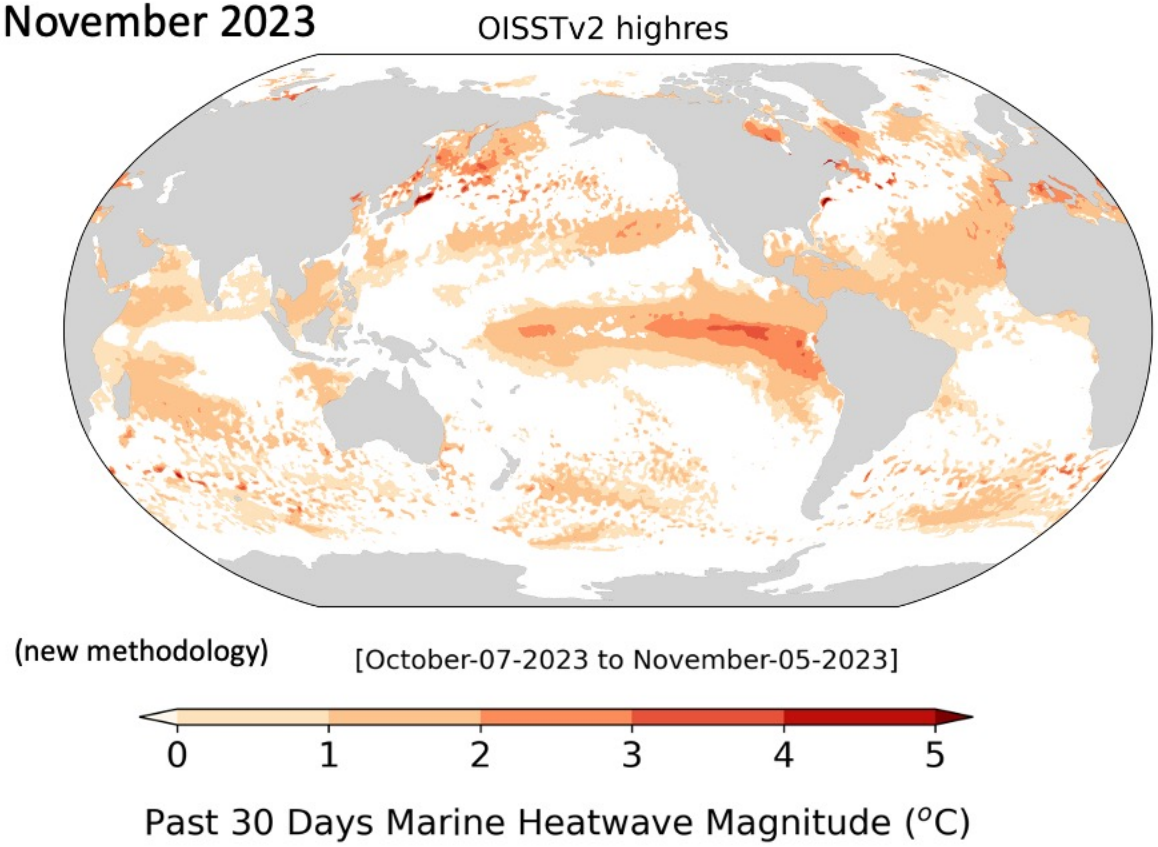
Peter Carter, Climate Emergency Institute

30% Global Ocean Marine Heat Waves

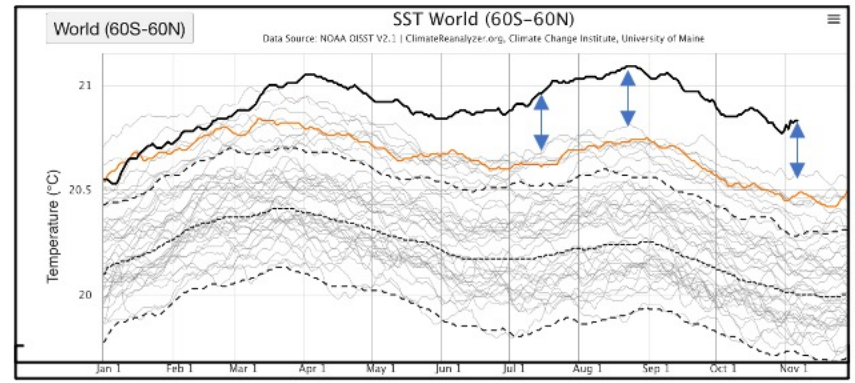
NOAA, Marine Heatwave Forecast Monthly Report

Forecasts predict that MHW coverage will remain elevated with over 30% of the global oceans experiencing MHW conditions through the end of 2023

5 November 2023

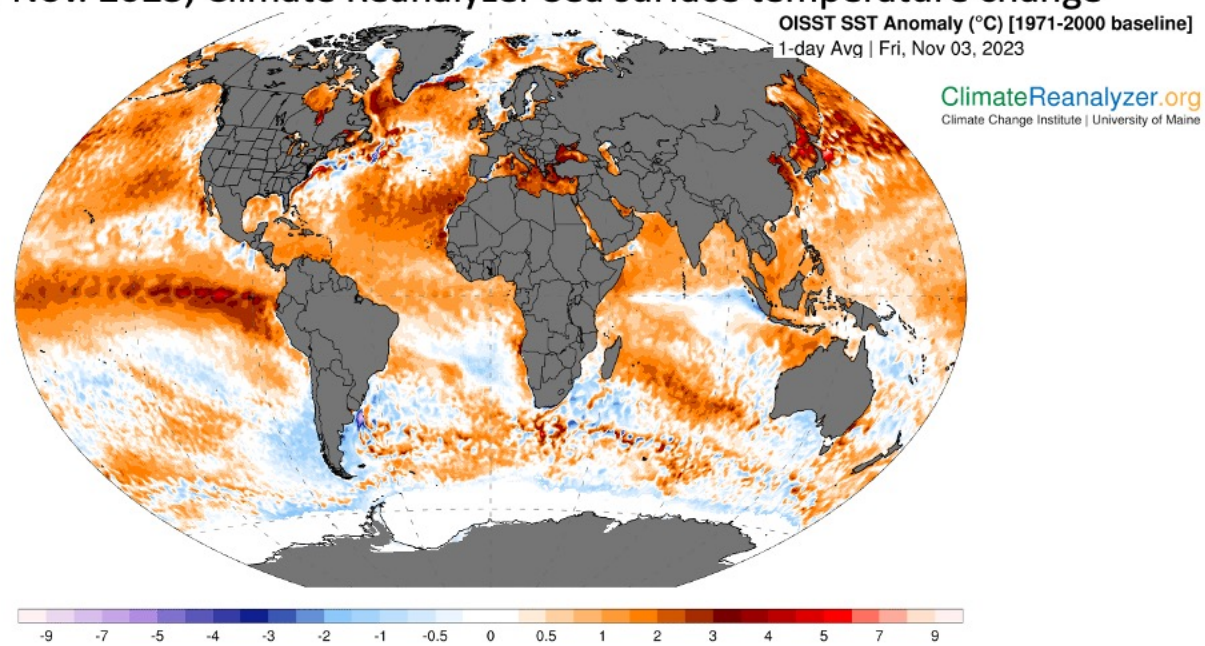


Record sea surface temperatures since July persist



6 Nov. 2023
20.8°C

5 Nov. 2023, Climate Reanalyzer Sea surface temperature change

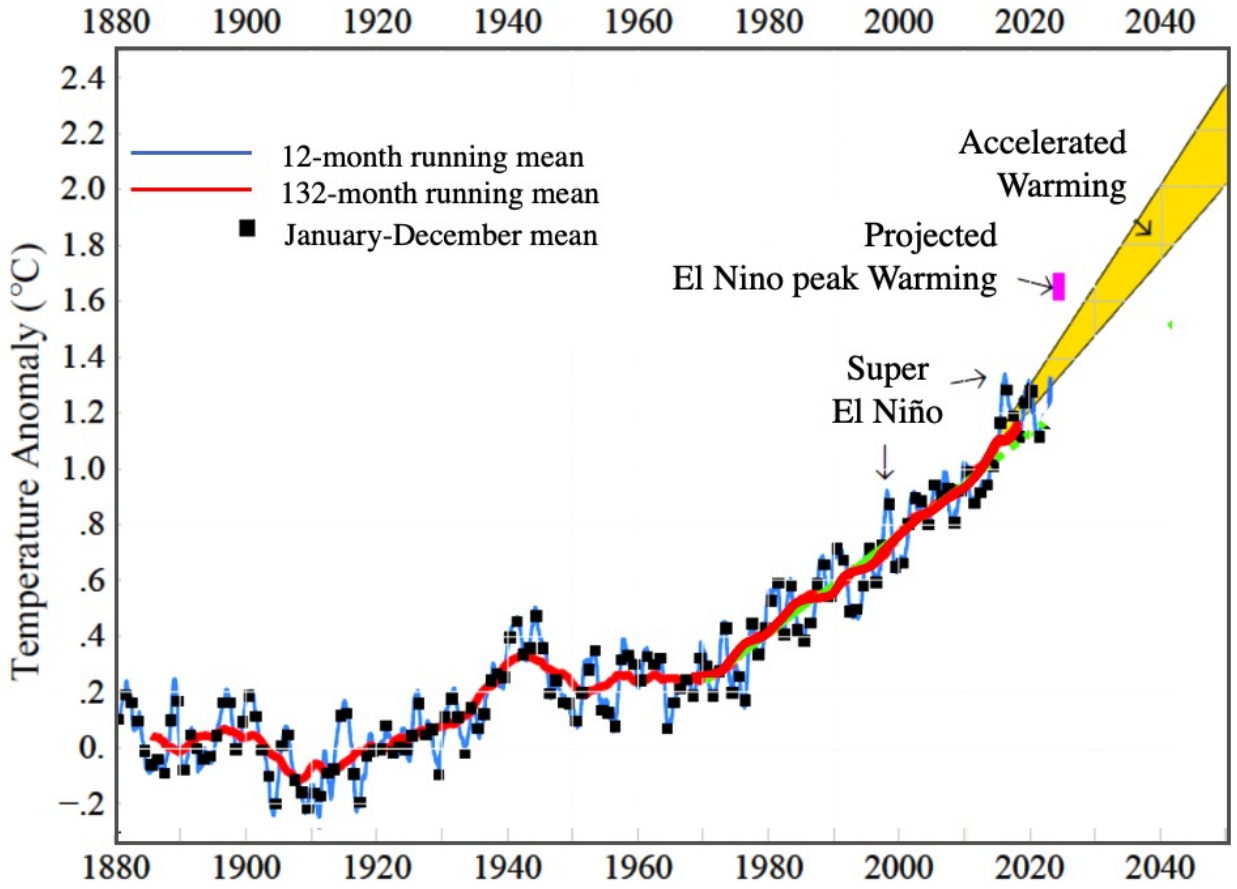


Peter Carter, Climate Emergency Institute

It’s now too late to avoid 1.5°C and 2°C
Warming in pipeline is 1.8°C

Global warming in the pipeline
James Hansen et al
10 November 2023

- **Global warming of 1.5°C will be reached by the late 2020s.**
- **Global warming of 2°C will be reached by the late 2030s.**
- **Warming still in the pipeline for 3 W/m$_2$ forcing is 1.8°C, exceeding warming realized to date (1.2°C). Excluding the large slow feedbacks.**



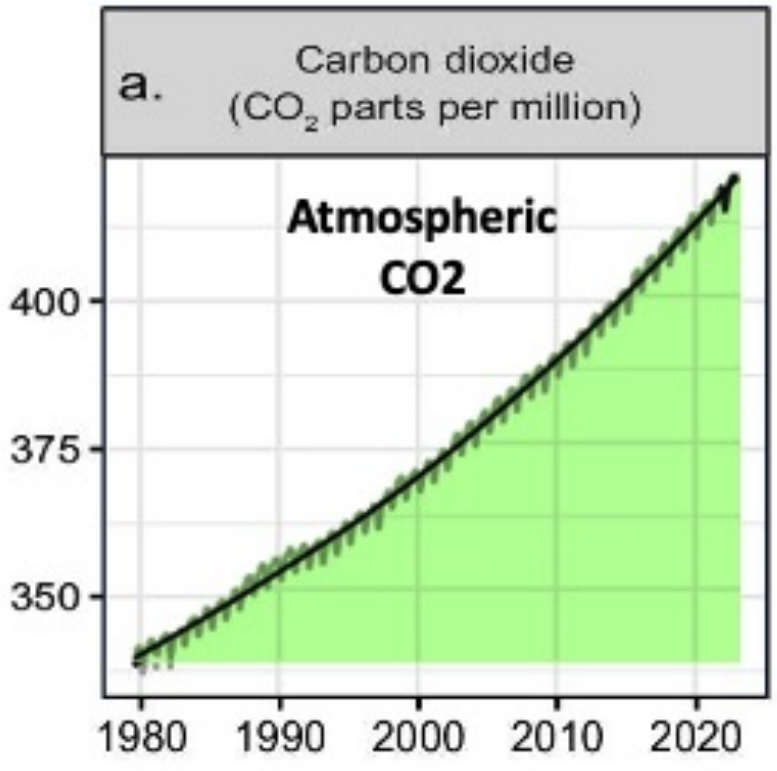
How We Know that Global Warming is Accelerating and that the Goal of the Paris Agreement is Dead

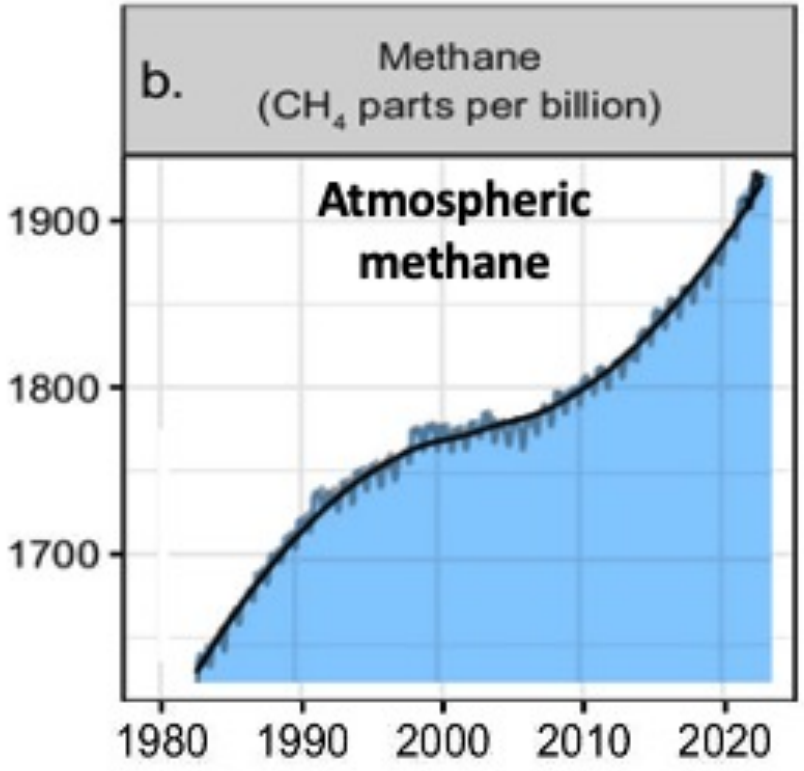
Multi-decadal acceleration of global ocean warming (Fig. 1 of Li et al., 2023).

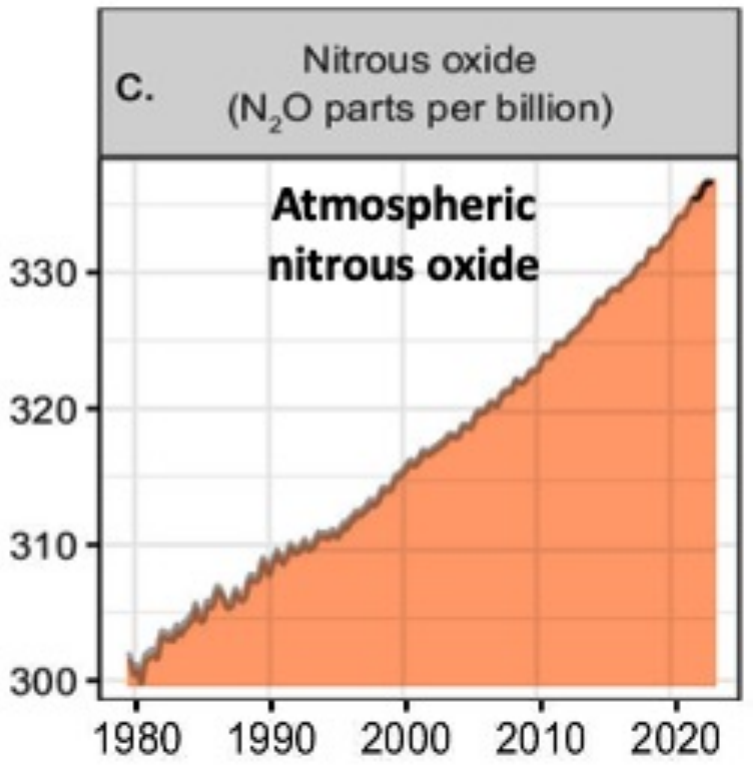
Accelerating increase in atmospheric greenhouse gas concentrations from 1980

24 October 2023
Ripple et al

Higher than ever,
Increasing faster than ever





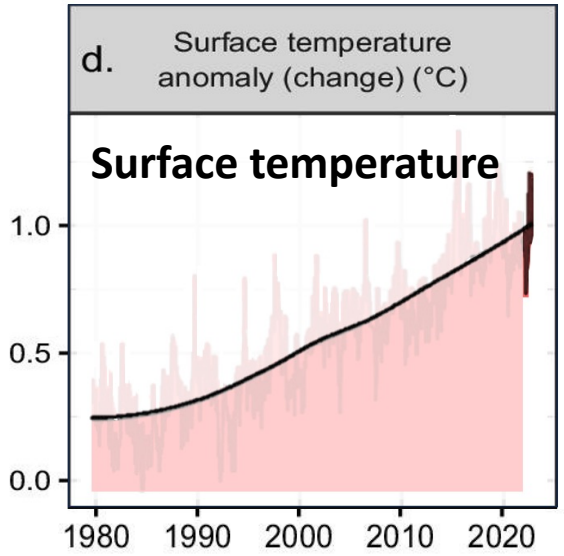


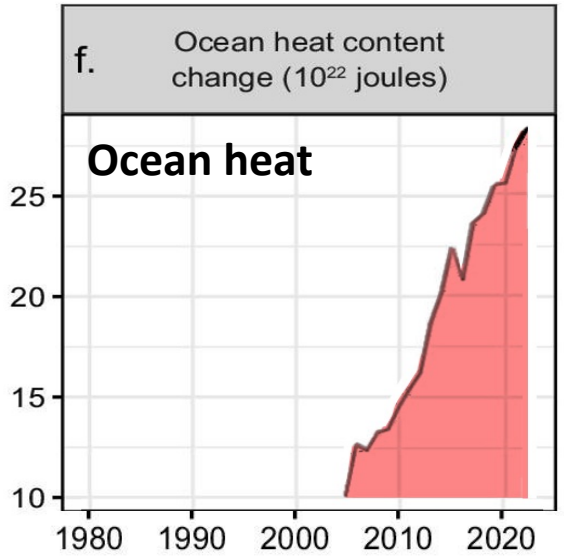
24 October 2023, The 2023 state of the climate report: Entering uncharted territory, William J Ripple et al

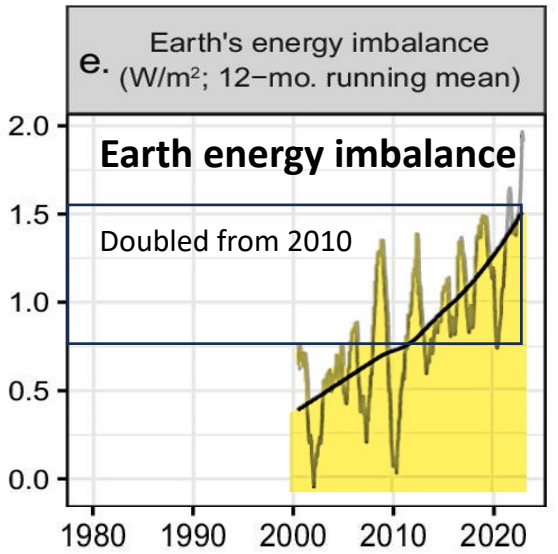
24 October 2023
Ripple et al

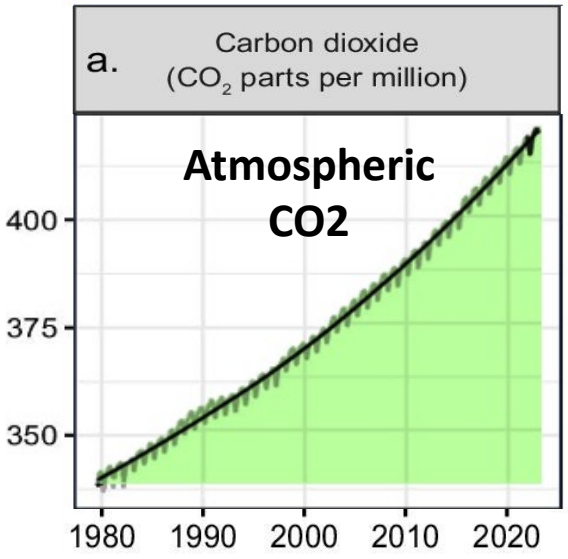
Accelerating Increase – Climate Change Indicators

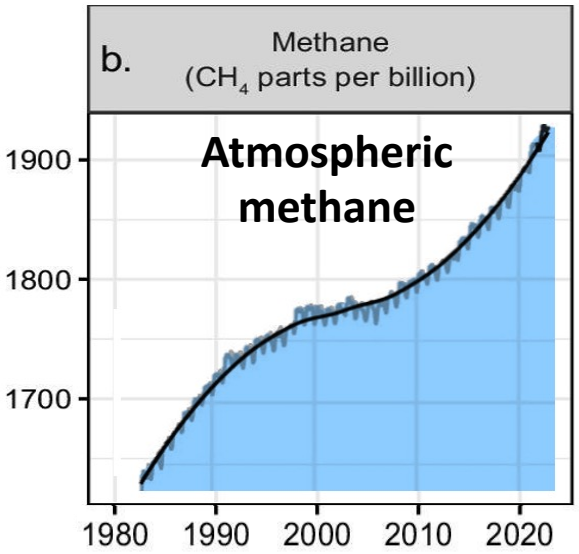
2023 State of the Climate Report

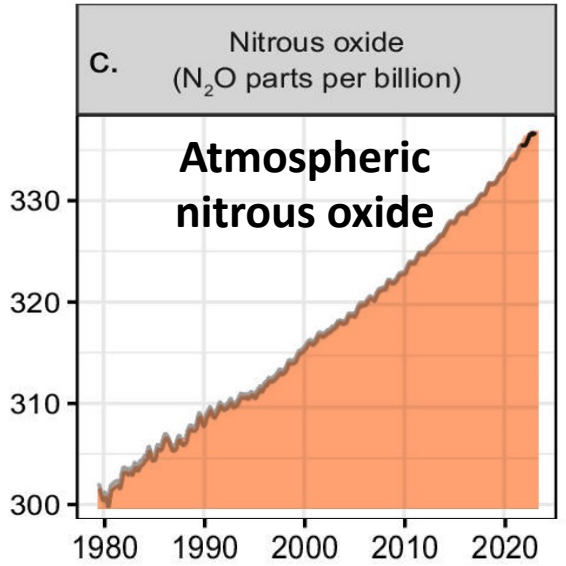






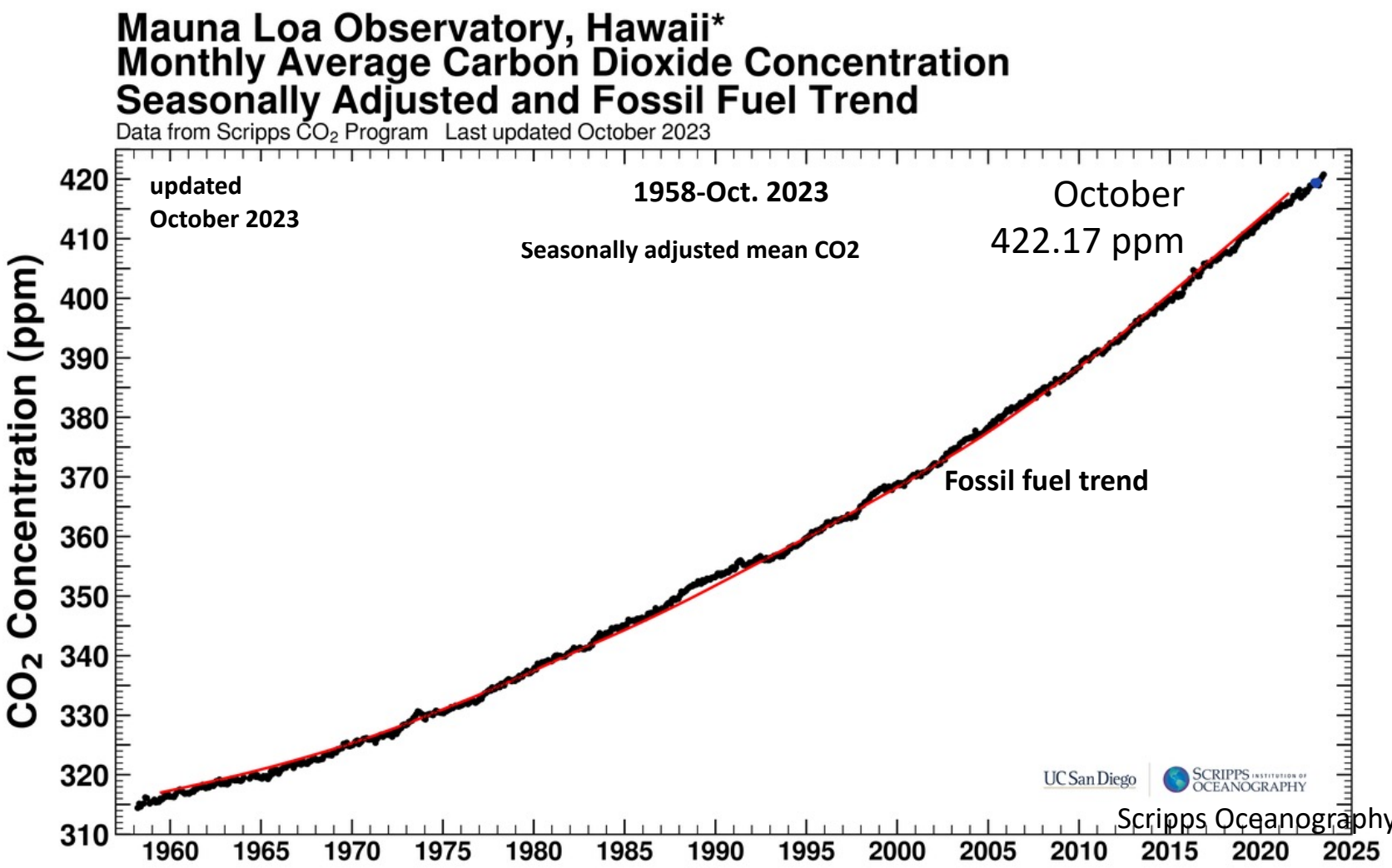


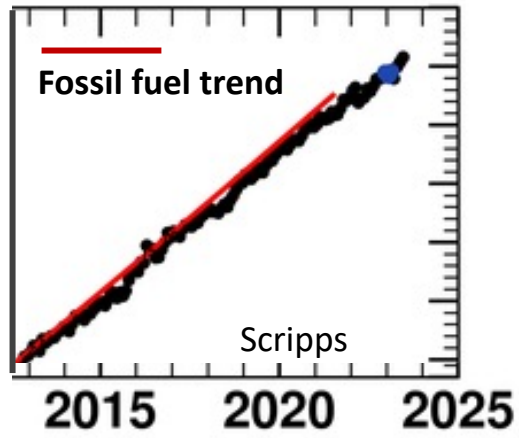




Atmospheric CO2: Increasing Faster Than Ever

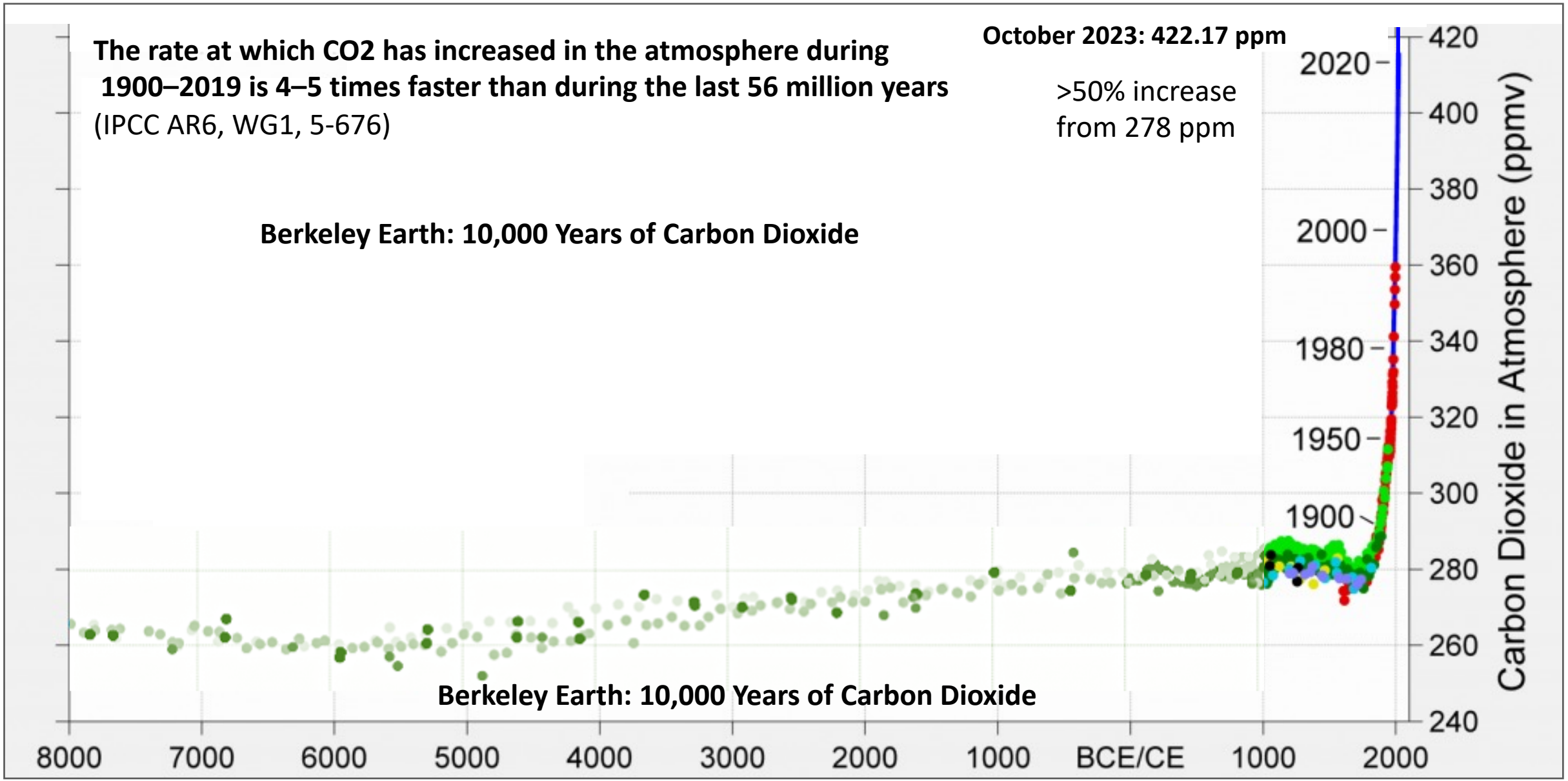
October 2023: Year-on-year increase = <u>3.108 ppm</u>





Scripps Oceanography

Unprecedented Still Accelerating Rate of Atmospheric CO2 Increase



Peter Carter, Climate Emergency Institute

12 May 23, NOAA

Atmospheric CO2: Increasing Faster Than Ever

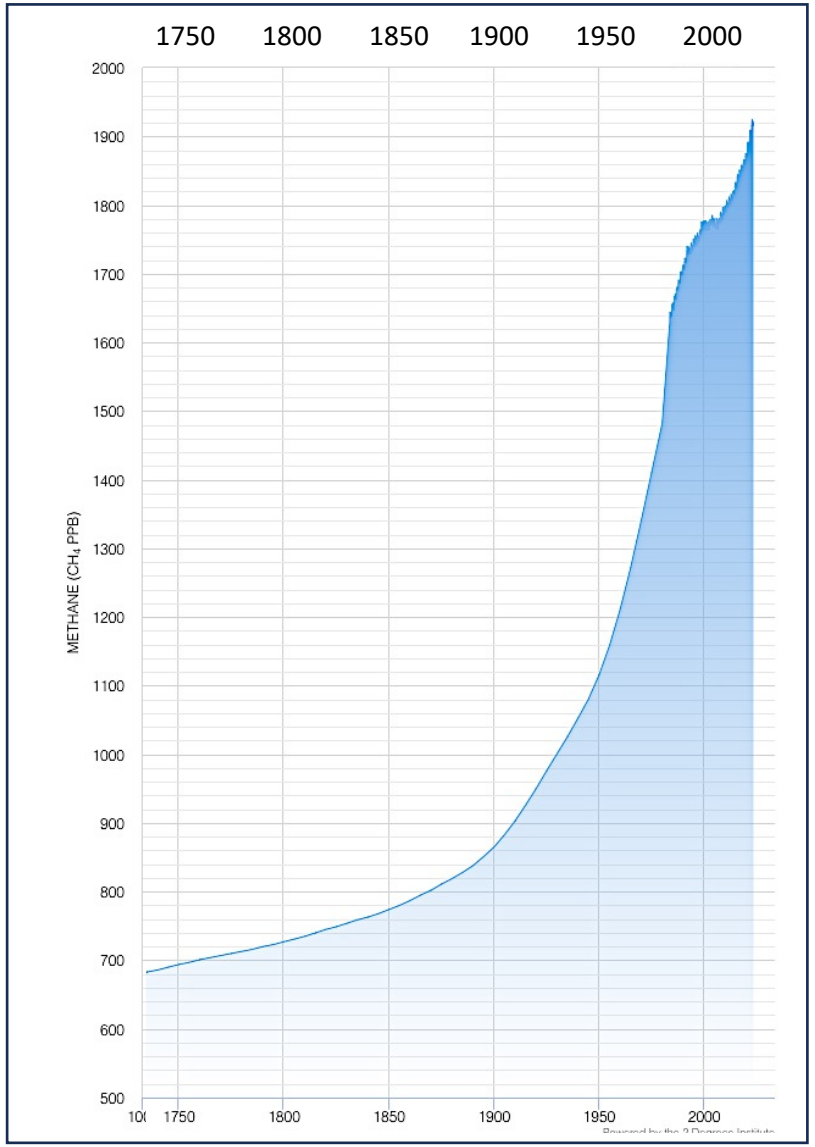
"Global average atmospheric carbon dioxide was **417.06** ppm (parts per million) in 2022, setting a new record high.

"The rate at which CO2 has increased in the atmosphere during 1900–2019 is 4–5 times faster than during the last 56 million years" (IPCC AR6, WG1, 5-676).

- **CO2 can last in the atmosphere for thousands of years.**
- Atmospheric carbon dioxide is now **50 percent higher** than it was before the Industrial Revolution.
- The annual rate of increase in atmospheric carbon dioxide over the past 60 years is about **100 times faster than previous natural increases**, such as those that occurred at the end of the last ice age 11,000-17,000 years ago.
- **The ocean has absorbed enough carbon dioxide to lower its pH by 0.1 units, a 30% increase in acidity.**

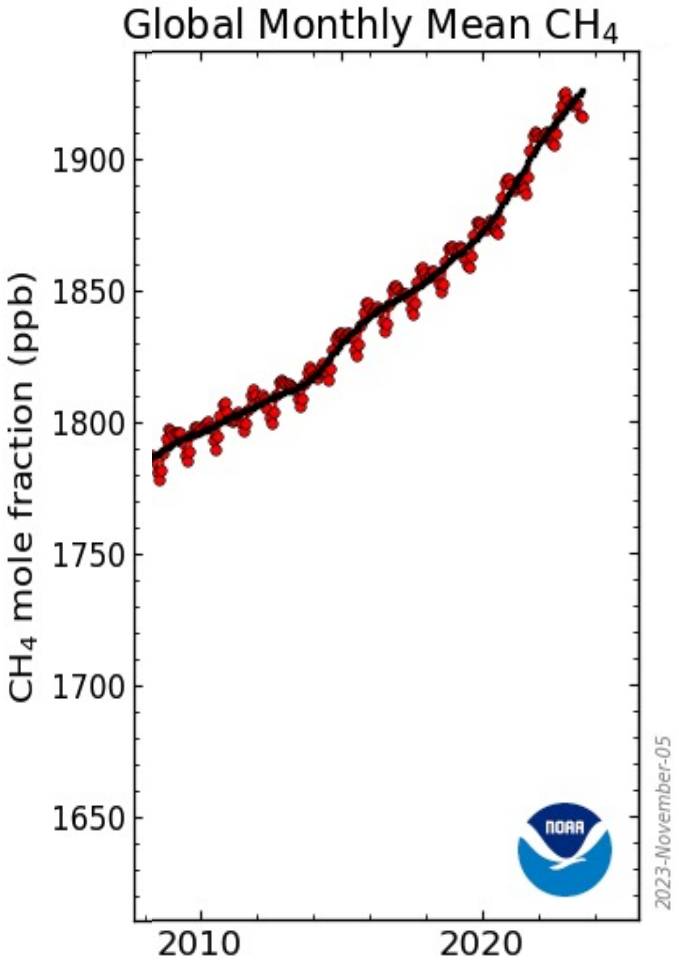
Atmospheric methane increasing faster than ever — record 266% increase

from 1750



from 2010

5th November, 2023



1,928 ppb
from 722 ppb

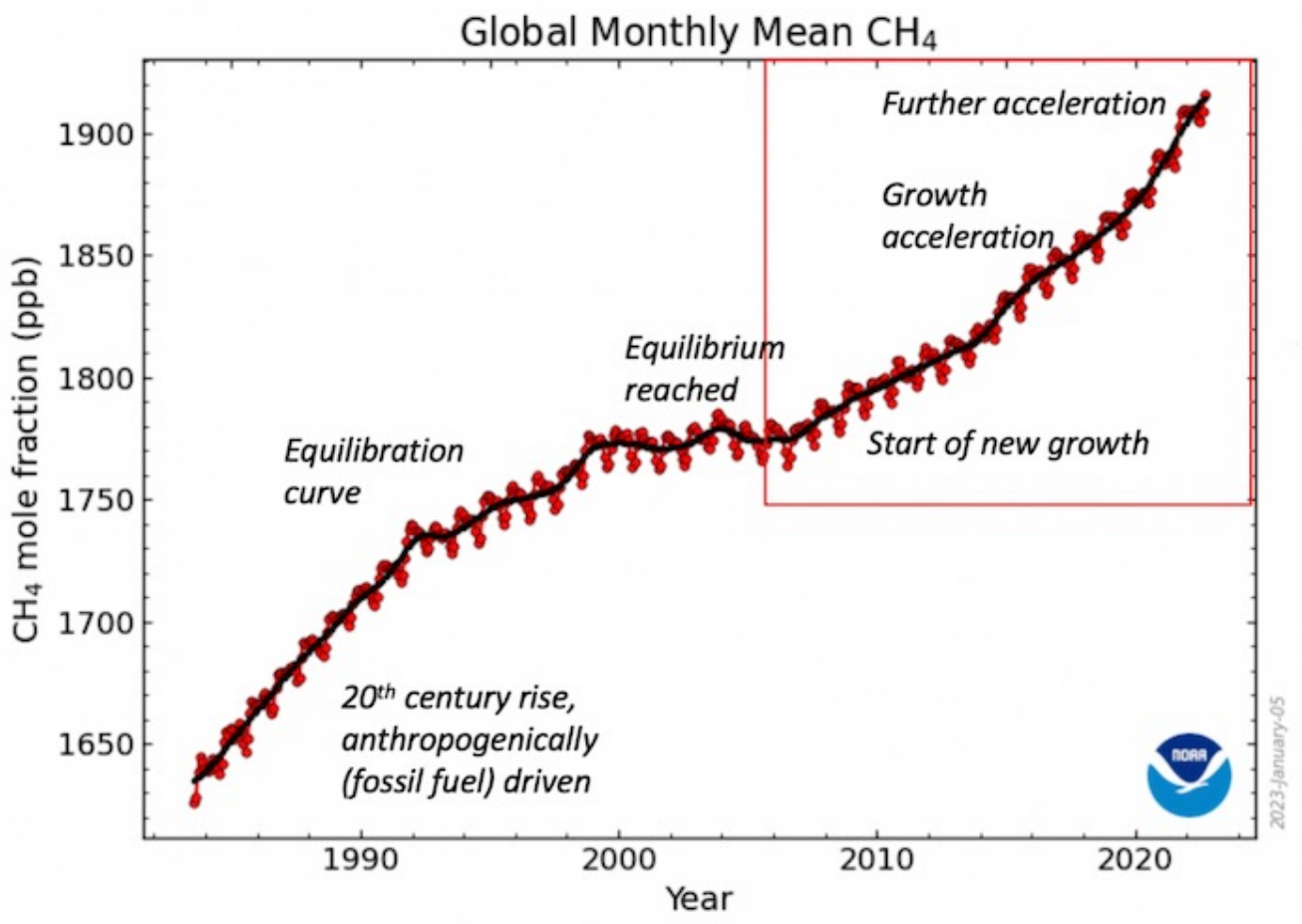
https://www.methanelevels.org/

Accelerating increase in atmospheric methane now driven faster by wetland feedback emissions

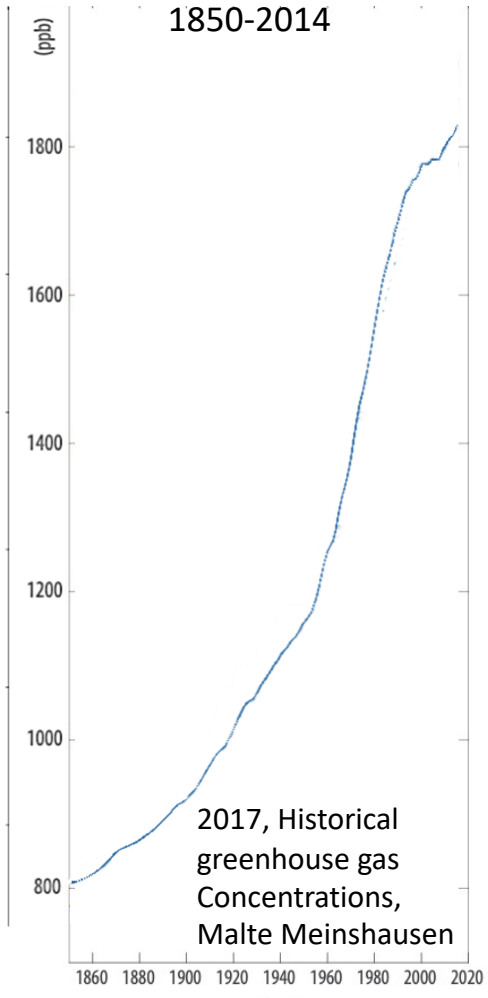
The world has been pushed into the catastrophic carbon feedback stage of global warming

Global wetlands are emitting more methane (CH4)

Methane in the air rose rapidly from 2006 – then it rose again, and again. NOAA/Nisbet et al. (2023)



Atmospheric methane
1850-2014



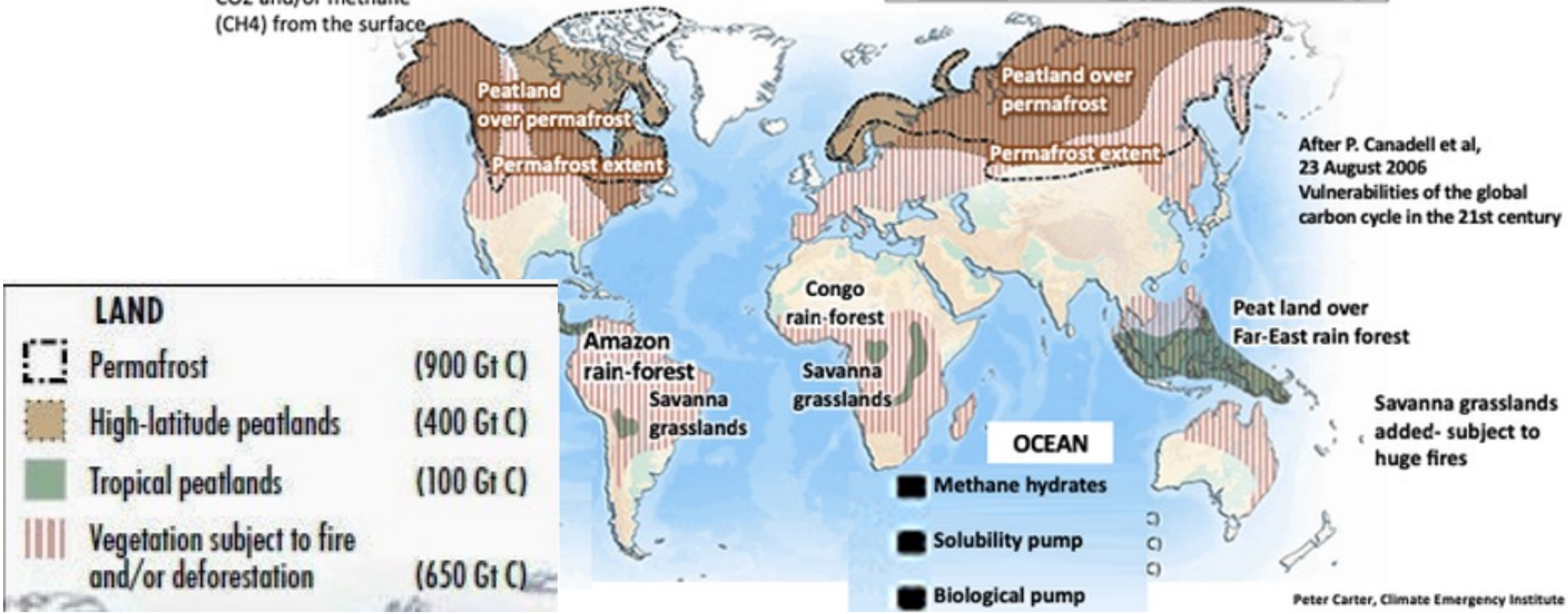
2017, Historical greenhouse gas Concentrations, Malte Meinshausen

Vulnerable carbon pools
Enormous sources of amplifying feedback carbon emissions

Canadell, 2006

Global warming causes carbon to be emitted as CO2 and/or methane (CH4) from the surface

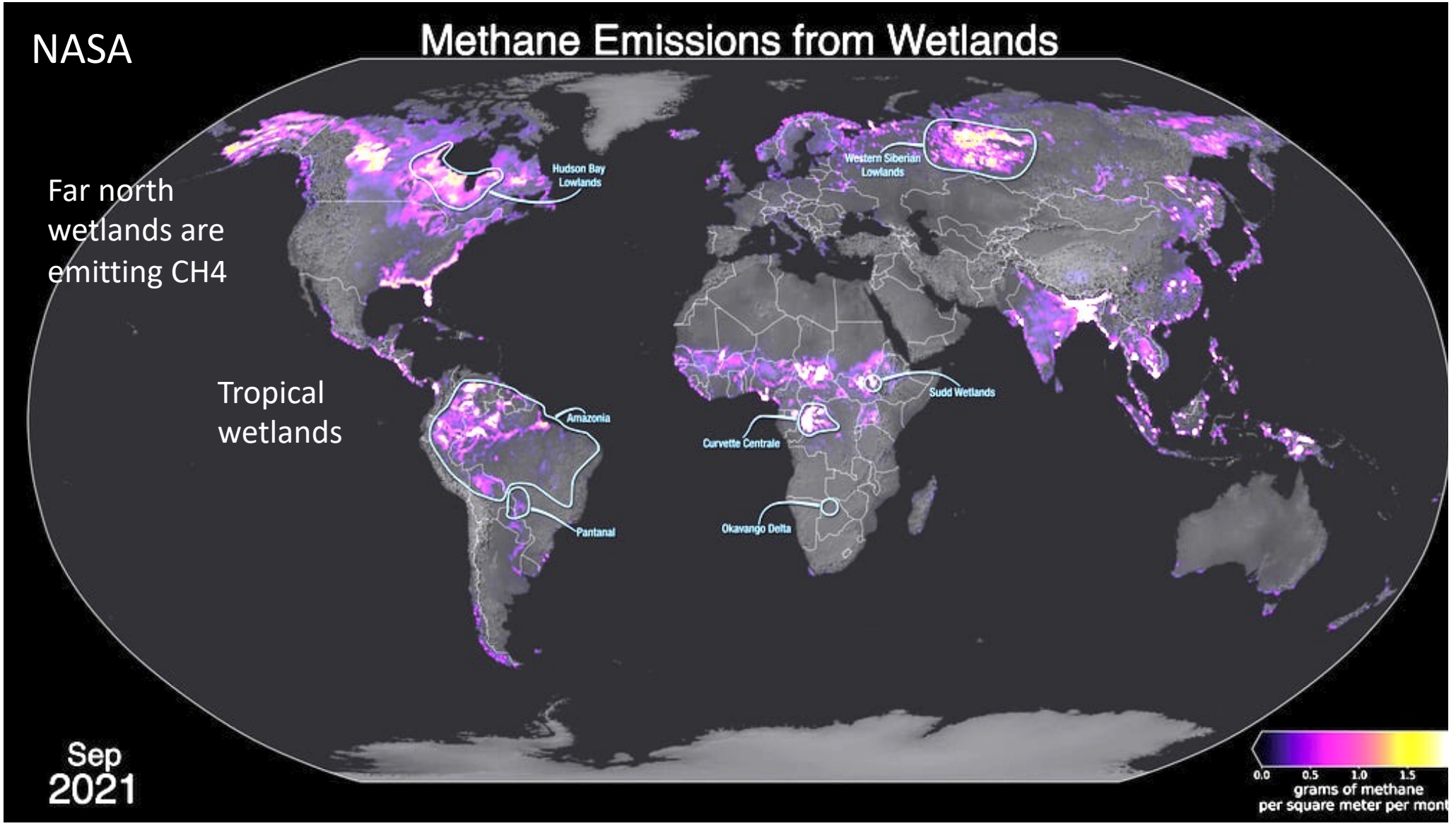
Boreal forest added- fire risk



The world has been pushed into the catastrophic CARBON FEEDBACK STAGE of global warming

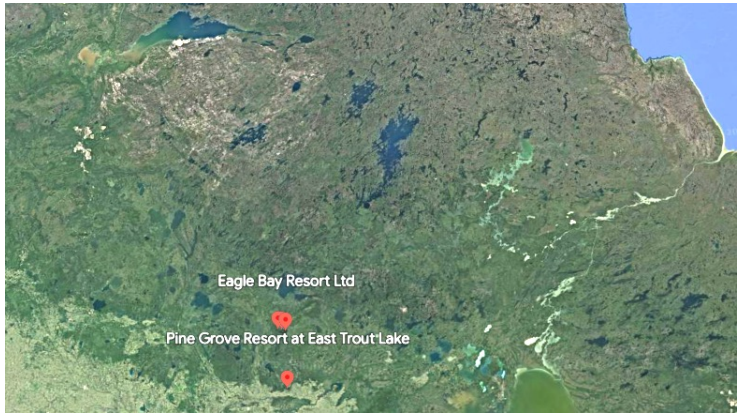
Atmospheric methane increasing faster than ever, now driven faster by wetland methane feedback emissions

All human sources of methane emissions are being increased – including cattle and natural gas (mainly methane)

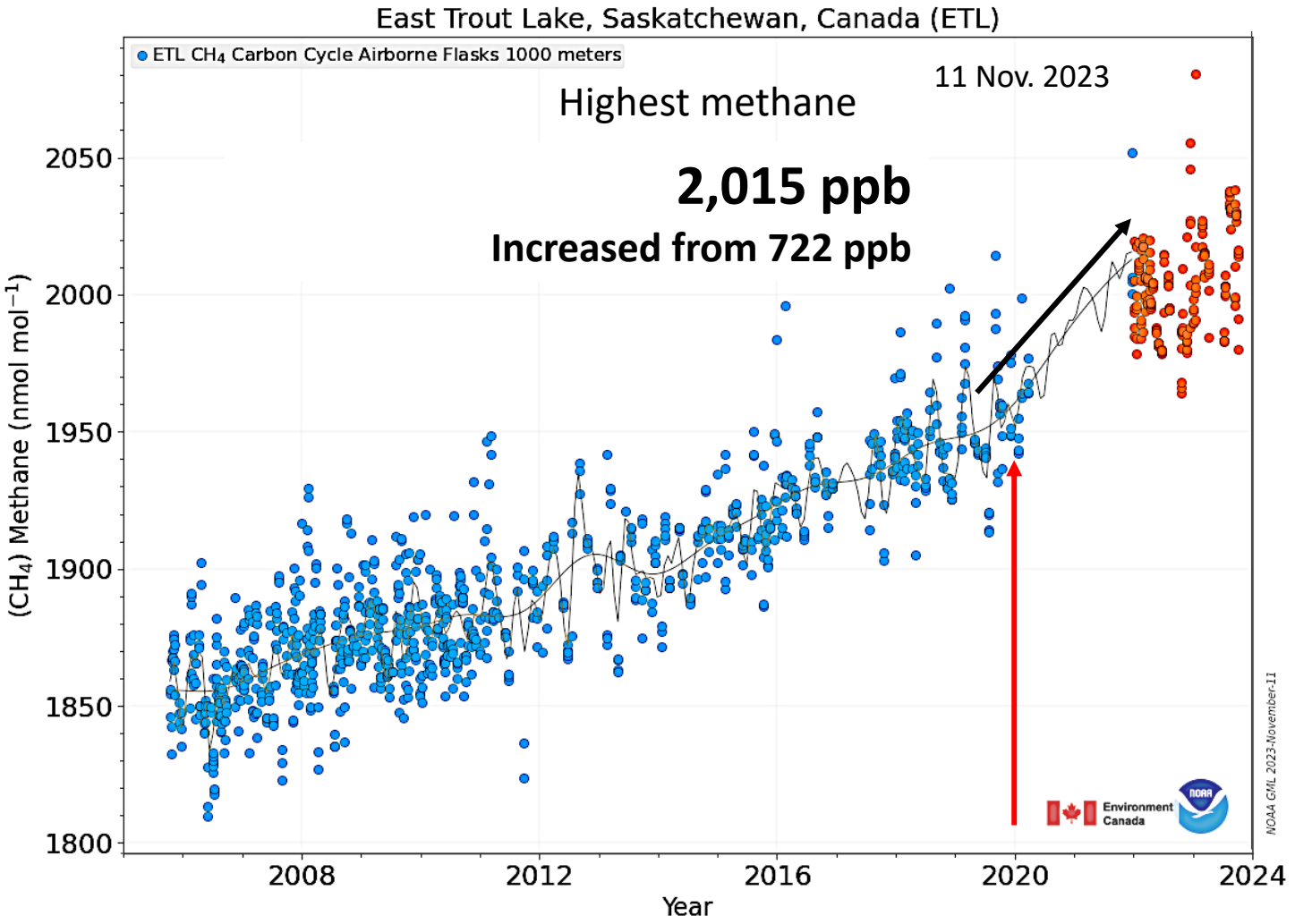


A higher rate of increase in atmospheric methane from 2020 Wetland methane feedback emissions

Southern edge of vast Canada wetlands



East Trout Lake Northern Saskatchewan



Rapidly increasing climate-change-driven extreme weather events (including forest fires)

1.5ºC = Globally disastrous

2.0ºC = Globally catastrophic

31 October 2023

Canada's Northwest Still Burns

End-October persistent severe widespread western drought

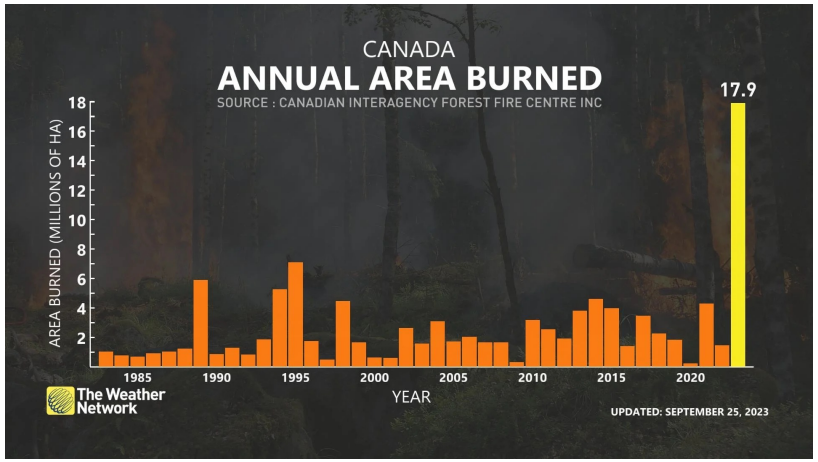
2023

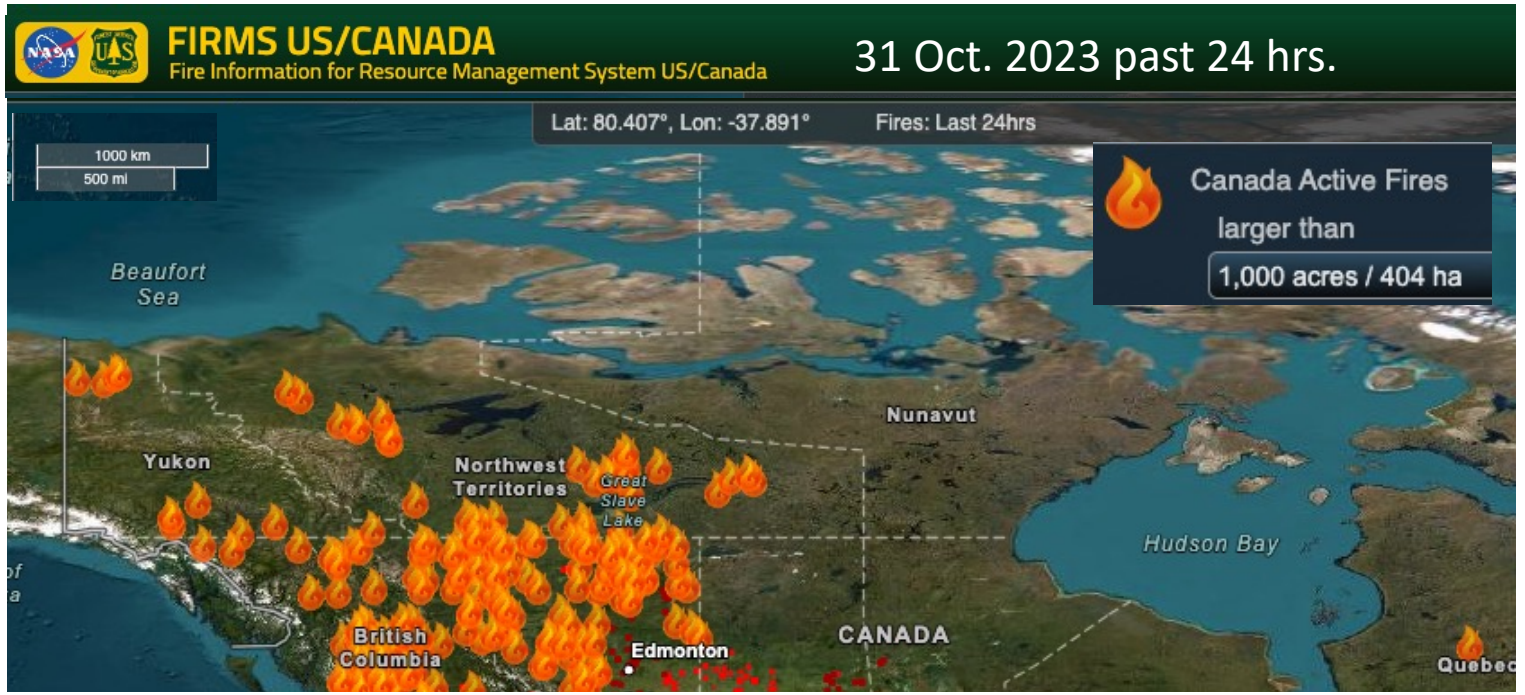
Record fires

71,042.8 square miles burned

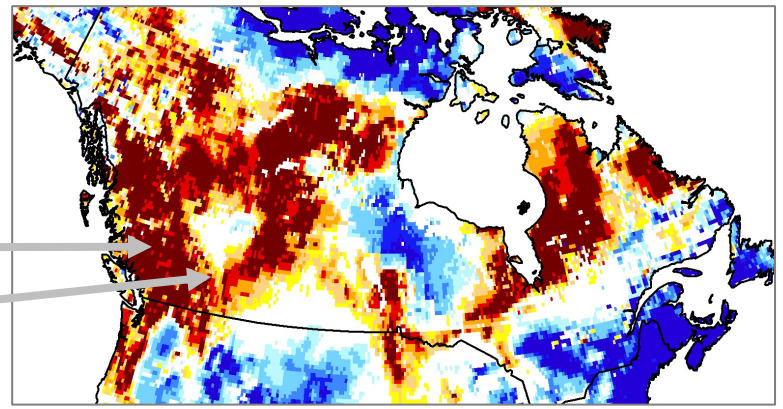
Size of Washington State

4th largest area burnt in history





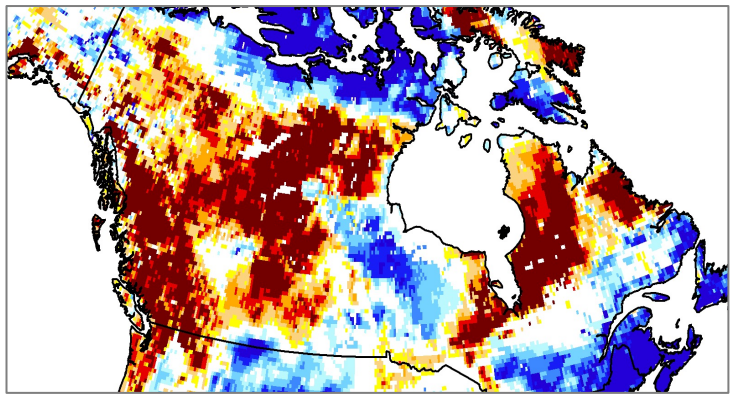
Ground water drought



British Columbia

Alberta

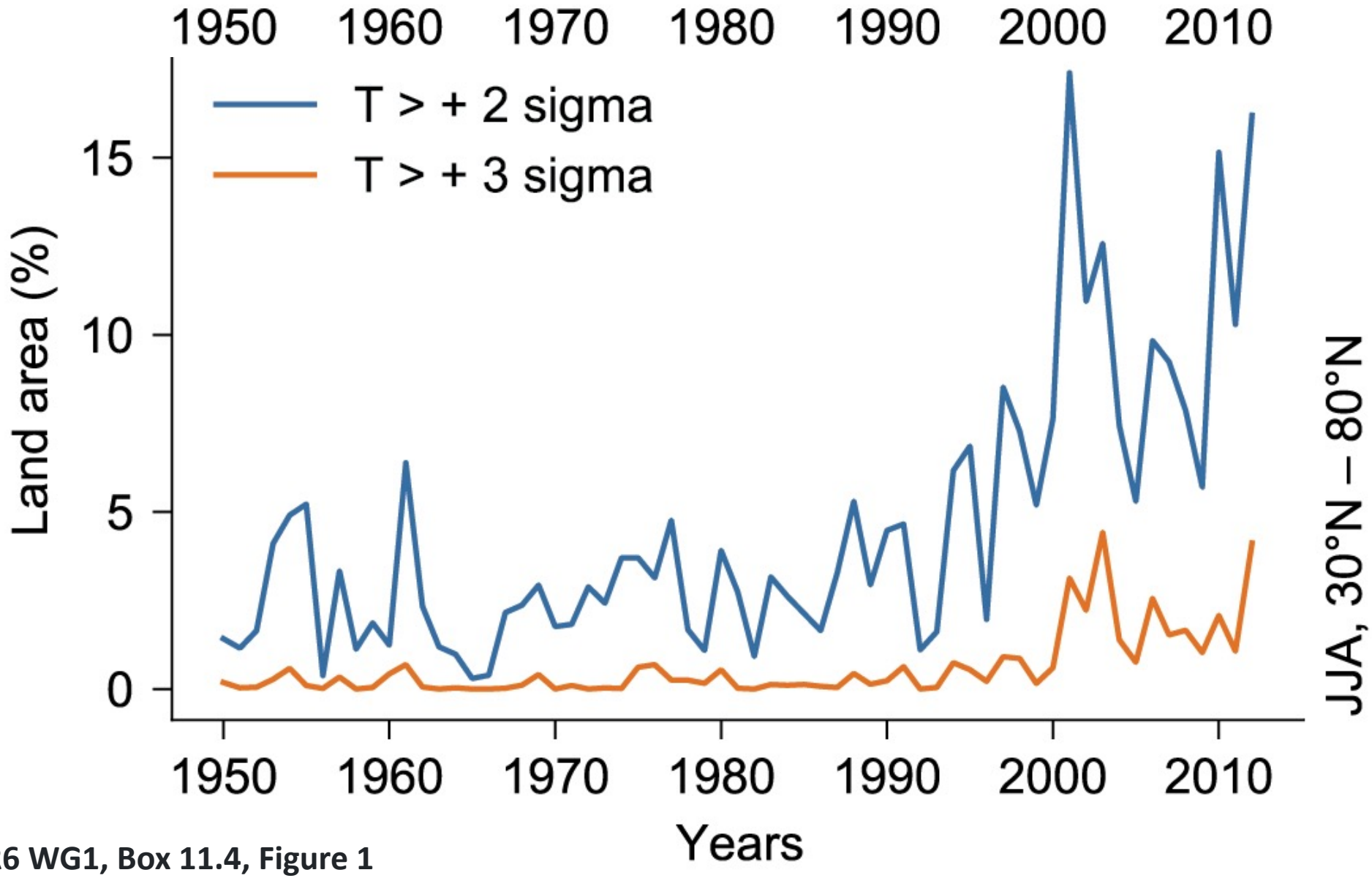
Surface soil moisture drought



+ CO2 FEEDBACK

Land area affected by temperature extremes

IPCC AR6

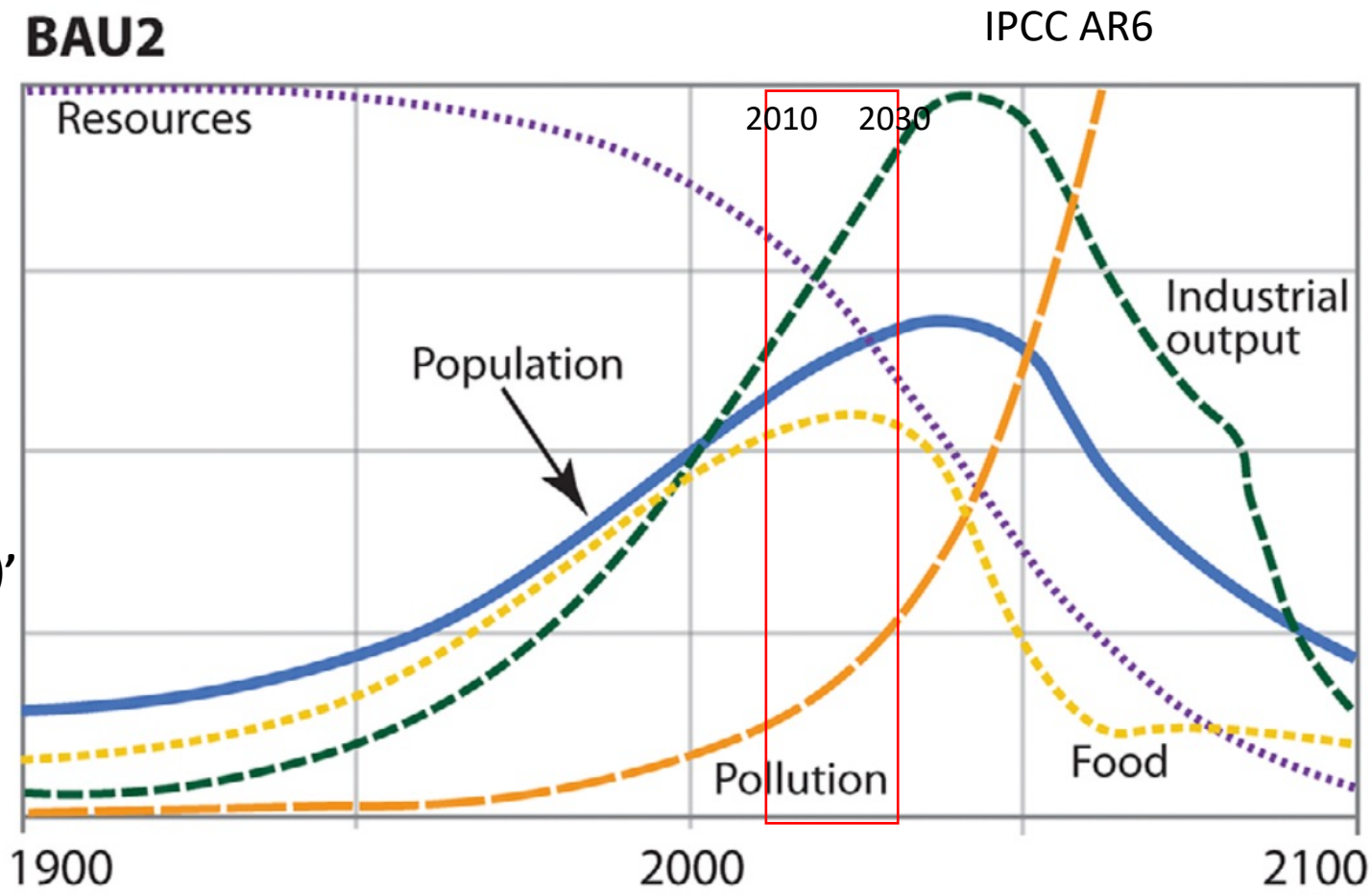


IPCC AR6 WG1, Box 11.4, Figure 1

Extreme Weather is Slowing the Increase in World Food Productivity

30 November 2020, Updates to Limits to Growth
Gaya Herrington

BAU2
'Double resources of BAU
Collapse due to pollution
(climate change equivalent)'



IPCC AR6

Agricultural productivity:

- slows from 2010
- **is happening from 2013 (FAO)**
- declines from 2030
- plummets from 2040

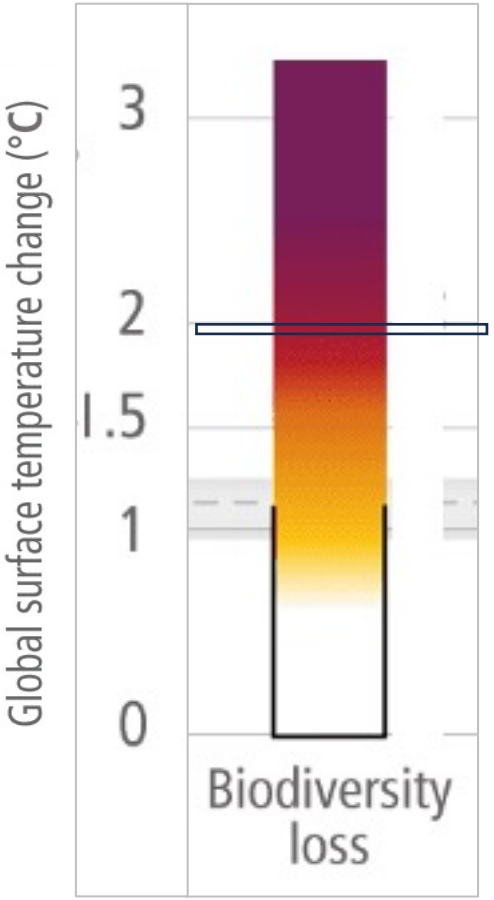
30 November 2020, Updates to Limits to Growth, Gaya Herrington, Industrial Ecology,

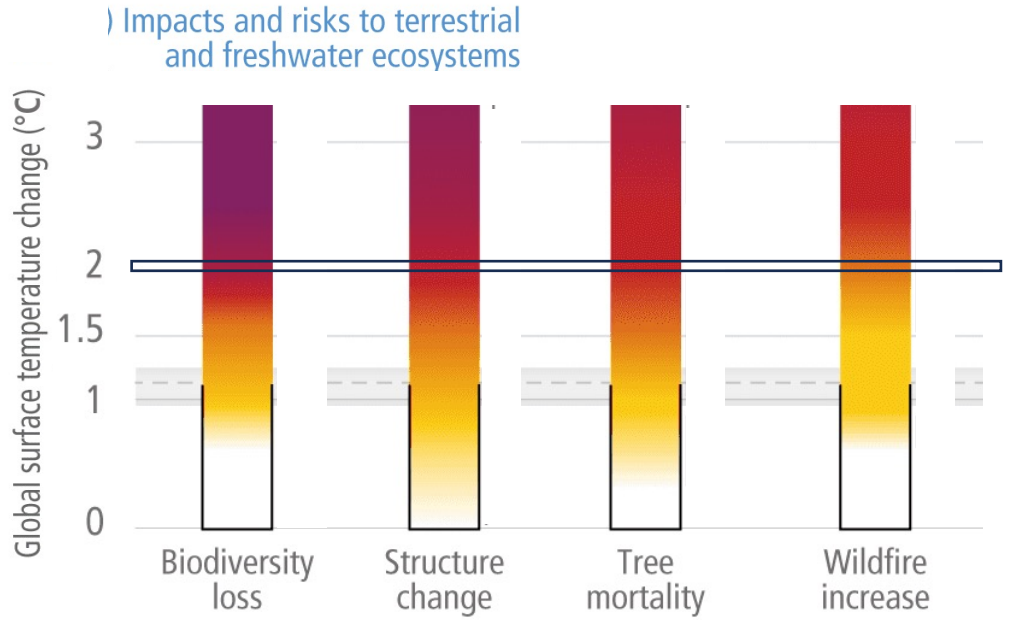
F I G U R E 1 The BAU, BAU2, CT, and SW scenarios. Adapted from Limits to Growth: The 30-Year Update

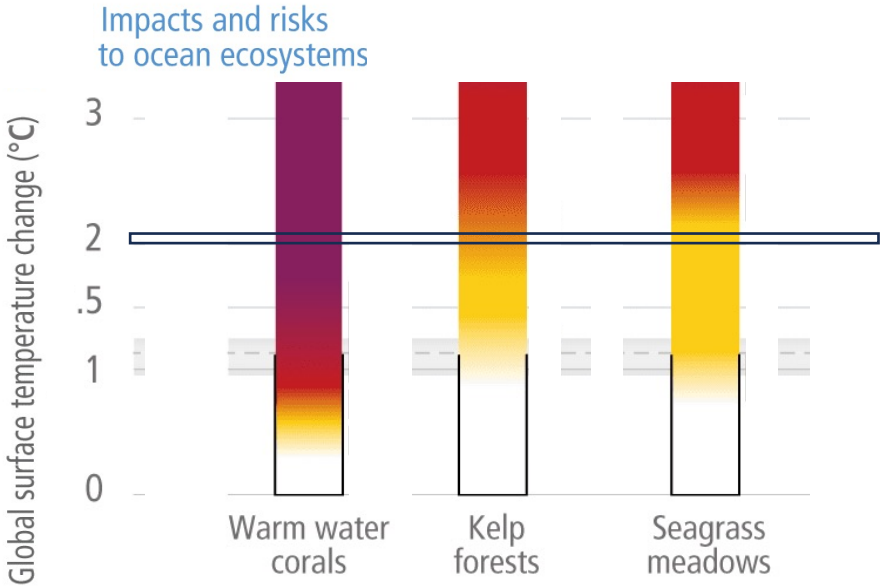
Impacts to Nature

1.5°C Globally disastrous
2°C Global catastrophe

Biodiversity Loss



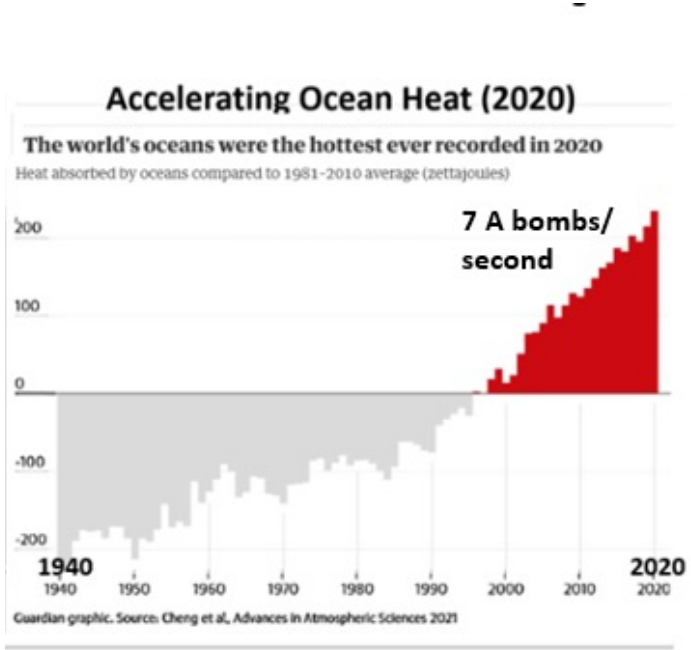


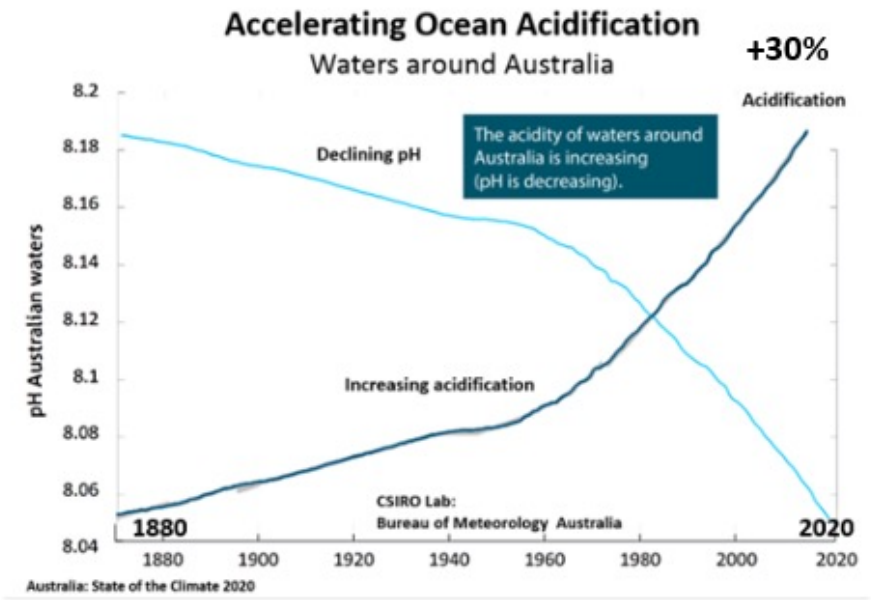


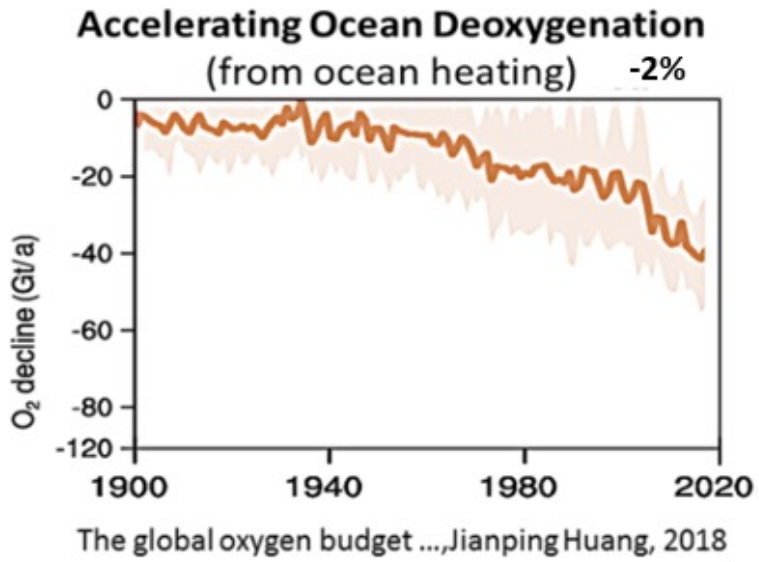
impacts/risks.
Red indicates severe and widespread impacts/risks.
Yellow indicates that impacts/risks are detectable and attributable to climate change with at least medium confidence.

IPCC AR6 WG2, Figure SPM.3 |

Triple Assault on the Oceans to 2020







Accelerating Ocean Heat = 7 atomic bombs per second

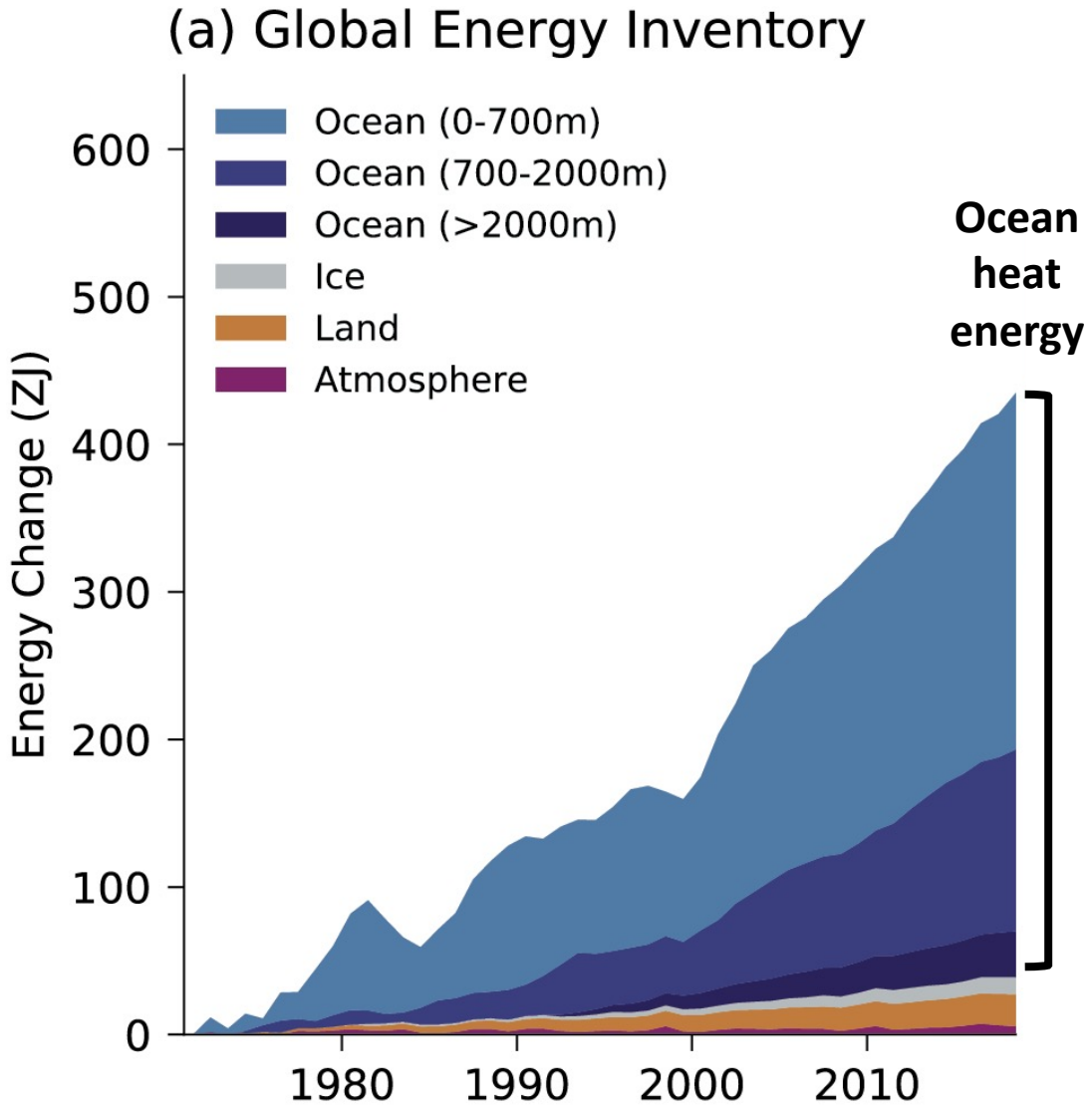
Accelerating Ocean Acidification = 30% more acidic

Accelerating Ocean Deoxygenation = 2% decrease in oxygen

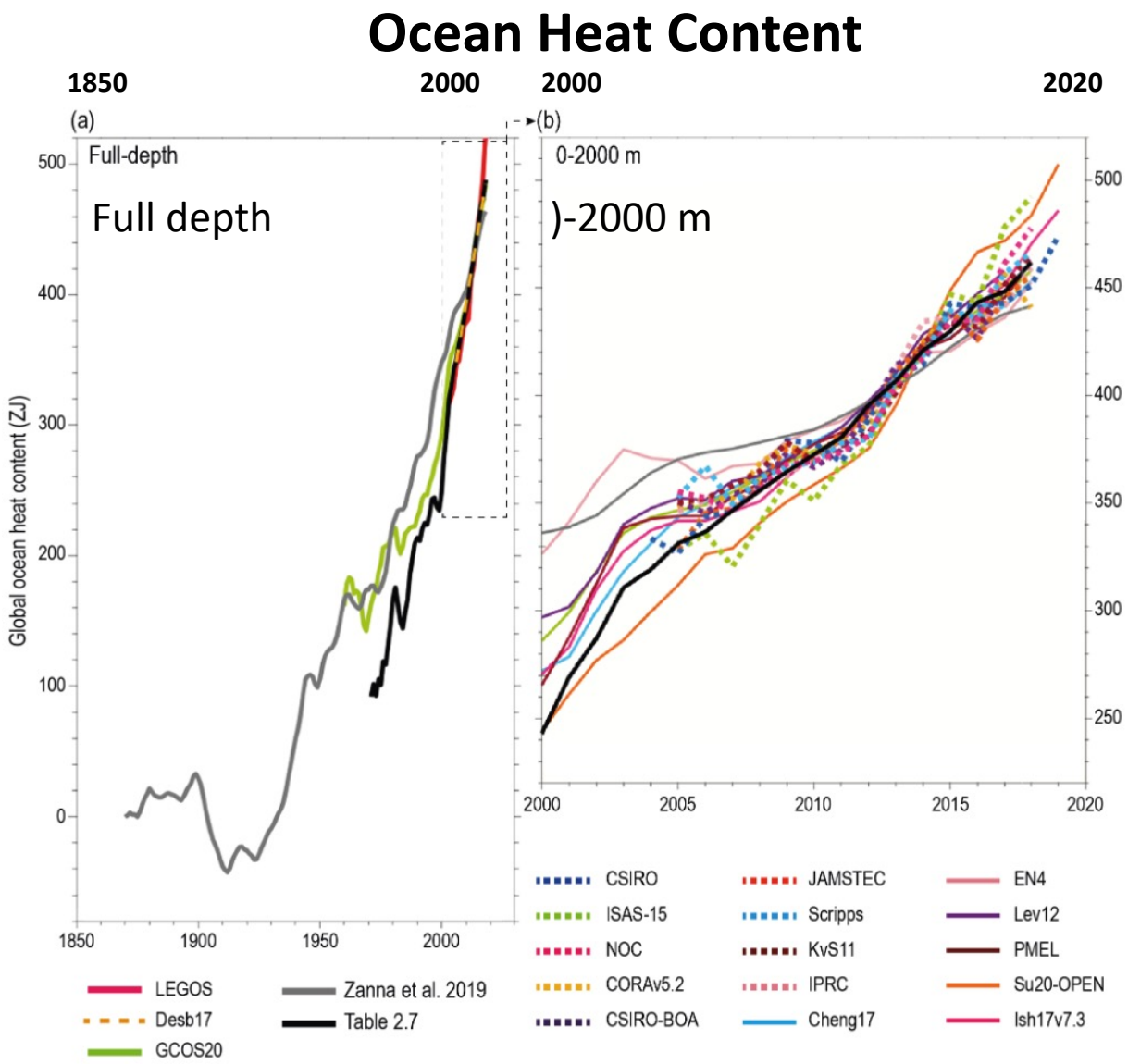
Peter Carter, Climate Emergency Institute

IPCC AR6

Accelerating Explosive Ocean Heat



IPCC Ar6 WG1 Cross-Chapter Box 9.1, Figure 1

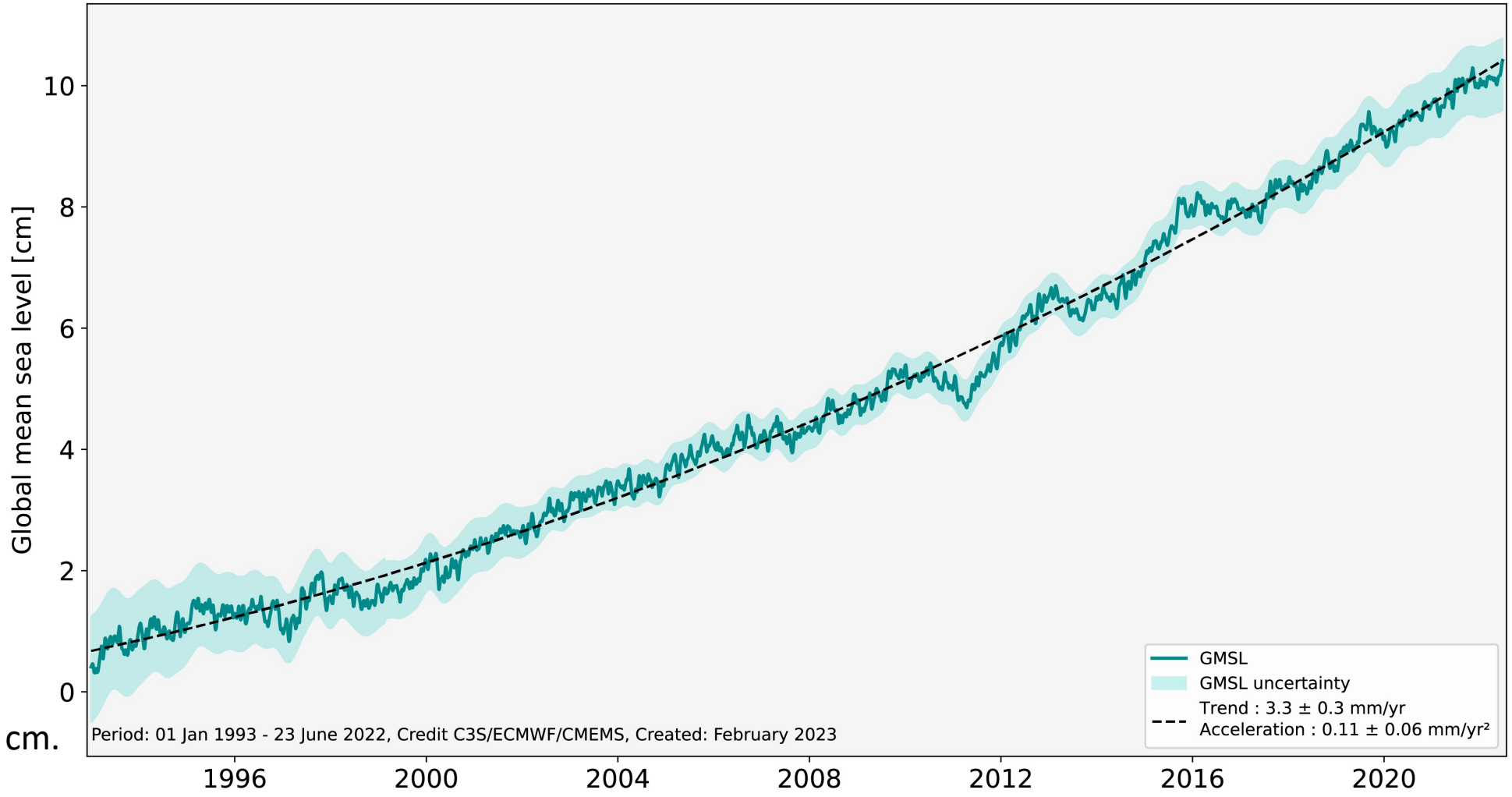


IPCC Ar6 WG1, Figure AR6| Climate Change 2021

Peter Carter, Climate Emergency Institute

- **Heat energy of 25 billion Hiroshima atomic bombs has been added to the climate system in just 50 years, with over 90% gone to ocean heat.**
- **Now at least 10 bombs are being added per second.**

Global Mean Sea Level Rise



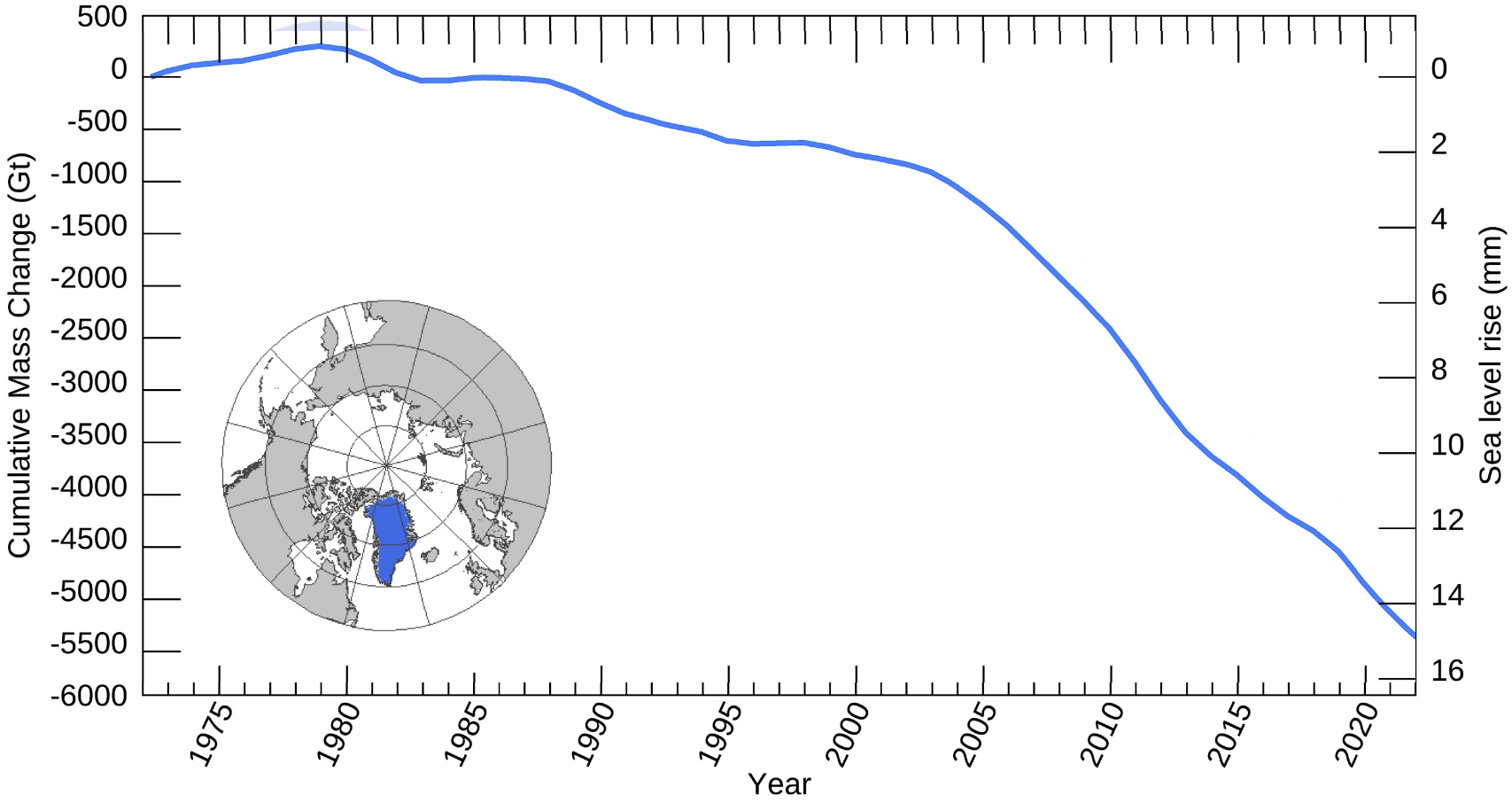
Copernicus Climate Change Service
Climate Indicators | 2022

PROGRAMME OF
THE EUROPEAN UNION

opernicus
Europe's eyes on Earth

IMPLEMENTED BY
ECMWF

Mass Balance of the Greenland Ice Sheet



Data Source: IMBIE

Credit: IMBIE/ESA/NASA

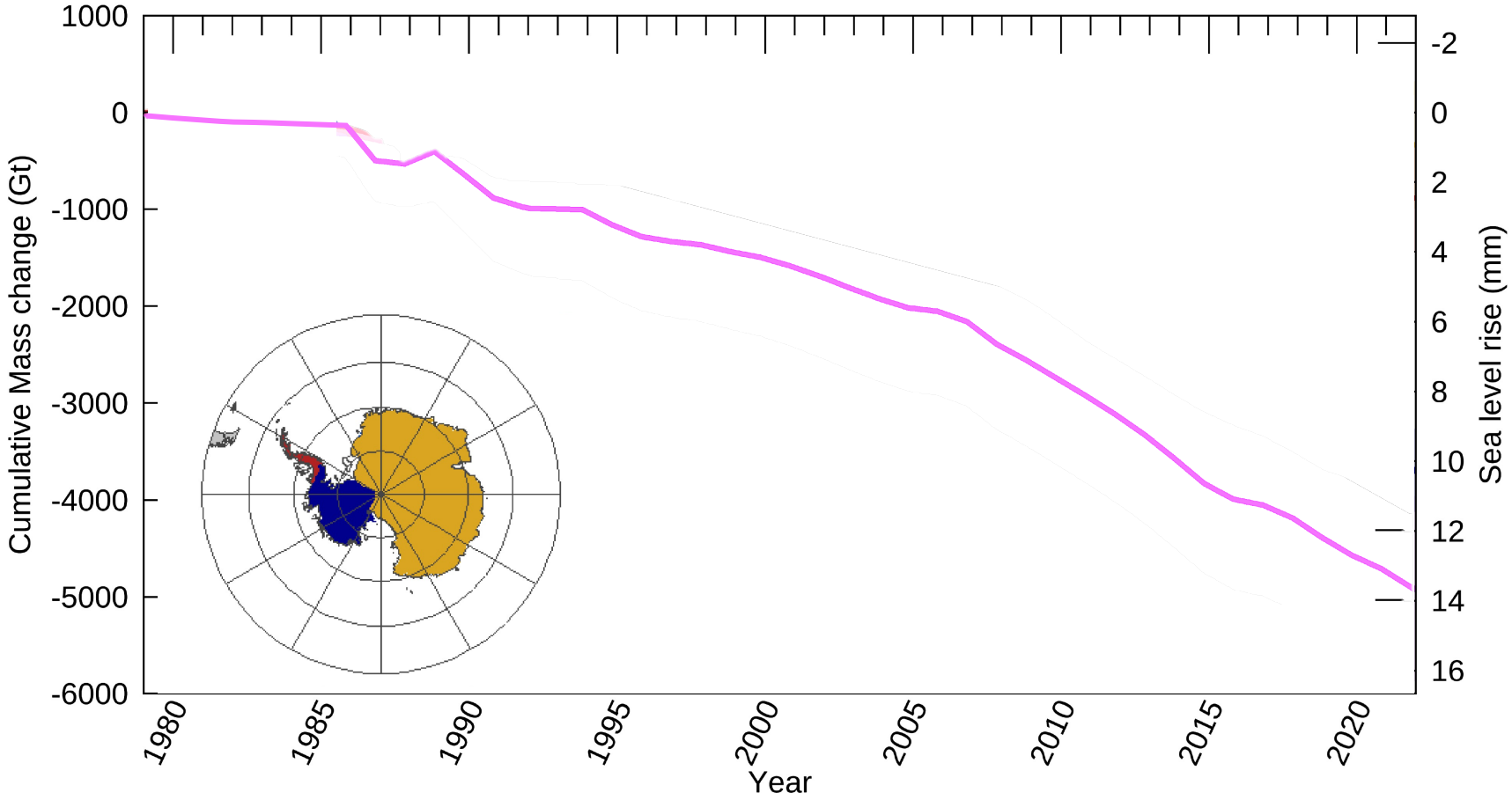
Copernicus Climate Change Service
Climate Indicators | 2022

PROGRAMME OF
THE EUROPEAN UNION

opernicus
Europe's eyes on Earth

IMPLEMENTED BY
ECMWF

Mass Balance of the Antarctic Ice Sheet



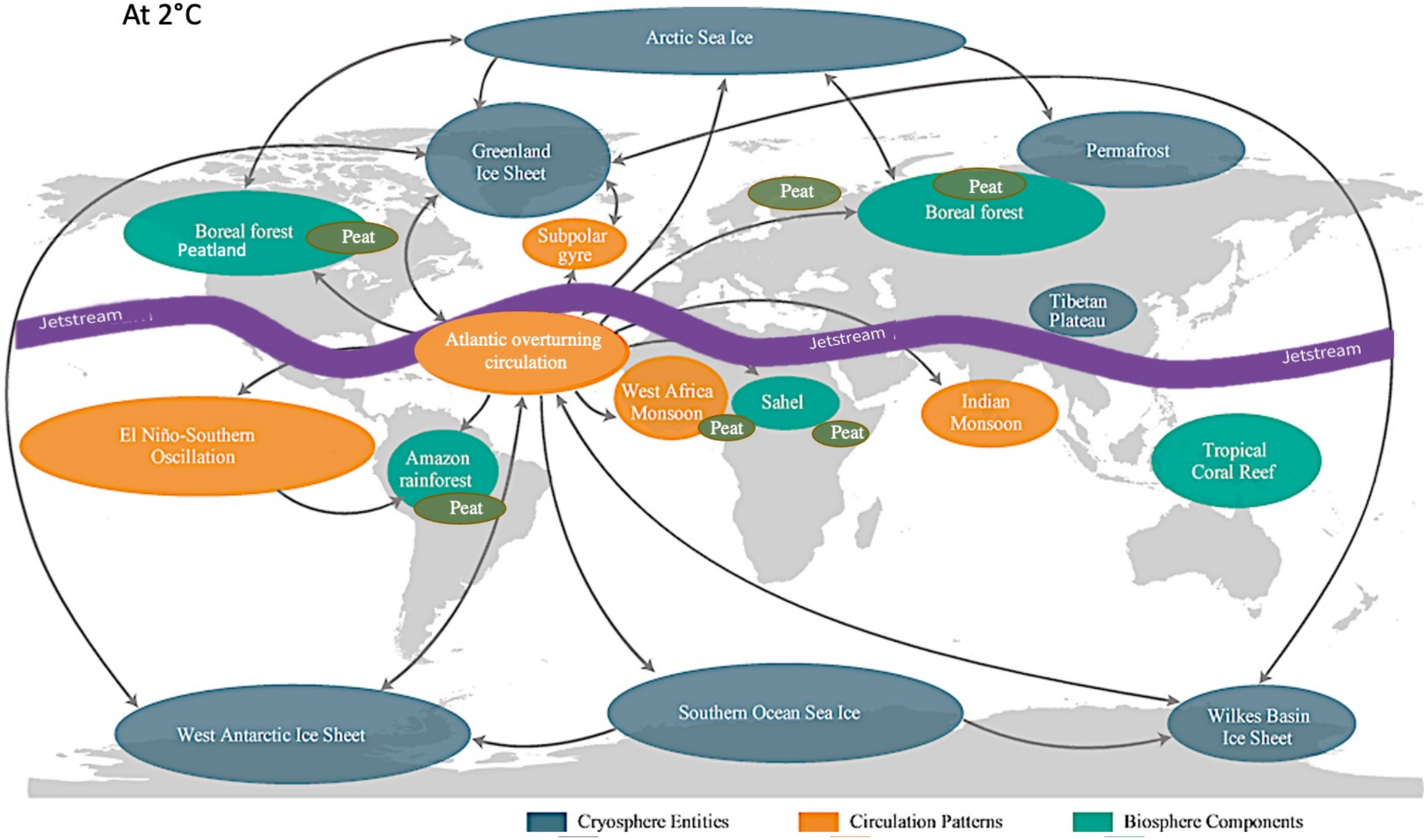
Data Source: IMBIE

Credit: IMBIE/ESA/NASA

Many Planetary Tipping point Systems

vulnerable to climate change

Source: OECD



Its INERTIA and momentum sank the great ship Titanic, despite repeated warnings of ice ahead

Mitigation calculations must include climate system inertias/long lag times

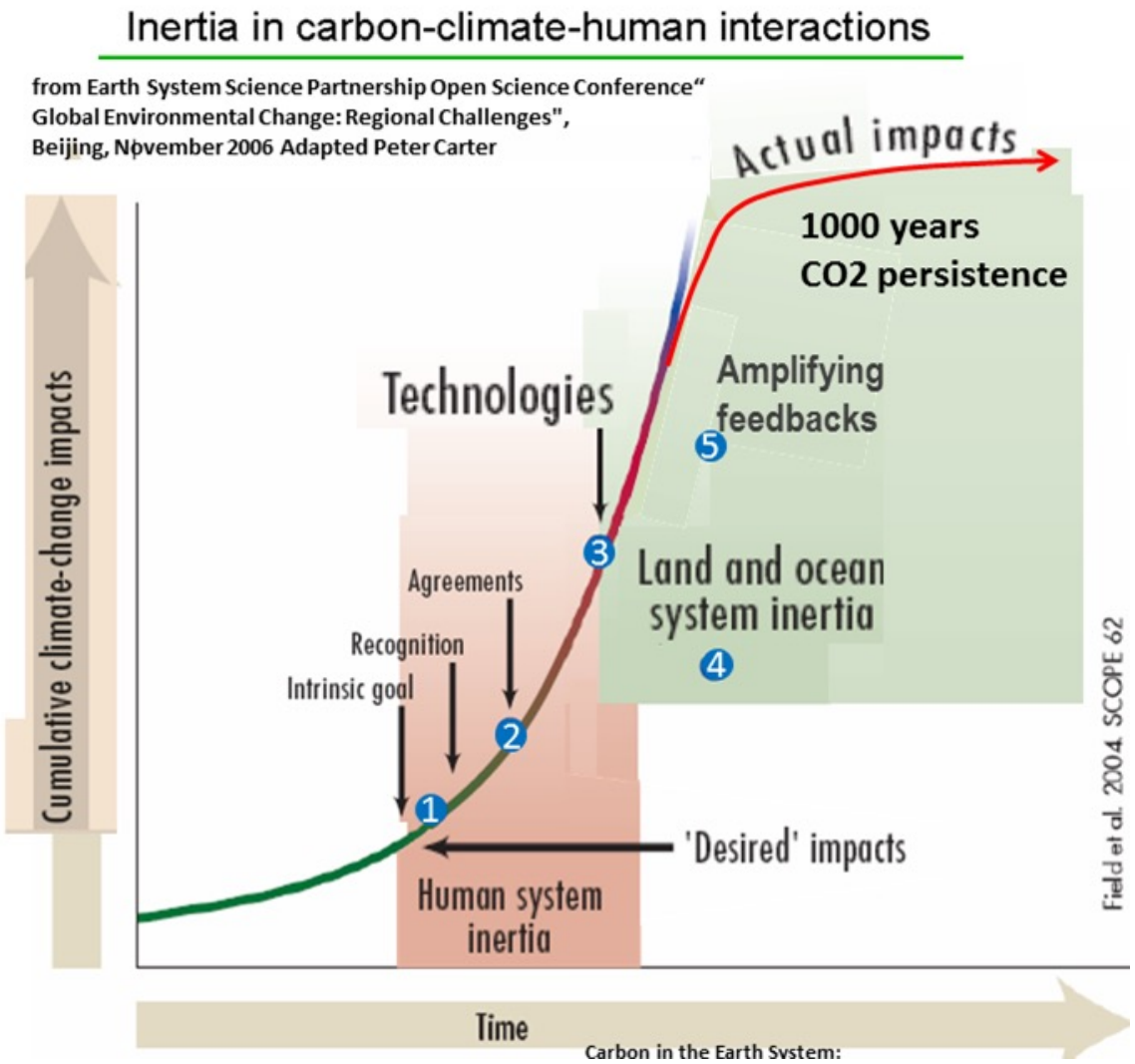
Many sources of inertia - commitment

Components

- **Recognition** of climate change
- Negotiation of **agreements**
- Deploying **technologies**
- **Land and ocean** system inertia
- **Amplifying feedbacks**

Implication

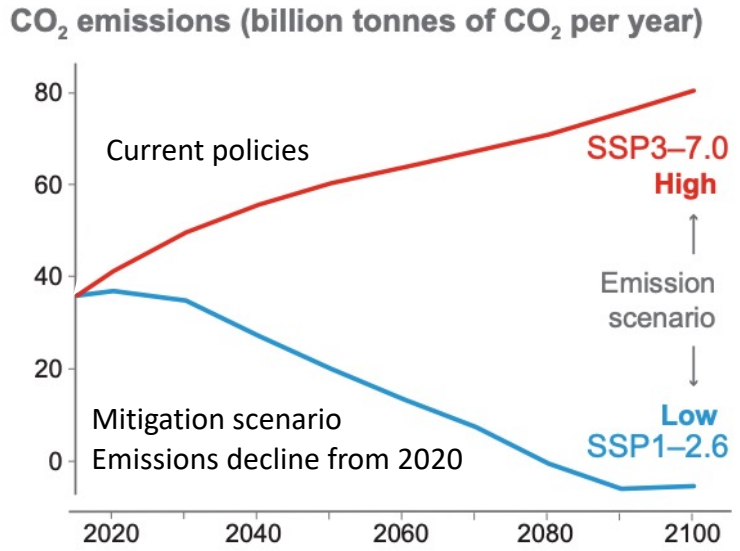
- Start now (or sooner)



Mitigation calculations must include climate system inertias/long lag times

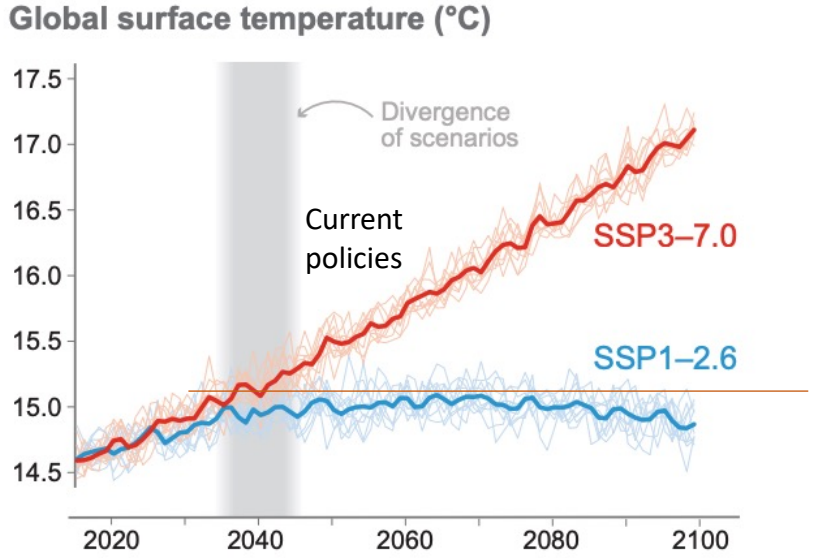
It takes decades for stabilization after emissions are put into decline under a strong mitigation scenario.

It is only after a few decades of reducing CO2 emissions that we would see global temperatures starting to stabilize.



Best case

Temperature increase slows 2040 (20 years after emissions peak)
Does not peak to decline until 2070



IPCC AR6 WG1, FAQ 4.2:

Climate system inertia
Climate change domino effect

Today is the climate's Titanic moment

Commitment (warming "in the pipe")
Great inertia of the climate system (the ocean is 99% of the biosphere)
Delayed catastrophic responses (e.g., permafrost GHG feedback)

What Must Be Done (… what must *have been* done)

Quit the catastrophic climate change
deaf, dumb and blindness denial

Think of climate action in terms of loving the children in your life

(Note: Considering only the science — not “feasibility”)

IPCC mitigation for 2°C and 1.5°C limits

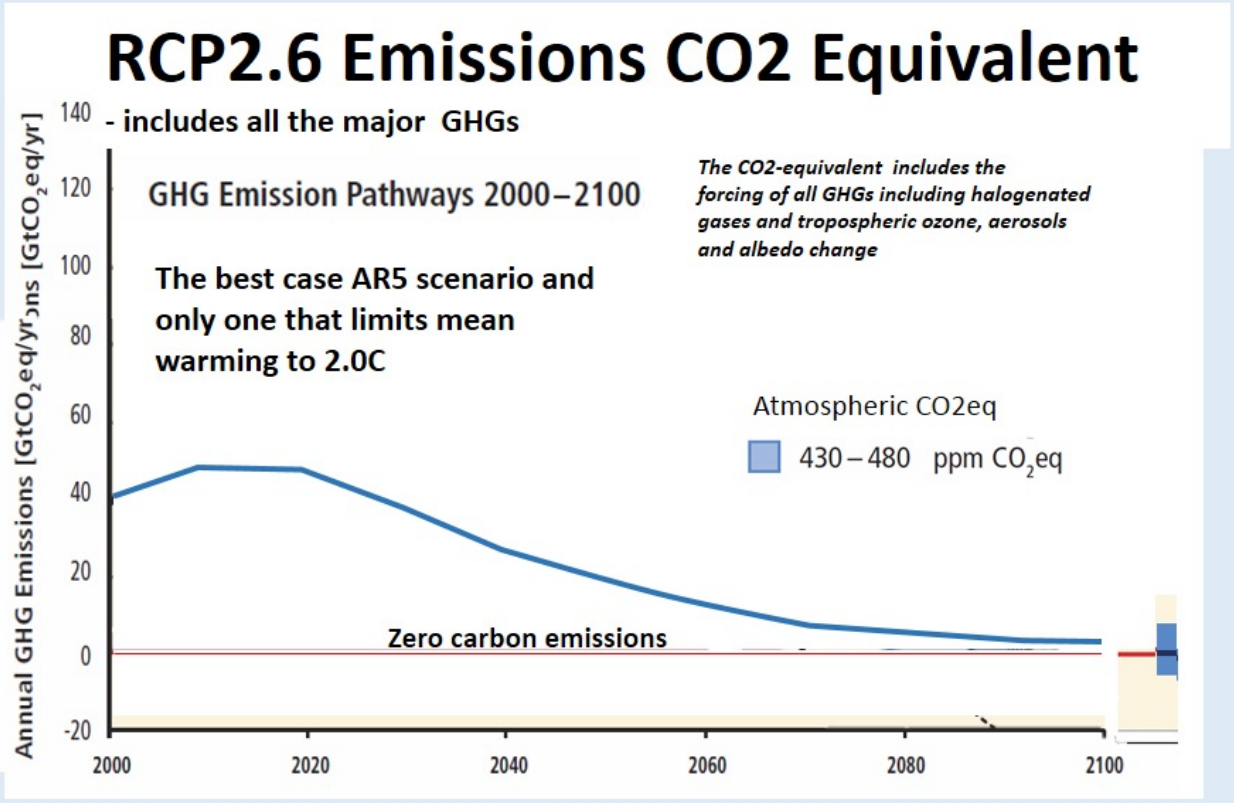
IPCC reports over the past 10 years say that global emissions have to decline by 2020 and drop to near zero (IPCC 2014 5th Assessment).

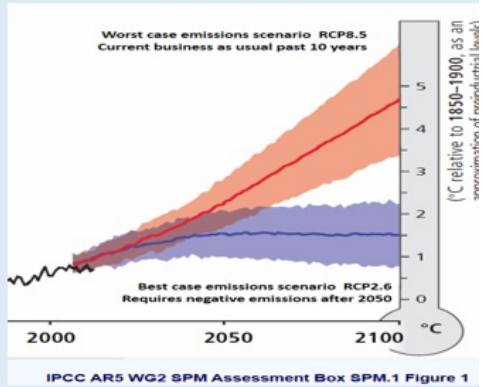
Headline Statements from the Summary for Policymakers

"Mitigation pathways that are likely to limit warming to below 2°C relative to pre-industrial levels require substantial emissions reductions over the next few decades and near zero emissions of carbon dioxide and other long-lived greenhouse gases."

Emissions of CO2 and methane had to decline by 2020 and be cut to “near zero” (for 2°C)

IPCC 2014 5th Assessment
Best-case RCP2.6 for 2°C
Only scenario under 2°C by 2100





IPCC has told the world that global emissions have to be put into rapid decline on an immediate basis for 1.5°C and 2°C.

— IPCC Chair, Hoesung Lee, 2019 Madrid COP25 & 2021 Glasgow COP26

This is not being reported or repeated

1.5ºC has been missed
2.0ºC is being missed

“Global warming of 1.5ºC and 2ºC will be exceeded during this century unless immediate, rapid, and large-scale reduction in greenhouse gas emissions, especially of carbon dioxide and methane, occur.”

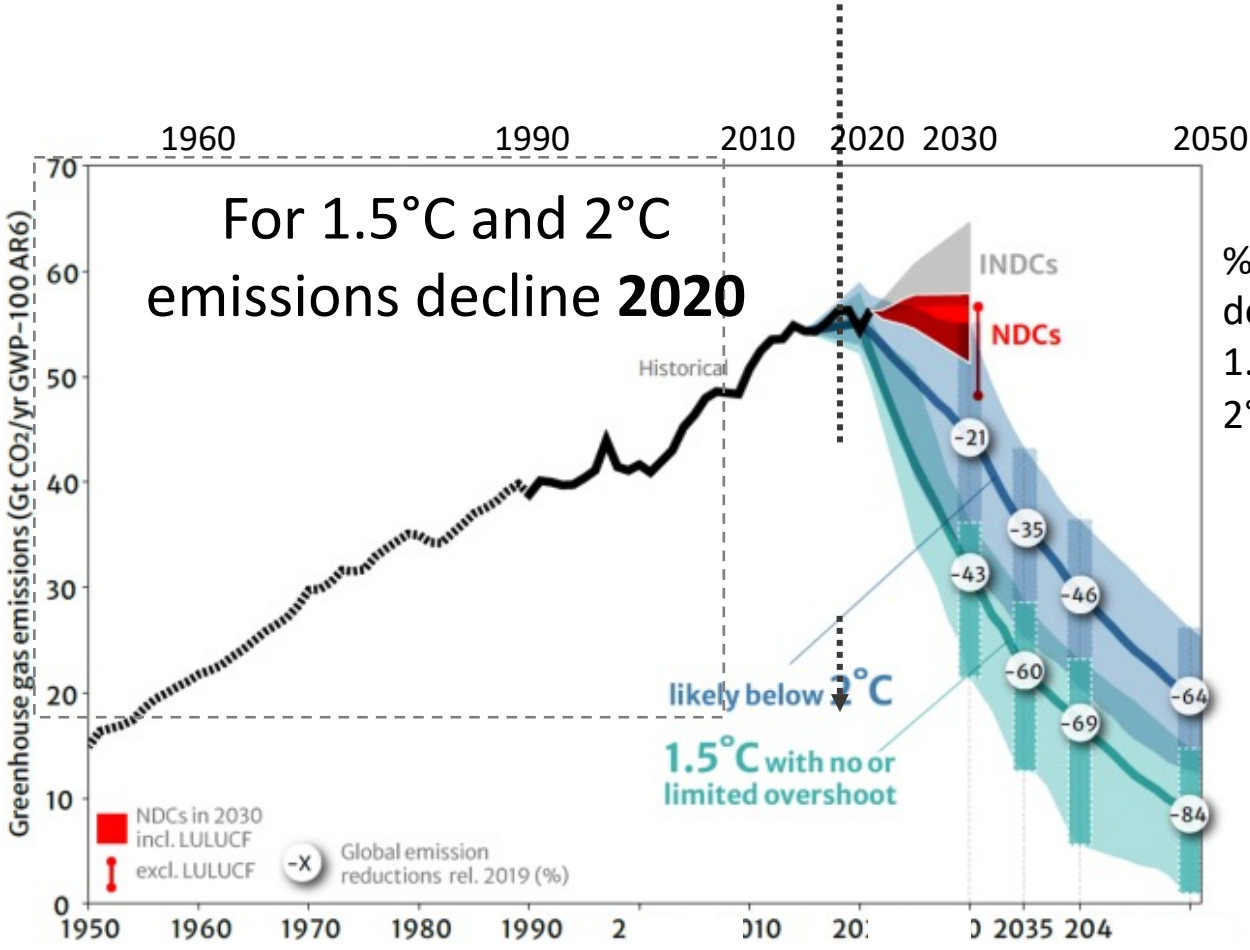
Keynote address by the IPCC Chair Hoesung Lee at the ceremonial opening of COP26
Glasgow, 31 October 2021

UN Climate Secretariat, Global Stocktake Technical Report

October 2023

IPCC requires immediate decline and 45% reduction by 2030, compared to 2010.

Limiting global warming to 1.5°C (>50% chance) implies a reduction of around 43, 60 and 84 per cent in global GHG emissions below the 2019 level by 2030, 2035 and 2050 respectively, as assessed by the IPCC.

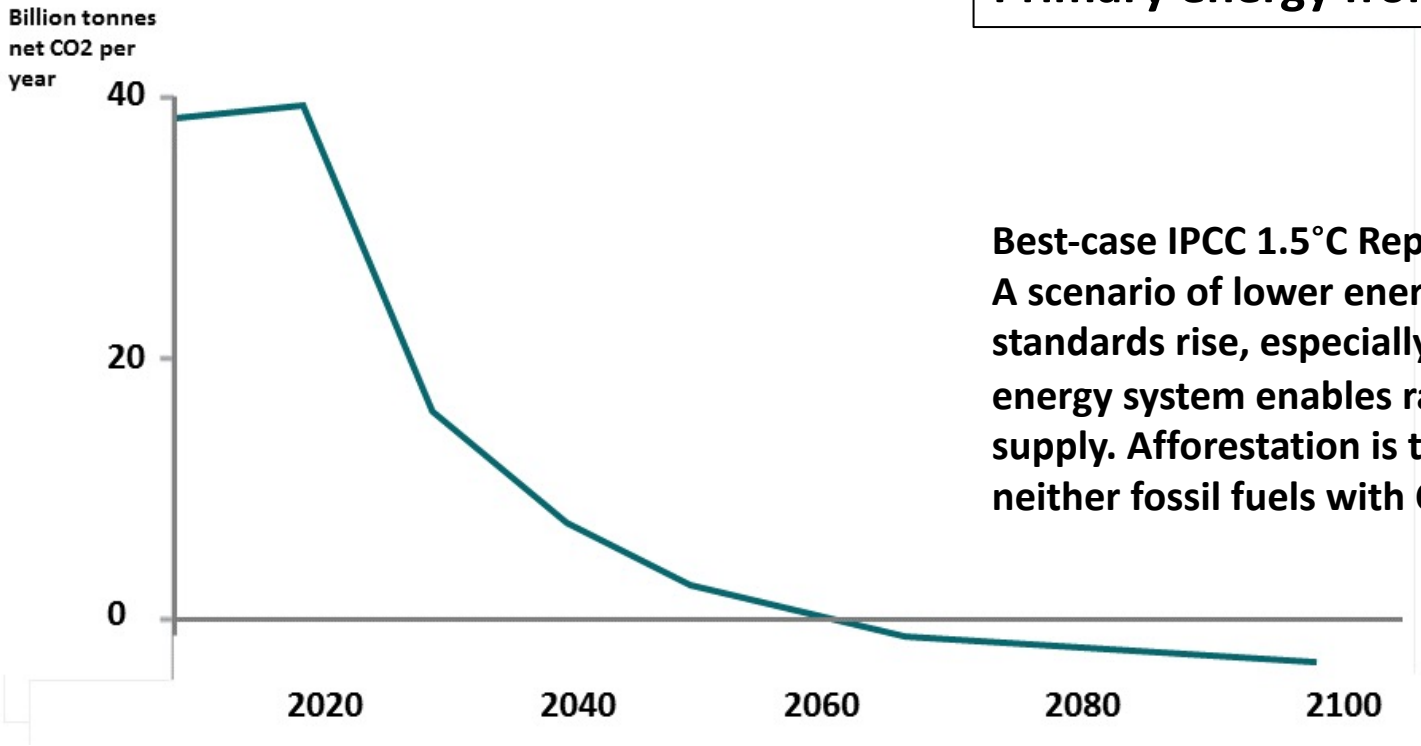


% emissions decline for 1.5°C and 2°C limits

UN Climate Secretariat
Technical dialogue of the first global stocktake

Five years ago, IPPC 1.5°C Report required global CO2 emissions to decline rapidly from 2020, to decline 45% on 2010 by 2030, with the fossil energy age over by 2050

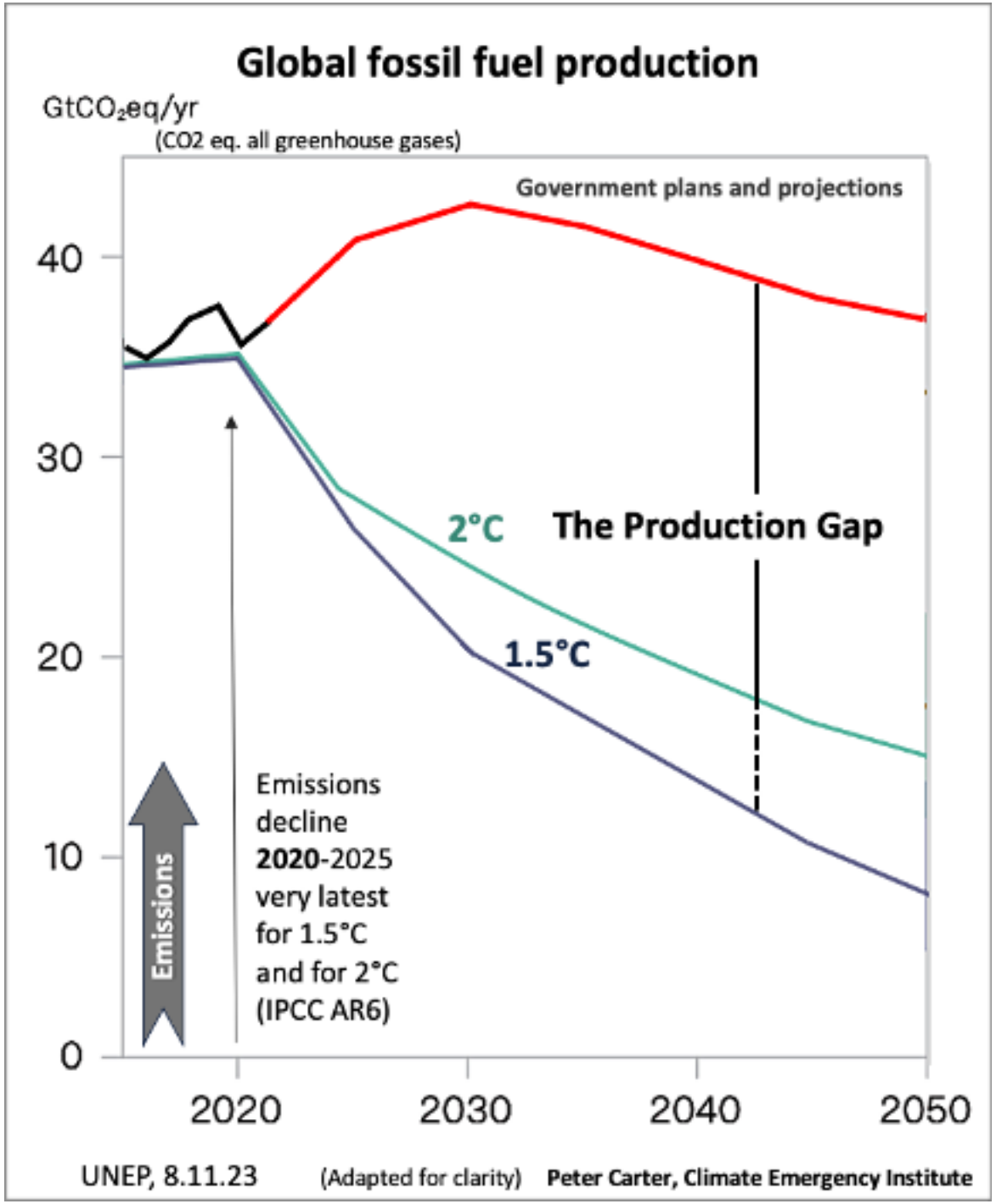
In model pathways with no or limited overshoot of 1.5°C, global net anthropogenic CO2 emissions decline by about 45% from 2010 levels by 2030



Primary energy from coal in 2050 – 97%
Primary energy from oil in 2050 – 87%
Primary energy from gas in 2050 – 74%

Best-case IPCC 1.5˚C Report scenario P1
A scenario of lower energy demand up to 2050 while living standards rise, especially in the global South. A downsized energy system enables rapid decarbonization of energy supply. Afforestation is the only CDR option considered; neither fossil fuels with CCS nor BECCS are used.

IPCC 218, 1.5C Report, Figure SPM.3b | C



The Production Gap Report, UNEP

8 November 2023

World powers continue to push and pollute with fossil fuel emissions, regardless of the IPCC science.

They must be held accountable.

IPCC AR6 projects that on continued current policies, we are headed to 3.2ºC.

Global emissions have to decline rapidly immediately (IPCC AR6)

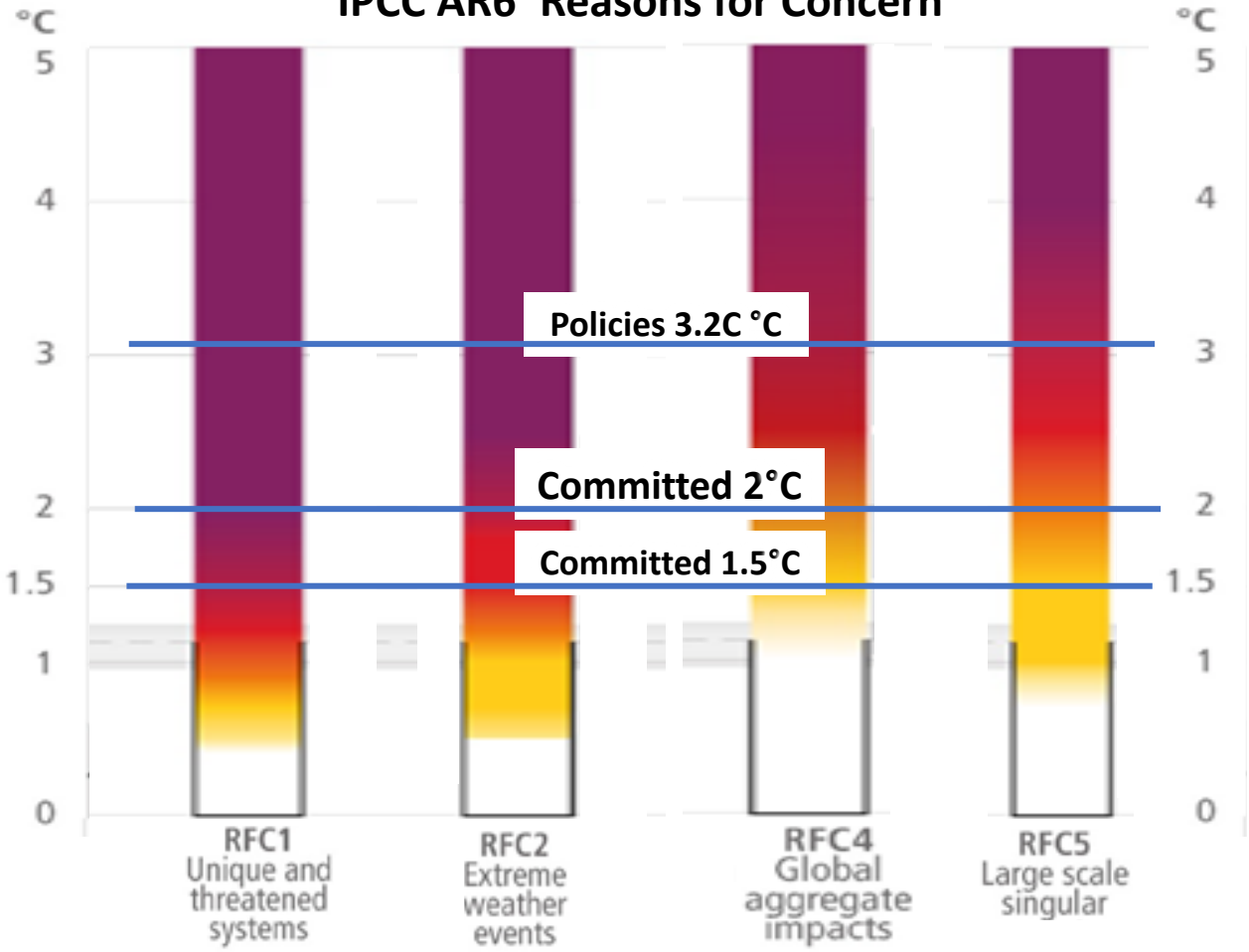
1.5°C Globally disastrous
2°C Global catastrophe

Large Inertias =
lots of warming
in the pipe

Long lag times from agreement to decline in global emissions to a global temperature response

<u>Climate system commitment</u>
This century, commitment is double (1.8°C).
Total multi-century commitment is 8°C (J. Hansen).

IPCC AR6 'Reasons for Concern'



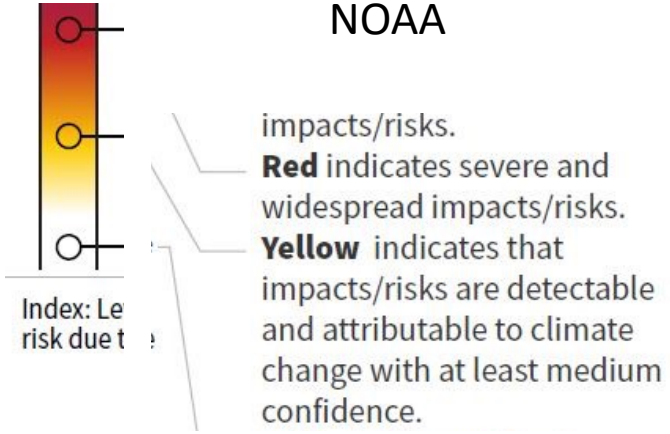
Most vulnerable ecosystems & populations

Most damaging to populations, crops

Overall damage to economy & environment

Tipping points

NOAA



Tipping points crossed at 2°C

Fight Fossil Fuels Through Mobilization

- New fossil fuel development projects must NOT be given the go-ahead.
- Fossil fuel extractions MUST be stopped immediately.
- Fossil fuel subsidies MUST be stopped immediately

Governments must be compelled to act.

The only institution with the influence to compel governments is national science academies and royal societies.

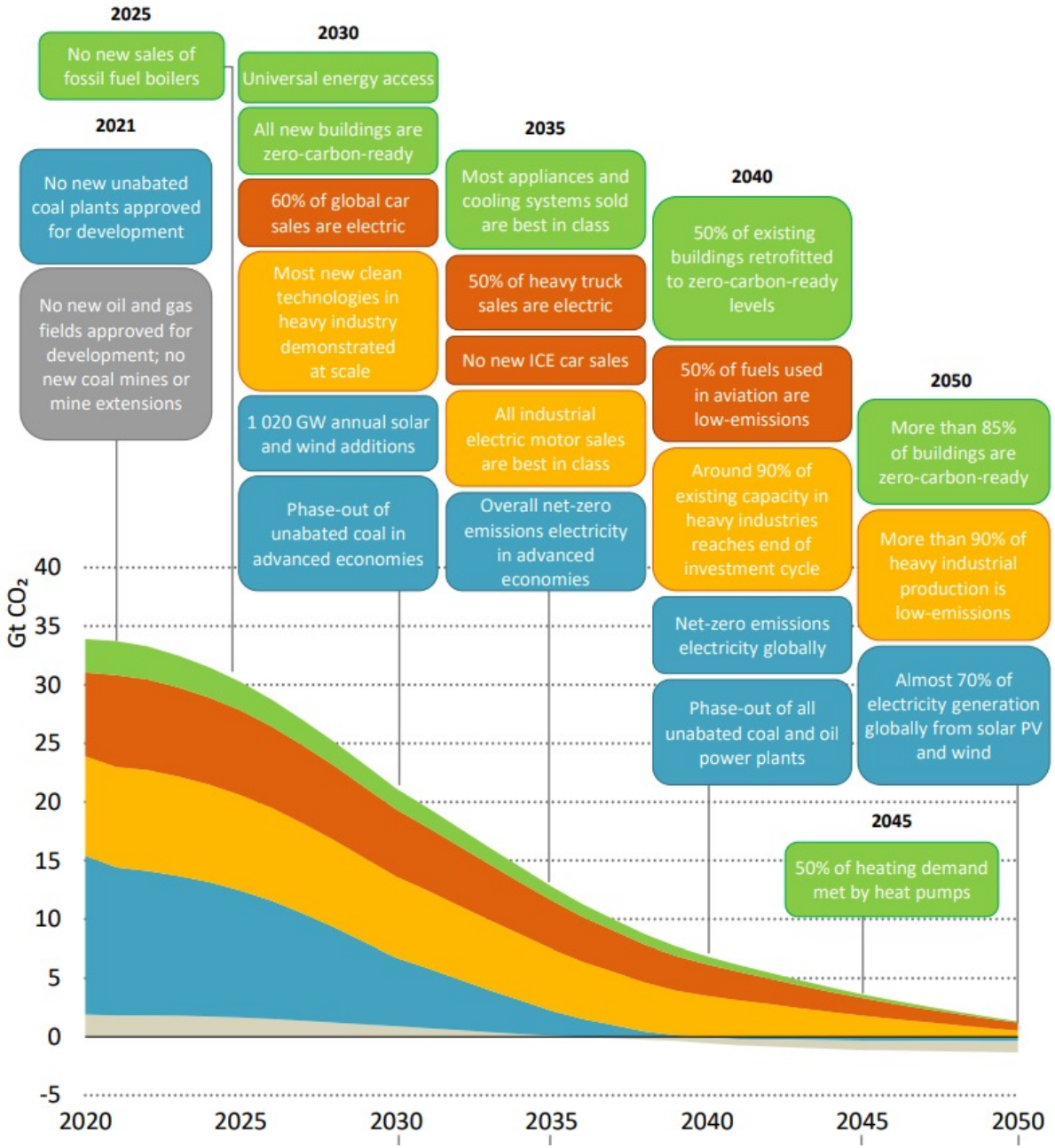
THE CLIMATE MOBILIZATION

The IEA published a climate emergency mitigation plan (only for energy)

2021

No new unabated coal plants approved for development

No new oil and gas fields approved for development; no new coal mines or mine extensions



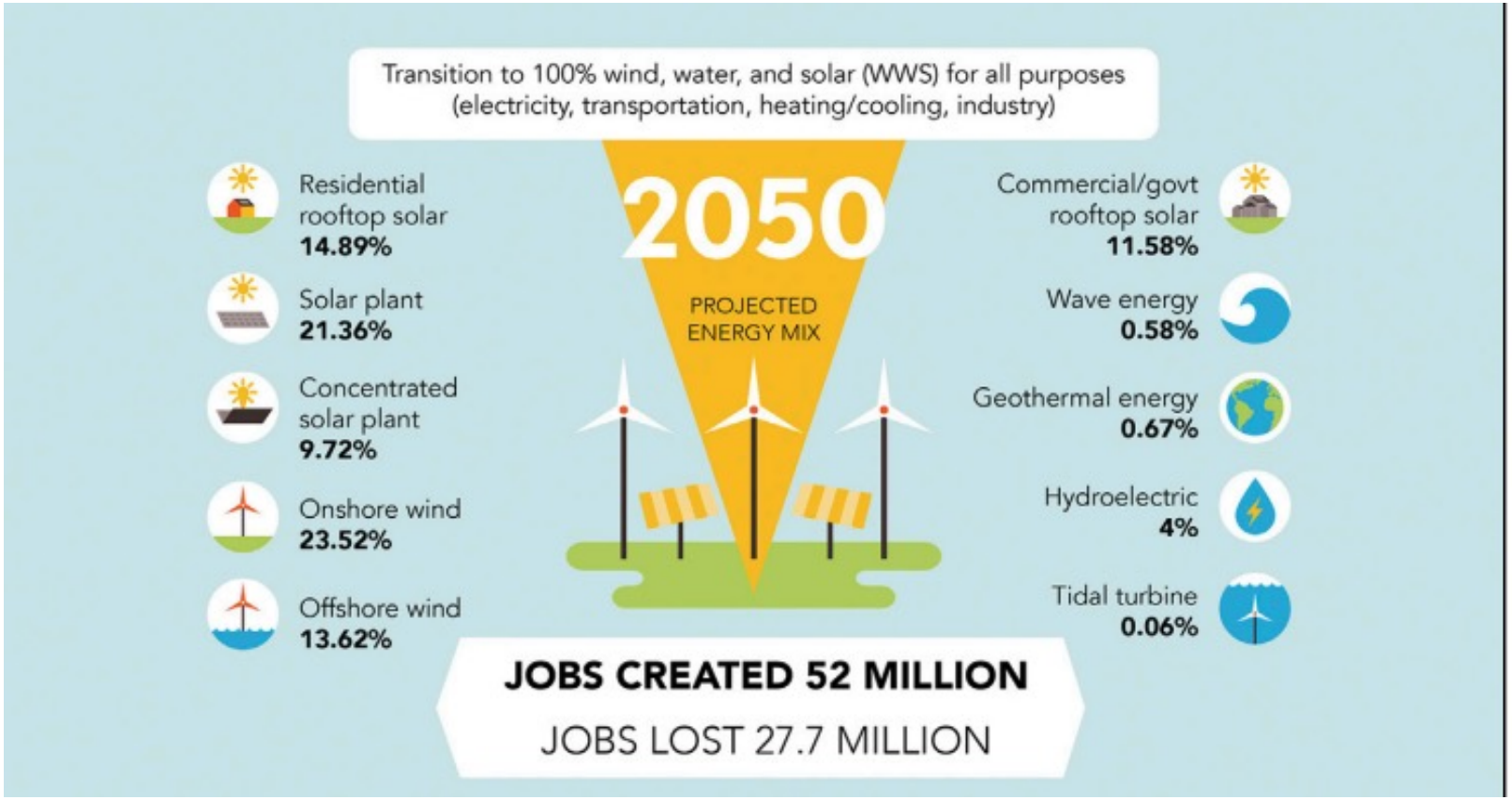
May 2021, IEA Net Zero by 2050

The Solutions Project

The Burning age for energy is over

100% clean and renewable wind, water and sunlight (with energy efficiency and conservation)

All-Sector Energy ONLY • No burning for any energy, any way



Current nuclear fission energy should not be terminated.

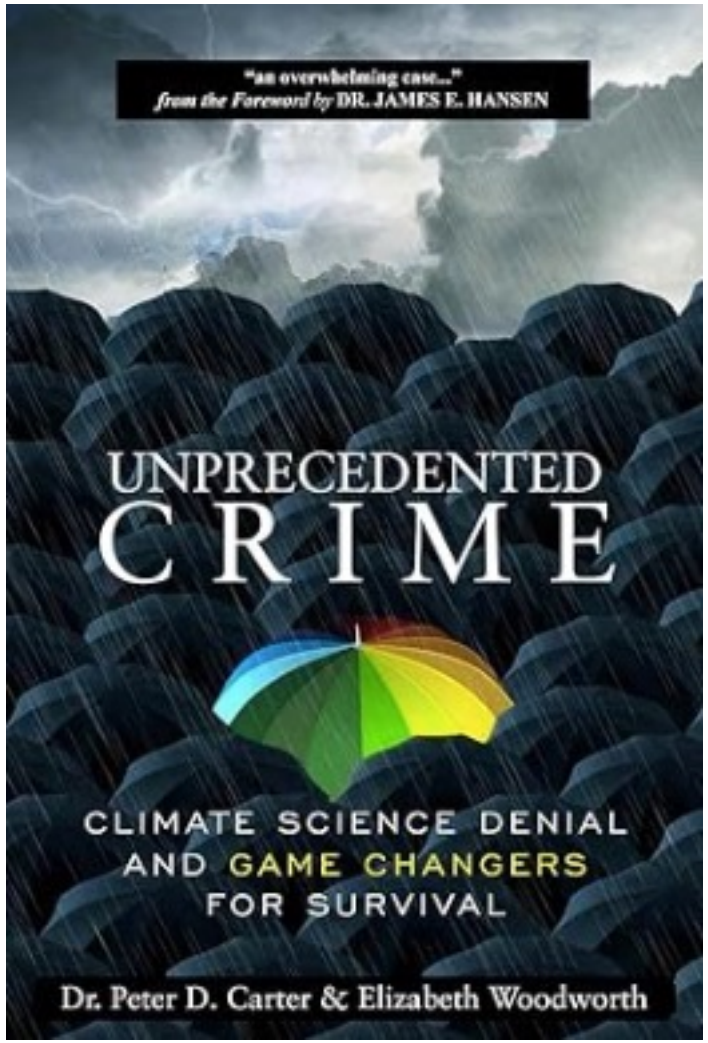
Mark Z. Jacobson, Professor of civil & environmental engineering and Director of the Atmosphere/Energy Program at Stanford U.

Conversion is the Climate Change Solution

Emissions of CO2, methane and nitrous oxide have to decline to “near zero” (IPCC).

All our goods and services that emit GHGs do so constantly.

They have to be converted to the non-emitting, much better alternatives.

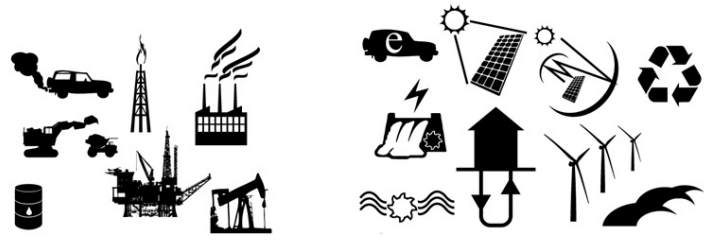


See Unprecedented Crime: Climate Science Denial and Game Changers for Survival

Conversion for climate change mitigation

Energy

Convert 100% of Fossil Fuel Energy to Zero-Combustion Renewable Energy



Fossil-fuel based transport
Fracking oil & gas
Power plants
Methane gas
Coal
Oil

CO_2

Zero-carbon electric transport
Solar photovoltaic
Concentrated solar thermal
Conservation
Hydro & micro-hydro
Geothermal
Wind
Wave

$\not{CO}_2$

$Trillions subsidies (IMF)

Construction

Convert Construction Materials from Steel / Concrete to Engineered Wood

Carbon source
CO2

Cement and Steel production both result in heavy CO_2 emissions

Engineered wood structures function as a carbon sink

CO2
Carbon sink

Steel manufacturing **burns** iron ore using **coal**

Calcium **carbon**ate limestone is **burned** to manufacture cement

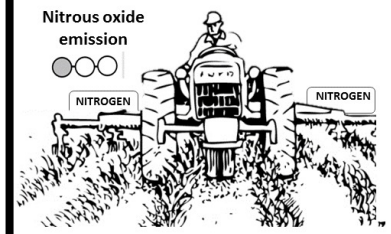
Wood multi-storey construction

Agriculture

Agriculture Conversion

Nitrous oxide emissions

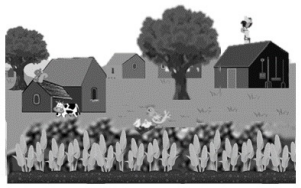
Nitrous oxide emission



Clipartlibrary.com

Chemical intensive & highly mechanized mono crop

Carbon retention



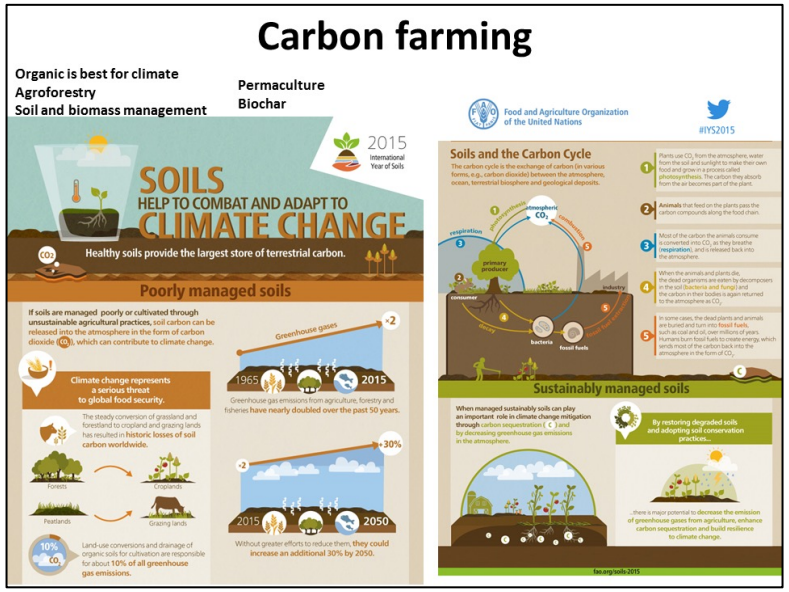
Publicdomainvectors.org

Mixed organic natural fertilizer farm (permaculture)

Carbon farming

Organic is best for climate
Agroforestry
Soil and biomass management

Permaculture
Biochar



Diet

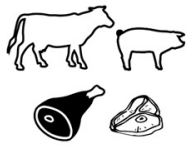
Convert Diet from Meat Based to Plant Based

Methane CH4

CH4 (relative Reduction)

Meat intensive diet

Plant-based diet:
100% fruit, vegetable, nut, grains



USD $75B direct subsidies for meat industry (OECD $53B USD)

Organic farm subsidies
Meat pollution tax

Switch subsidies

World Military Conversion

Swords to ploughshares

- Highest number of military conflicts since World War 2
- Total global military expenditure increased by 3.7 per cent in real terms in 2022, to reach a new high of $2240 billion (International Peace Research Institute).
- The world's militaries are responsible for ±6 percent of global greenhouse gas emissions (Scientists for Global Responsibility).
- Absolutely essential for global survival
- Climate change mitigation requires an unprecedented degree of national and international co-operation.
- Many benefits. Total replacement of all fossil fuel energy by clean zero-combustion renewable energy will greatly diminish international conflict.

World **Manhattan–Apollo-Marshall** Type Venture

Carbon dioxide removal (CDR) — now a priority

- must develop and deploy safe, effective, feasible, carbon dioxide removal at scale

World energy conversion

- must develop and deploy best possible technology to replace all fossil fuel energy with clean renewable zero-combustion energy
- we need a lot of clean energy, so we need a new source

Construction

- rebuild for the zero-combustion world
- convert from steel & concrete to construction with engineered wood

Arctic cooling

- stabilize sea ice and northern carbon (James Hansen says cooling is now required)

Climate Survival is Job 1

There is a silver bullet — it's called subsidies

Compel governments to immediately
terminate all fossil fuel subsidies unconditionally

- Not just so-called "inefficient" fossil fuel subsidies
- Carbon "tax" — governments (of course) must charge the large central polluters the full cost of their pollution
- Specifically, fossil fuel air pollution **kills 10 million people a year**
- Tax meat (methane)

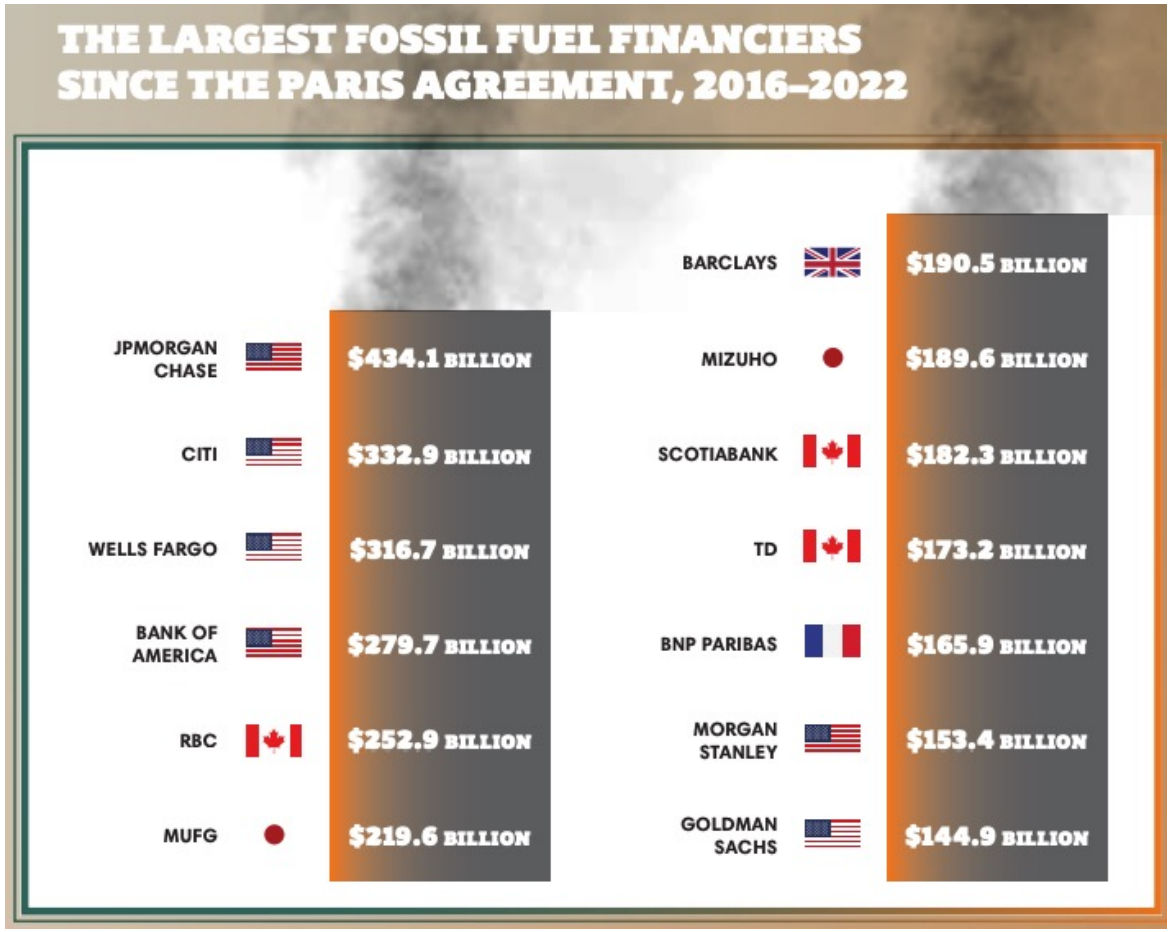
$7 TRILLION/year globally
(IMF, August 2023

https://www.greenmatters.com/p/fossil-fuel-air-pollution-deaths
https://www.sciencedirect.com/science/article/abs/pii/S0013935121000487

Prohibit banks from financing more fossil fuel extraction

Banks' financing of fossil fuel projects was $669 billion in 2022

Fossil fuel financing from the world's 60 largest banks has reached USD $5.5 trillion in the seven years since the adoption of the Paris Agreement, with $669 billion in fossil fuel financing in 2022 alone.



Many currently proposed solutions do not avoid global climate planetary catastrophe because they allow continued fossil fuel combustion

The COP28 Ruses

CO_2 emissions must drop to NEAR ZERO

There is NO solution without replacing all fossil fuel energy by 100% with clean renewable energy
Many current mitigation proposals allow continued fossil fuel combustion, and are excuses for delay

Carbon budget is indefinite — there is NO MORE allowable carbon to burn
There is NO substitute for rapid global emissions decline with no delay

Net-zero emissions is undefined — it has to include with zero-combustion and no fossil fuels

Carbon offsetting — no delay (new forests don't grow fast enough)

Carbon capture storage (CCS) — includes bioenergy CCS, which is not zero-combustion

Fossil fuel 'abatement' (relies on CCS)

'Negative emissions' technology (relies on CCS)

Biomass combustion emits as much CO_2 as coal

Climate Action
Mass Mobilization

This is essential because all institutions are either encouraging or ignoring constant emissions, and constantly increasing emissions.

Public information and persuasion campaign (Stern Commission, 2006)

Conversion: Consumer to Conserver

Climate mitigation diet → World conversion to vegan diet

THE CLIMATE MOBILIZATION

Adaptation, of course

There is no climate change adaptation without mitigation

Adaptation will not work (for long) in the absence of previous effective mitigation

Climate change and climate risks cannot be reversed

Adaptation mainly requires major upgrading of (free) public services

Early warning systems for disasters

“We are committing Earth, and ourselves,
to climate chaos for thousands of years.”
— NOAA Power Greenhouse Gases, May 2023

Thank you …
Questions? Thoughts? Uplifting flute music?

Peter D. Carter
Climate Emergency Institute, Victoria, BC