ipcc
INTERGOVERNMENTAL PANEL ON climate change
WMO UNEP

Radical Realism:
Climate Change and the challenge of overshoot.

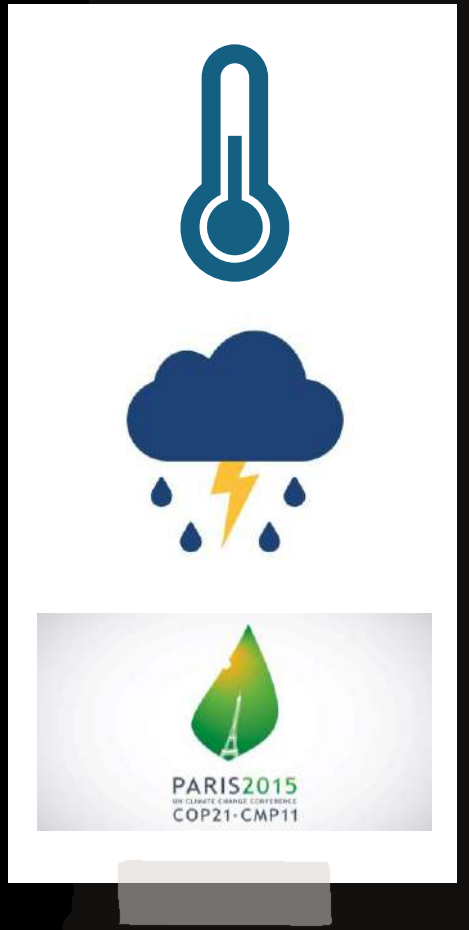
Prof. Debra Roberts (UKZN/University of Twente)
IPCC Co-Chair Working Group II (AR6)
UNFCCC Negotiator/Expert
Local government practitioner

[Ocean Image Bank/Matt Curnock, S. Baldwin, both CC BY-NC-ND 2.0; Yuichi Ishida/UNDP Timor-Leste CC BY-NY 2.0]

The global compact

The United Nations Framework Convention on Climate Change's (UNFCCC) goal is to **prevent dangerous human interference with the climate system** by stabilizing greenhouse gas concentrations in the atmosphere.

This is achieved through various mechanisms, including the **Paris Agreement**, which aims to limit global warming to **well below 2°C, and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels** (1850-1900).... global peaking of greenhouse gas emissions as soon as possible...and undertaking rapid reductions thereafter.

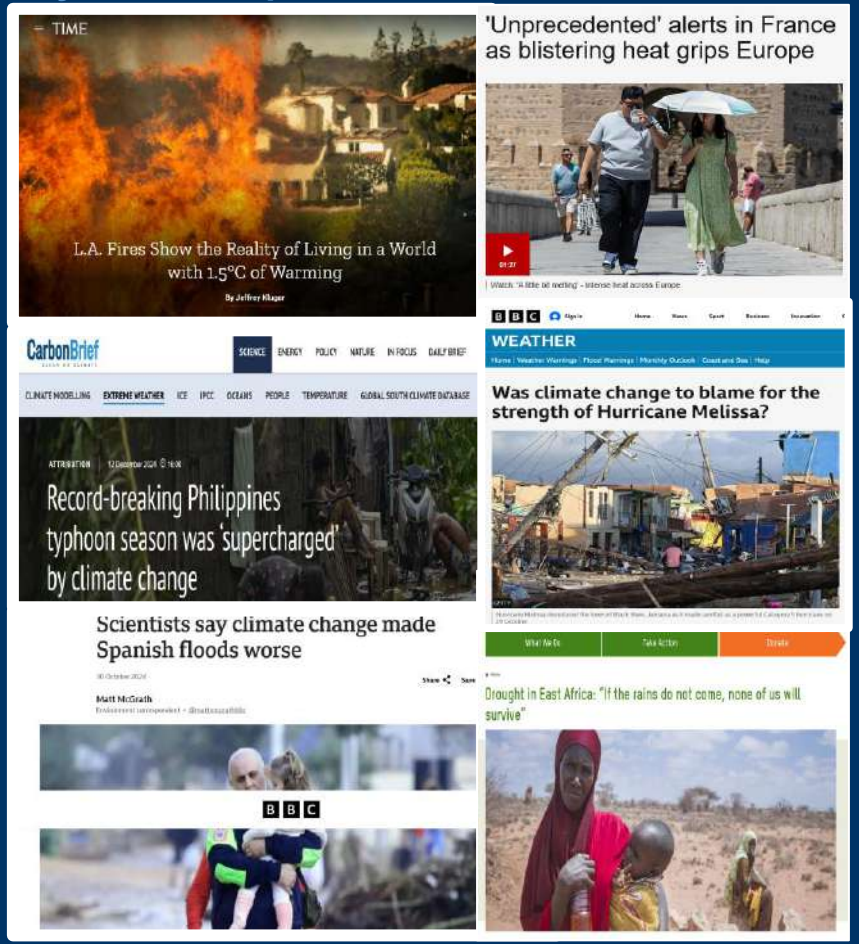


Synthesis Report AR6: key findings of 3 Special Reports and 3 Main Assessments

Jezael Melgoza

Where we are and where we're headed

Current trends of emissions and development are incompatible with a sustainable, equitable world.



Where we are and where we're headed

- The 10% highest-emitting households: ±40% of global greenhouse gas emissions; the 50% households with lowest emissions: less than 15%
- Global surface temperature has increased faster since 1970 than in any other 50-year period over at least the last 2000 years – 1.1°C (SYR 2023 - 1.15°C) now 1.22 °C (2015-2024).
- Increasing at a rate unprecedented in the instrumental record: 0.27 °C per decade.
- Human-caused climate change has resulted in widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere

Impacts

Caused dangerous impacts on nature and people **in every region** of the world.

- Heatwaves, heat related mortality
- Heavy rainfall
- Agricultural droughts
- Tropical cyclones increased
- Reduced water security, water scarcity
- Acute food insecurity
- Growth in agricultural productivity slowed
- Reduced fish and shellfish yields
- Intensified impacts in cities
- Loss of infrastructure and livelihoods
- Economic impacts (agriculture, forestry, fisheries, energy and infrastructure)

Dominic Chandler, Obscape

Roland Flickr

Where we are and where we're headed

The pace and scale of what has been done so far, and current plans, are insufficient to tackle climate change.

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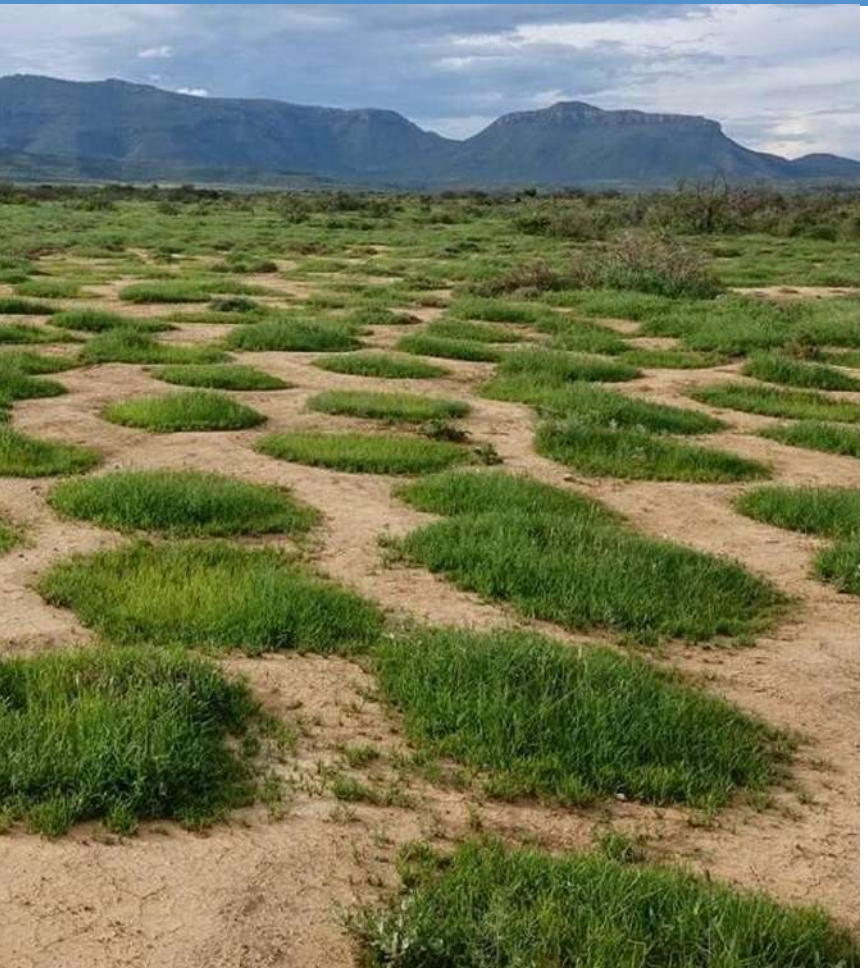
Where we are and where we're headed

Adaptation: has progressed across all sectors and regions, but remains fragmented, incremental and sector specific.

Adaptation gaps exist and will continue to grow at current rates of implementation.



Adaptation to date

- Examples of **effective adaptation**
  - on-farm water management and storage
  - soil moisture conservation
  - Ecosystem based adaptation (e.g urban greening)
- Some **limits to adaptation** reached
  - warm water corals, coastal wetlands, rainforests, polar and mountain ecosystems
  - small-scale farmers and households in coastal regions

- **Adaptation finance** – only a small portion of globally tracked climate finance
- **Maladaptation** – unintended consequences. Marginalised and vulnerable are most affected
- **Adaptation** does not prevent all losses and damages

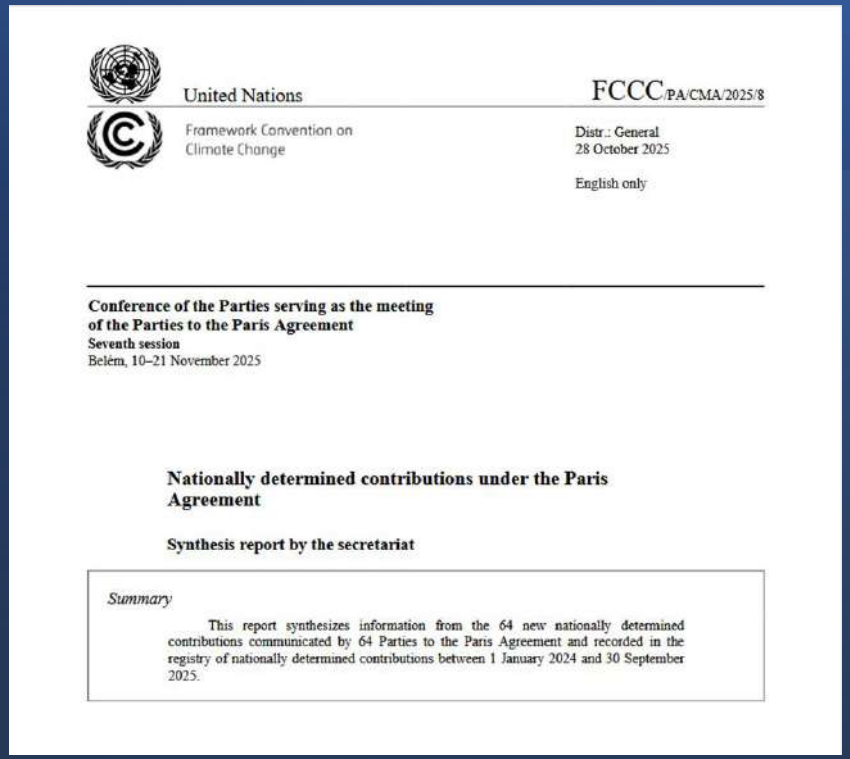
The Herding Academy

Roland Flickr

Where we are and where we're headed

Mitigation: Policies and laws have expanded but government pledges on greenhouse gas emissions announced by October 2021 make it harder to limit warming below 2°C.

There are substantial gaps between pledges made and policies implemented at the end of 2020.



United Nations

Framework Convention on Climate Change

FCCC/PA/CMA/2025/8

Distr.: General
28 October 2025

English only

Conference of the Parties serving as the meeting of the Parties to the Paris Agreement
Seventh session
Belém, 10–21 November 2025

Nationally determined contributions under the Paris Agreement

Synthesis report by the secretariat

Summary

This report synthesizes information from the 64 new nationally determined contributions communicated by 64 Parties to the Paris Agreement and recorded in the registry of nationally determined contributions between 1 January 2024 and 30 September 2025.

Full implementation of all new Nationally Determined Contributions(NDCs) including **all conditional elements**, is estimated to bring the total GHG emission level of the relevant group of Parties down to 12.3 (12.0–12.7) Gt CO_2 eq by 2035, which would be **19–24% below the 2019 level**. IPCC (AR6): Greenhouse gas emissions must be cut by **60% by 2035**.

"Despite gathering momentum behind transitions, the world is still a long way from a trajectory aligned with its climate goals."
IEA, 2024.

Mitigation to date

- **Expanding policies to reduce greenhouse gas emissions** over last decade including sub-national.
- **Technically viable and increasingly cost-effective** options
  - Solar and wind energy

  IEA: "*unstoppable*" shift (2023) "Clean energy is entering the energy system at an *unprecedented rate*" (2024)
  - Energy efficiency
  - Demand side management
  - Electrification of urban systems
  - Green infrastructure in cities
  - Forest and crop/grassland management
  - Reduced food waste
- **Lags in adoption of low emission technologies in developing countries** - finance, technology development and transfer
- Finance flows **fall short** of the levels needed to meet climate goals – 3-6x current levels.
- [**COP 29**: USD 300 billion annually by 2035/USD 1.3 trillion annually by 2035 - viewed as largely inadequate, too little too late].

Curt Carnemark / World Bank

NLRC via IFRC CC BY-NC 2.0

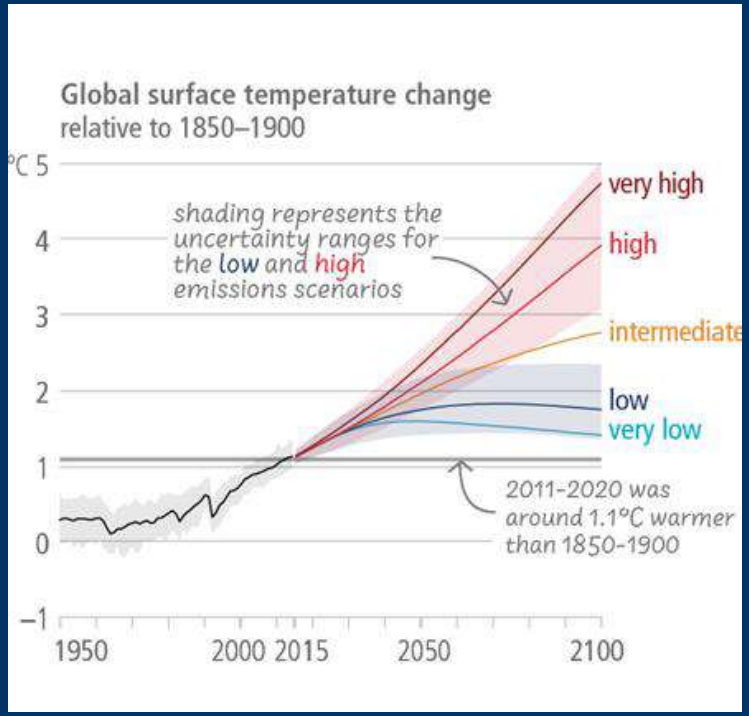
Where we are and where we're headed

We are ill prepared for the hazards and extraordinary threats we face today and into the future.

TheOceanAgency

Our Future

Scientific advances have resulted in a better understanding of what the future will look like, depending on the choices we make today.



Because our efforts to reduce greenhouse gas emissions have been insufficient, the increase in average global surface temperature is **more likely than not to reach 1.5°C in the first half of the 2030s**.

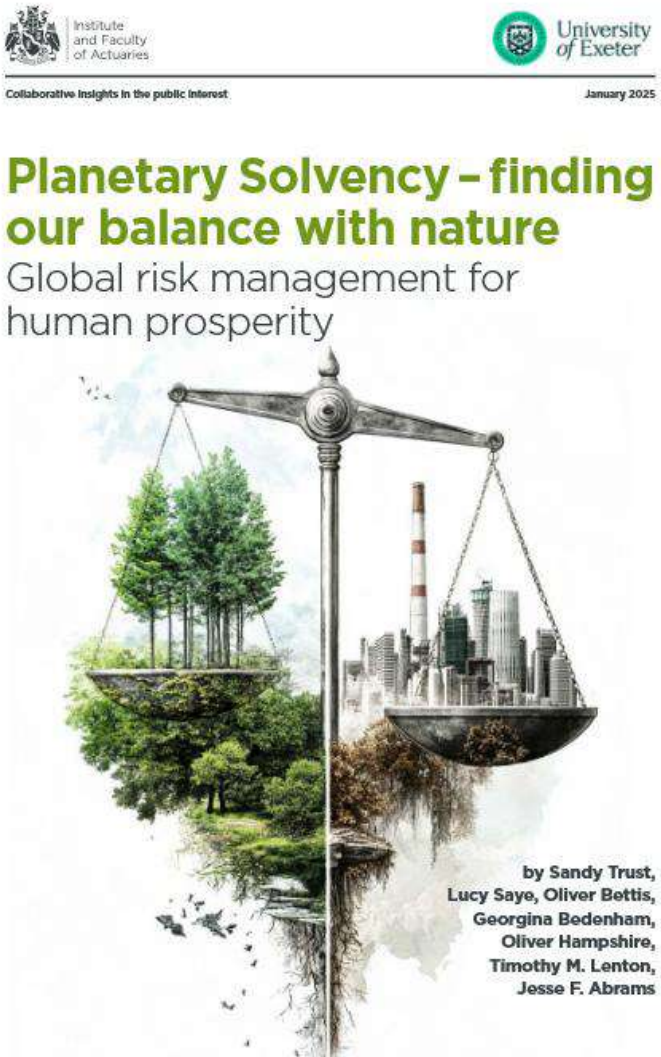
IPCC AR6 SYR Figure SPM.4a

info.peoplelike / Flick

“Warming of 1.5°C is not considered ‘safe’ for most nations, communities, ecosystems and sectors and poses significant risks to natural and human systems as compared to the current [as of 2018] warming of 1°C.”

Libyan Red Crescent

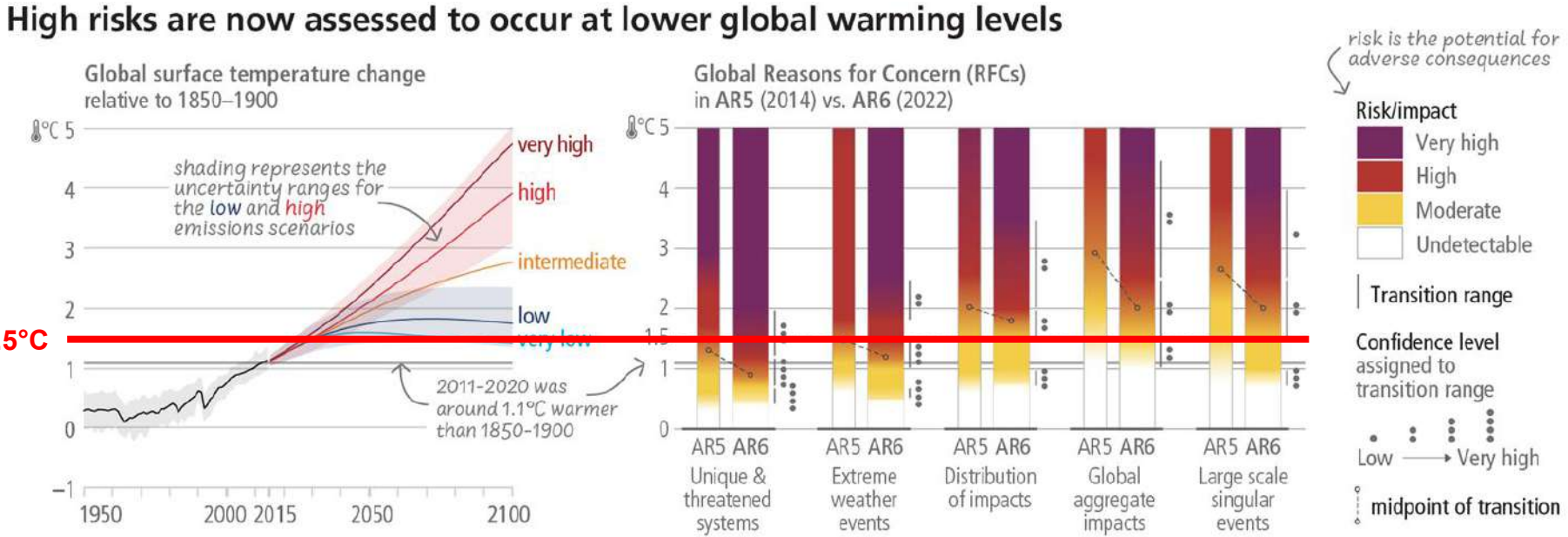
Tim Dennell / Flickr



- Policymakers lacked information **on the level of risk they accepted by agreeing the Paris goals** of 1.5°C and 2°C in 2015.

- **Implicitly accepting much higher levels of risk than was understood** at the time of setting these goals.

Risks, impacts and related losses and damages increase with every increment of warming



IPCC AR6 SYR Figure SPM.4a

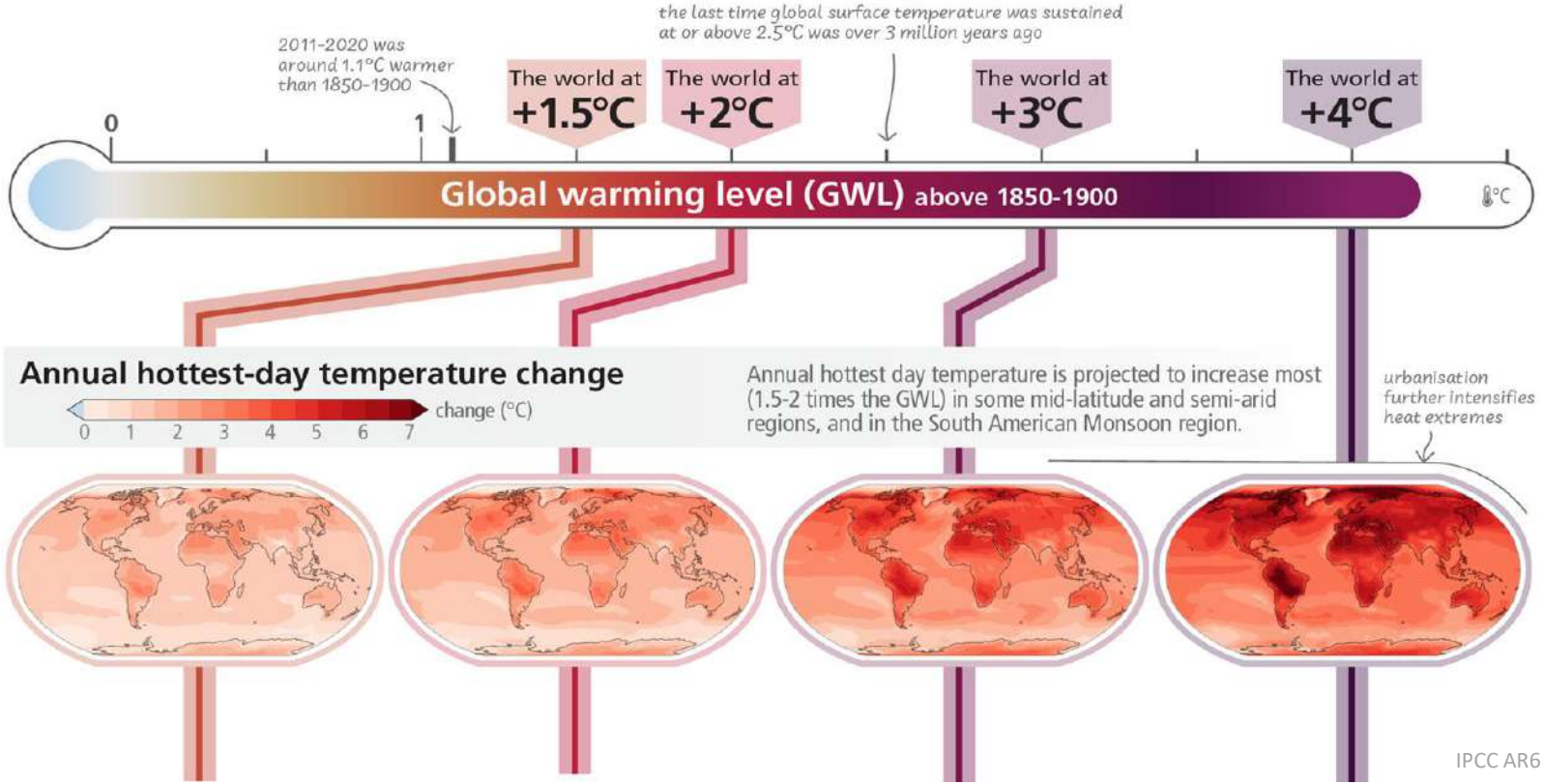
Future risks

Further emissions => further warming => **continue to affect** the atmosphere, the land, the air we breathe and the ocean.

Every region will face increases in climate hazards and be impacted in different ways.

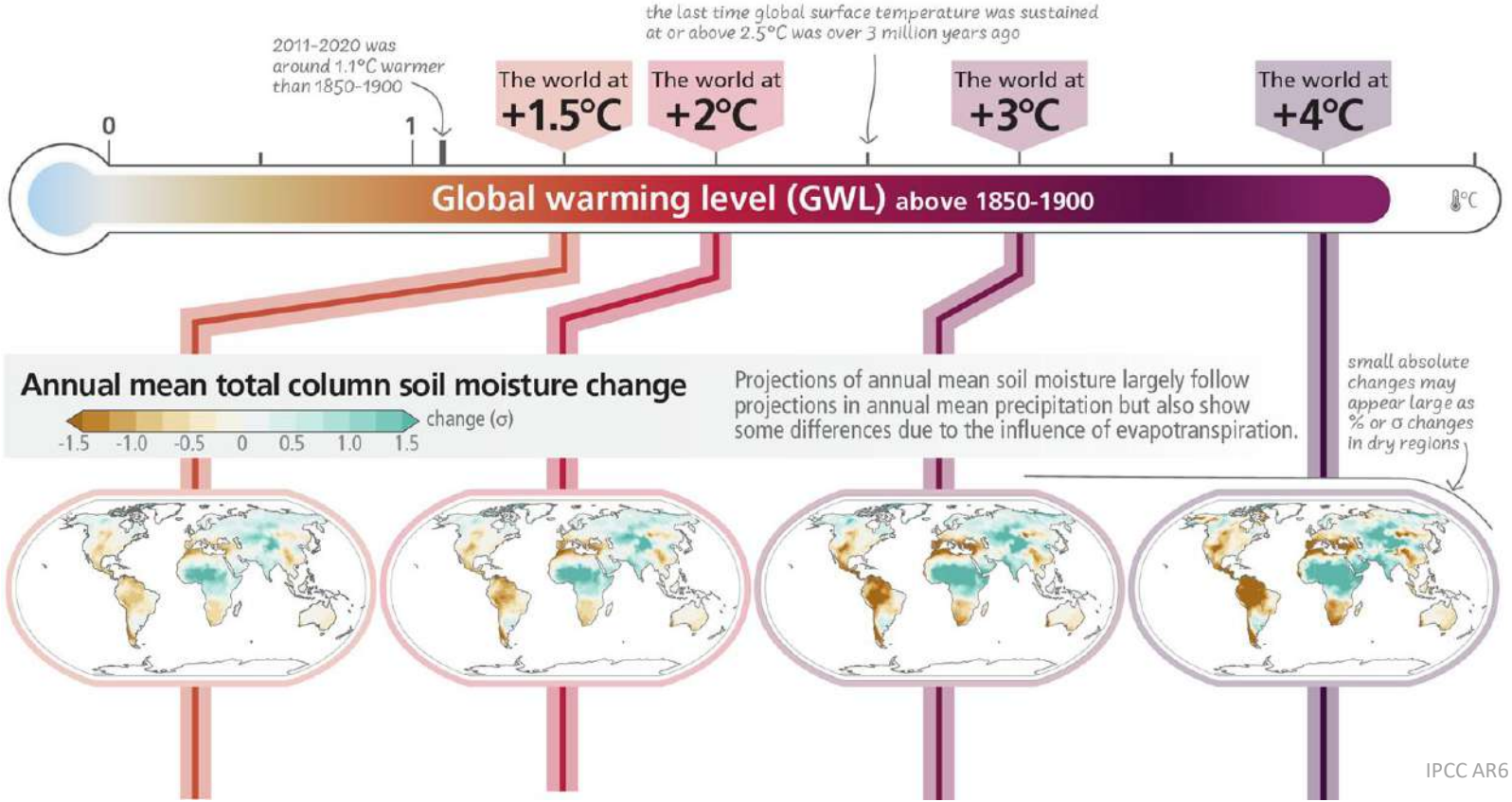
- Tropical cyclone increase in intensity
- Melting ice and snow, sea level rise
- Flooding
- Biodiversity loss
- Reduced food production
- Human health impacts
  - Heat-related deaths, diseases, mental health, malnutrition
- **Changes in extremes** will become more noticeable
- **Compound and cascading risks** that are more complex and difficult to manage – created through the interaction of climatic and non-climatic drivers

Every region expected to face further increases in climate hazards in the near future and the adverse impacts will escalate with higher temperatures



IPCC AR6 SYR Figure SPM.2a

Soil moisture



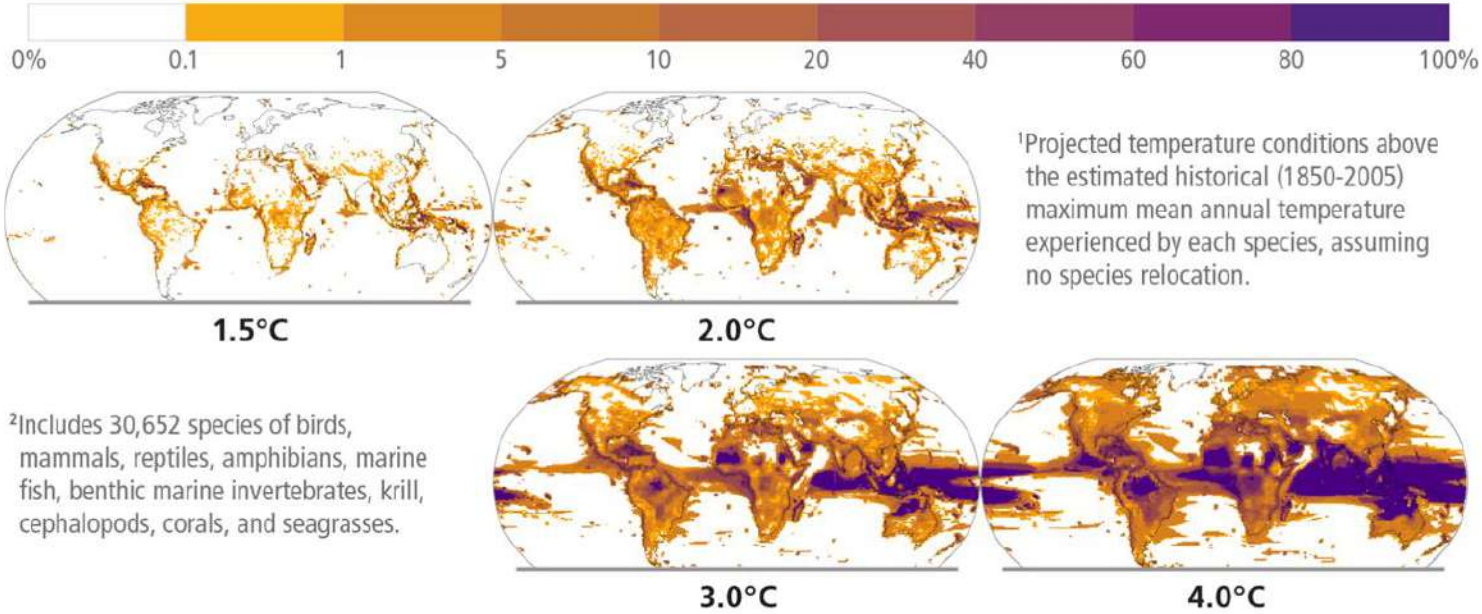
IPCC AR6 SYR Figure SPM.2a

Risk of species losses

Examples of impacts without additional adaptation

Risk of species losses

Percentage of animal species and seagrasses exposed to potentially dangerous temperature conditions[1,2]



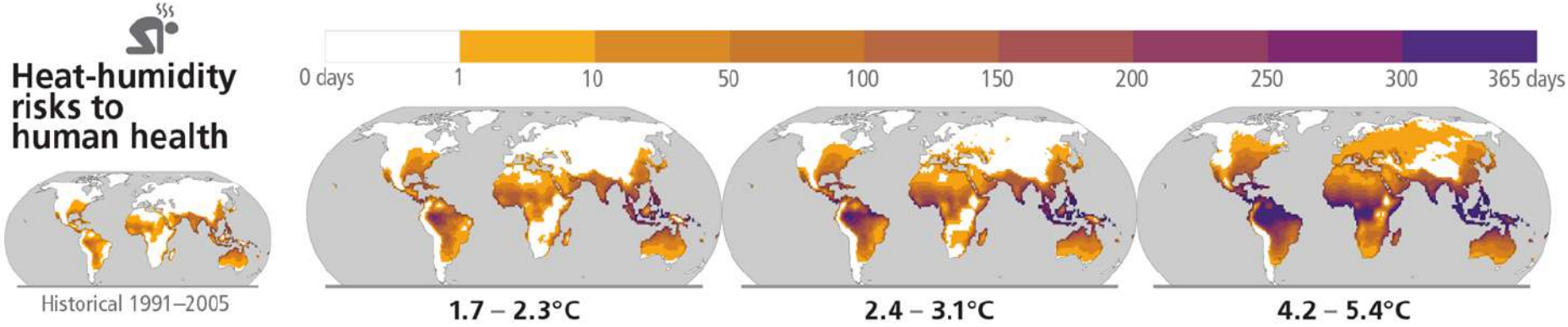
[1]Projected temperature conditions above the estimated historical (1850-2005) maximum mean annual temperature experienced by each species, assuming no species relocation.

[2]Includes 30,652 species of birds, mammals, reptiles, amphibians, marine fish, benthic marine invertebrates, krill, cephalopods, corals, and seagrasses.

IPCC AR6 SYR Figure SPM.3a

Heat-humidity risks to human health

Examples of impacts without additional adaptation



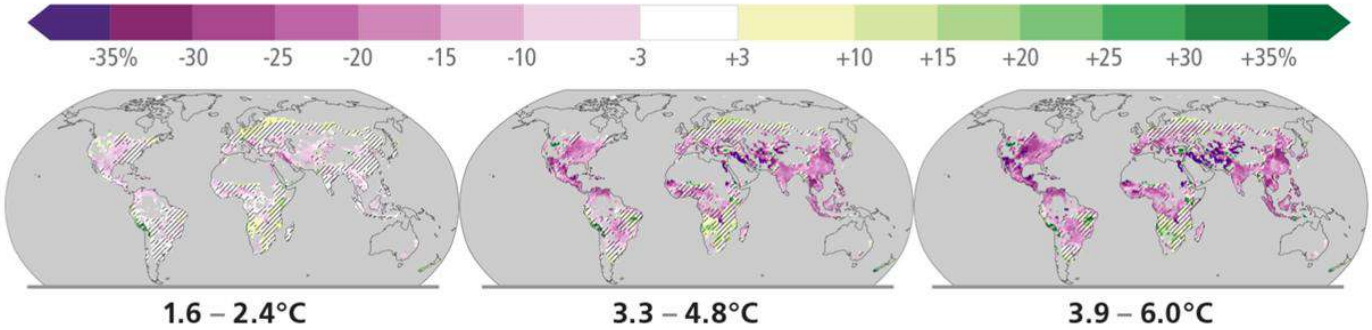
Days per year where combined temperature and humidity conditions pose a risk of mortality to individuals[3]

[3]Projected regional impacts utilize a global threshold beyond which daily mean surface air temperature and relative humidity may induce hyperthermia that poses a risk of mortality. The duration and intensity of heatwaves are not presented here. Heat-related health outcomes vary by location and are highly moderated by socio-economic, occupational and other non-climatic determinants of individual health and socio-economic vulnerability. The threshold used in these maps is based on a single study that synthesized data from 783 cases to determine the relationship between heat-humidity conditions and mortality drawn largely from observations in temperate climates.

IPCC AR6 SYR Figure SPM.3b

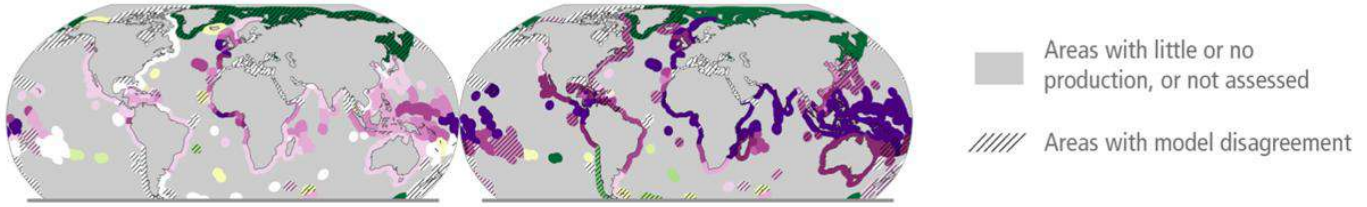
Examples of impacts without additional adaptation

Food production impacts



c1) **Maize yield**[4]
Changes (%) in yield

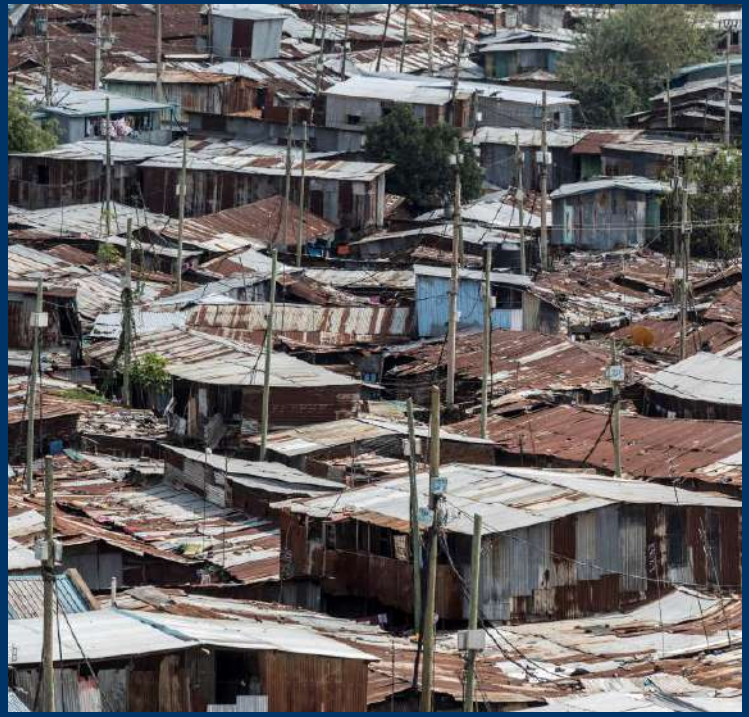
[4]Projected regional impacts reflect biophysical responses to changing temperature, precipitation, solar radiation, humidity, wind, and CO_2 enhancement of growth and water retention in currently cultivated areas. Models assume that irrigated areas are not water-limited. Models do not represent pests, diseases, future agro-technological changes and some extreme climate responses.



c2) **Fisheries yield**[5]
Changes (%) in maximum catch potential

[5]Projected regional impacts reflect fisheries and marine ecosystem responses to ocean physical and biogeochemical conditions such as temperature, oxygen level and net primary production. Models do not represent changes in fishing activities and some extreme climatic conditions. Projected changes in thea Arctic regions have low confidence due to uncertainties associated with modelling multiple interacting drivers and ecosystem responses.

IPCC AR6 SYR Figure SPM.3c



Our Future

Losses and damages are part of our future, disproportionately affecting the most vulnerable ecosystems and people.

BUT actions taken now will make a difference.

Denis Onyodial

Reaching limits

- Adaptation options **more constrained and less effective** with every increment of warming
- **Adaptation limits**
  - Ecosystem based adaptation
  - Water management
- **Insufficient freshwater for people to continue living** on islands and mountains
- **Irreversible changes**
  - Species extinctions
  - Loss of biodiversity and ecosystems (including warm-water corals, coastal wetlands, rainforests, polar and mountain ecosystems)
- **Dangerous feedbacks** in climate system e.g. thawing of permafrost
- **Unavoidable** sea level rise – but can limit further acceleration
- **Severe infrastructure** damage/impacts in low-lying coastal settlements

WorldFish

Our Future

Climate change is an existential threat to human wellbeing, to our livelihoods, the global economy and to nature on which we rely to survive and thrive.

The Sanitation and Hygiene Fund

Our Future

Questions of equity and climate justice arise as vulnerable people who have contributed least to climate change are being disproportionately adversely affected.

World Bank sounds alarm on 'historical reversal' of development for poorest nations

PUBLISHED: MON, 15 APR 2024 11:16:14 GMT

Andrea Shalal
Reuters

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Need for climate justice

- Almost **half the world's population** lives in regions that are highly vulnerable to climate change – 3.3-3.6 billion.
- Between 2010-2020, deaths from floods, droughts and storms were **15 times higher** in highly vulnerable regions, *cf* to the most resilient regions.
- Exposure to climate hazards is increasing globally due to growing **inequality, urbanisation and other trends** including migration.

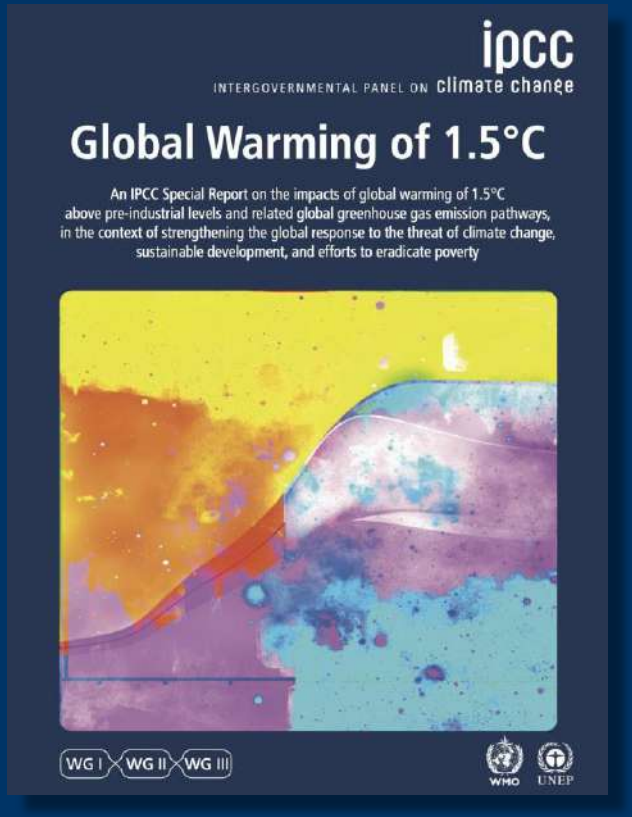
Photo: Marco Dormino UN Photo_CC BY-NC-ND 2,0

Need for climate justice

- Those people who **rely on the land or sea** to make a living are particularly vulnerable.

- Without strong climate action, losses and damages will continue to disproportionately affect the most vulnerable populations, especially those in **Africa, Asia, least developed countries, Central and South America, small islands and the Arctic**.

Denis Onyodi / KRCS CC BY-NC 2.0



Our Future

In 2018, IPCC highlighted the unprecedented scale of the challenge required to keep global warming to 1.5°C.

That challenge has become even greater.

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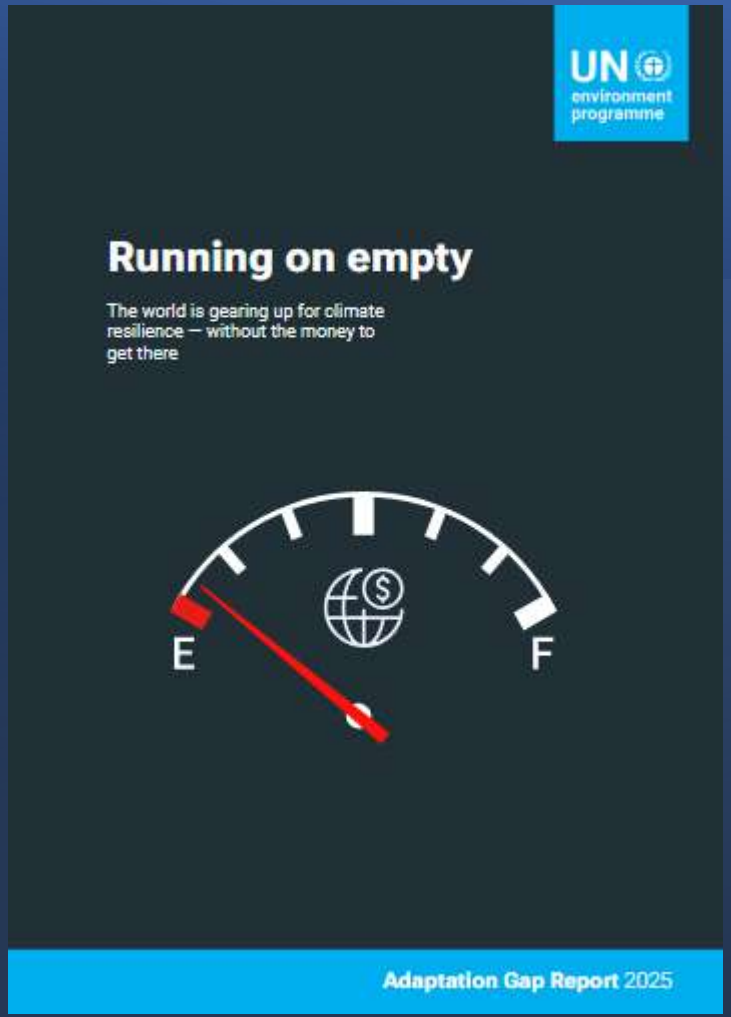
Adam Öjdahl / IWMI CC BY-NC 2.0

It is important, in this decade particularly, to accelerate action to adapt to climate change to close the existing adaptation gap.

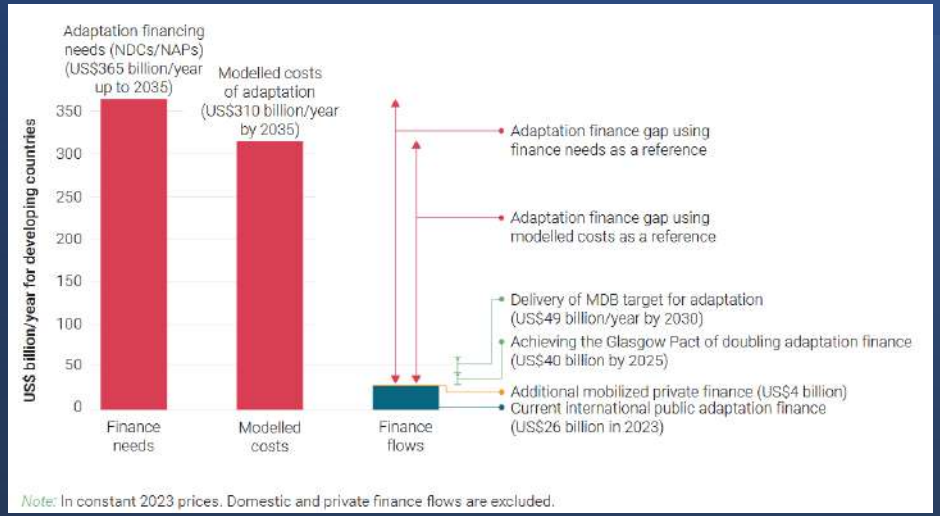


Action on adaptation is **still inadequate**.

There is evidence of improving adaptation planning and implementation, **but it is limited.**

The Glasgow Climate Pact goal of doubling 2019 adaptation finance flows by 2025 to approximately US$40 billion **will be missed** if current trends continue.

The new collective quantified goal for climate finance (NCQG) is **insufficient to meet developing countries' adaptation finance** needs in 2035.



Updates the cost of adaptation finance needed in developing countries: **US$310 billion per year in 2035** based on modelled costs.

Extrapolated needs expressed in Nationally Determined Contributions and National Adaptation Plans, this **rises to US$365 billion a year.**

International public adaptation finance flows to developing countries were US$26 billion in 2023: **down from US$28 billion** the previous year.

This makes adaptation financing needs in developing countries **12-14 times as much as current flows.**

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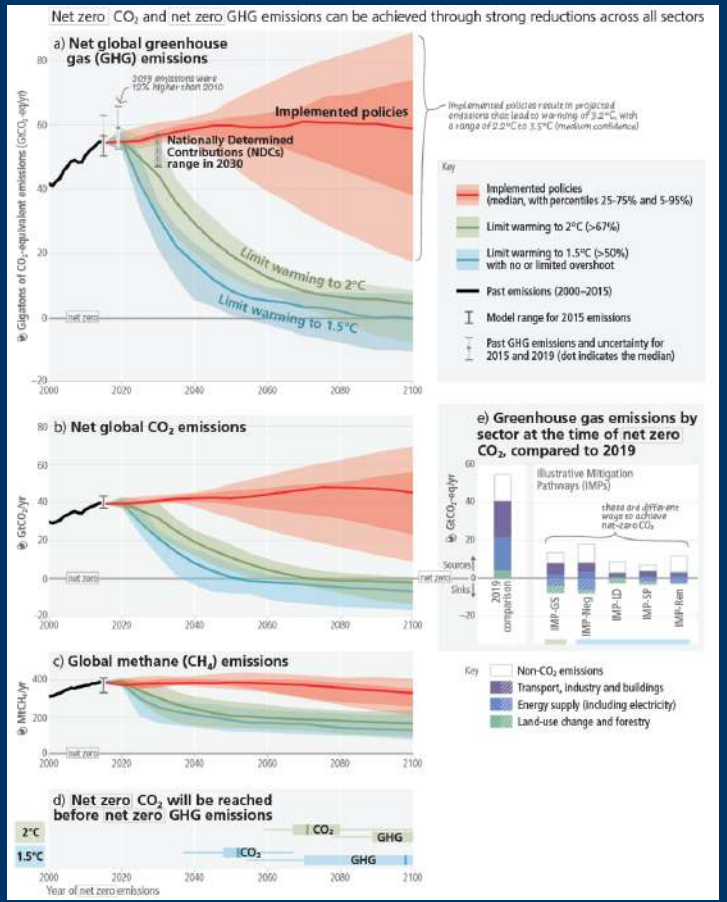
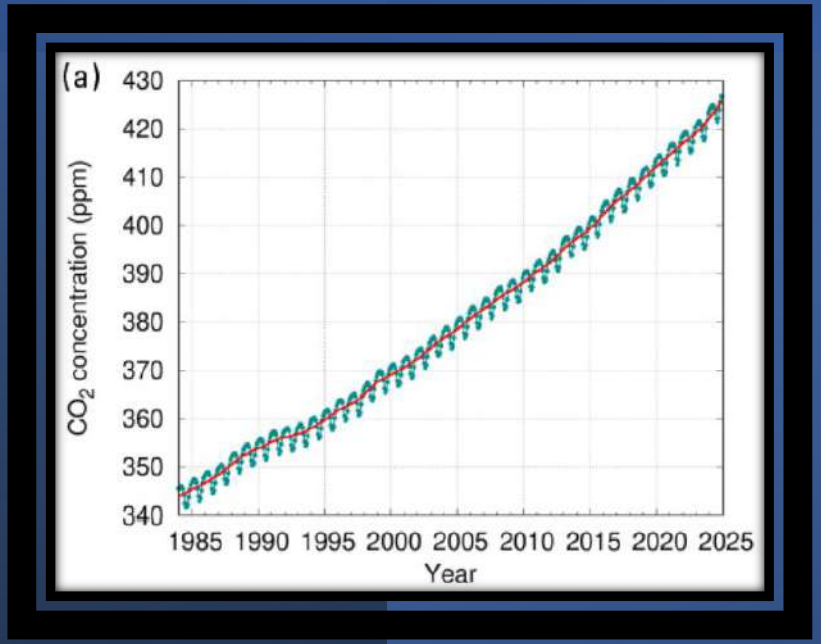


SYR Figure SPM.5

Limiting warming to 1.5°C and 2°C involves rapid, deep and immediate reductions in greenhouse gas emissions.

According to WMO GREENHOUSE GAS BULLETIN 21:

- Atmospheric CO_2 continued to increase in 2024, with no sign of slowing down - 423.9 ppm.
- From 2023 to 2024 increased by 3.5 ppm, the largest one-year increase since modern measurements began in 1957.
- Driven by continued fossil CO_2 emissions, enhanced fire emissions and reduced terrestrial/ocean sinks in 2024, which could signal a climate feedback.



Natural sequestration of carbon dioxide is in decline: climate change will accelerate

James C. Curran and **Samuel A. Curran**
Uddingston, UK

recent 10 years, up to the CO_2 atmospheric maximum in 2024. In summary, and as shown in Figure 1, a quadratic regression is fitted through the time series maxima (for which $y = 0.0132x^2 + 0.7485x + 316.94$ with $R^2 = 0.9994$) and minima (for which

2008. The previous analysis in Curran and Curran (2016a) suggested a peak in 2006.

In more detail, Figure 2 exhibits a positive gradient in the early years, around 1960, of +0.05 ppm per year, meaning that sequestration was increasing in its annual CO_2 uptake

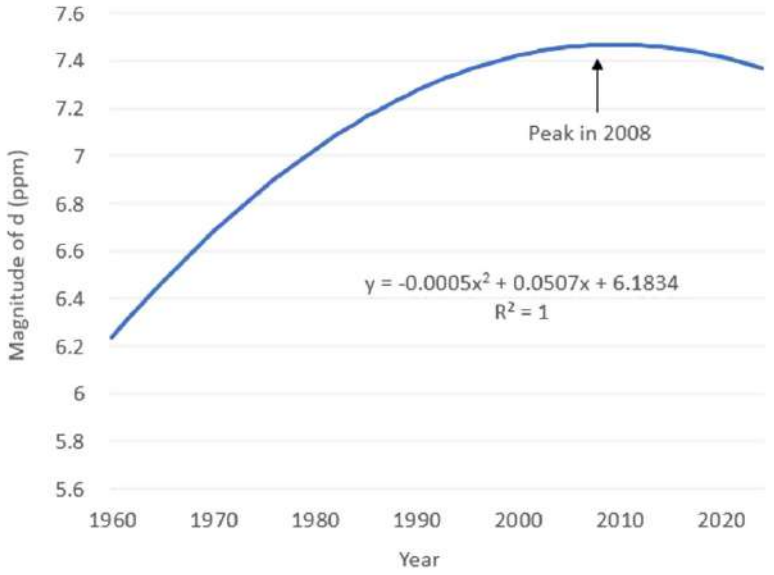


Figure 2. Magnitude of the intra-annual drop in CO_2 (i.e. parameter d in Figure 1) derived from the difference between the upper and lower regression curves shown in Figure 1. For the regression equation, x is the year number since the start of the Mauna Loa record in 1957. So, x = 68 in 2024.

Australian climate and environment in focus
Greenhouse gas emissions

Australian tropical rainforest trees switch in world first from carbon sink to emissions source

Researchers say carbon emissions change in Queensland tropical rainforests may have global climate implications

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About this content

Petra Stock

Wed 15 Oct 2025 16.00 BST

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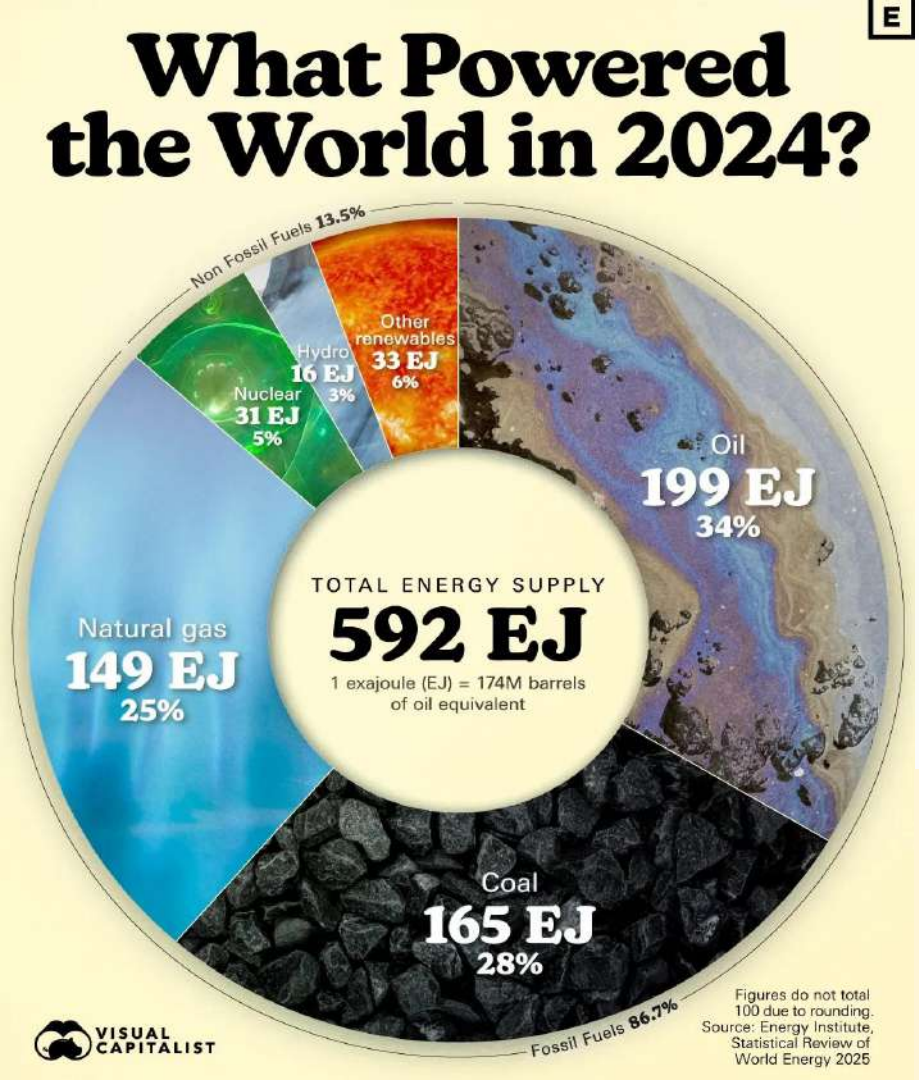
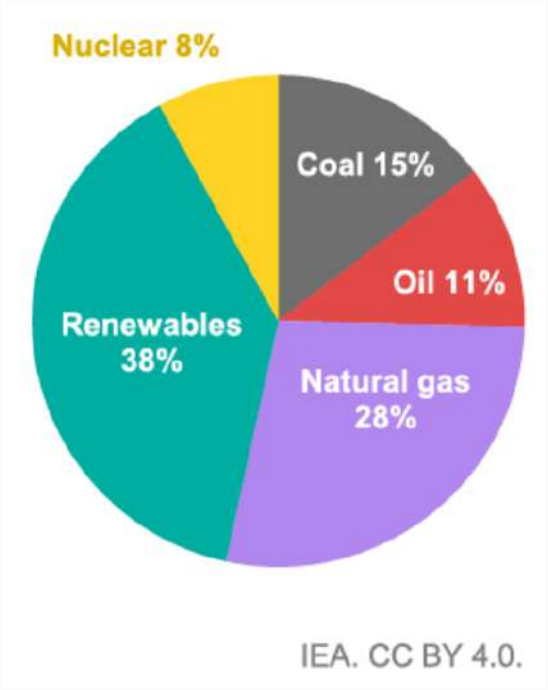
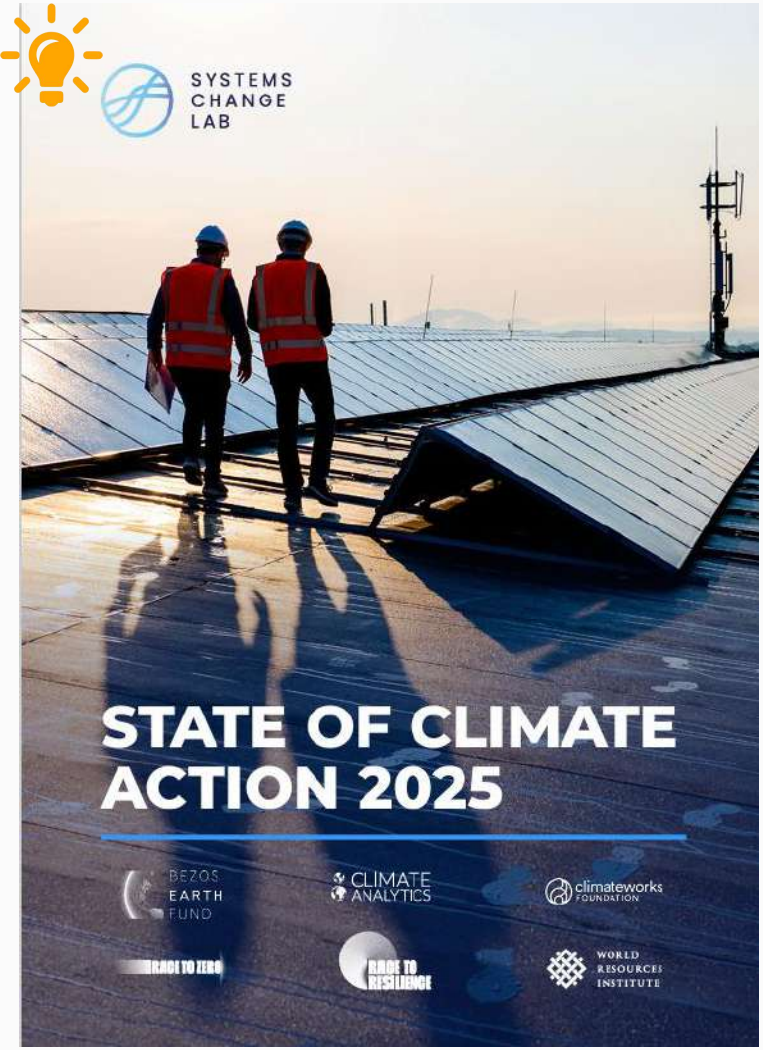
Nearly 50 years of data collected from tropical forests across Queensland has revealed the environment's crucial carbon sink could be under threat. Photograph: Ben Blanche/AMCS





IEA Global Energy Review (2025): in 2024 renewables accounted for the largest share of the growth in global energy supply (38%), followed by natural gas (28%), coal (15%), oil (11%) and nuclear (8%).



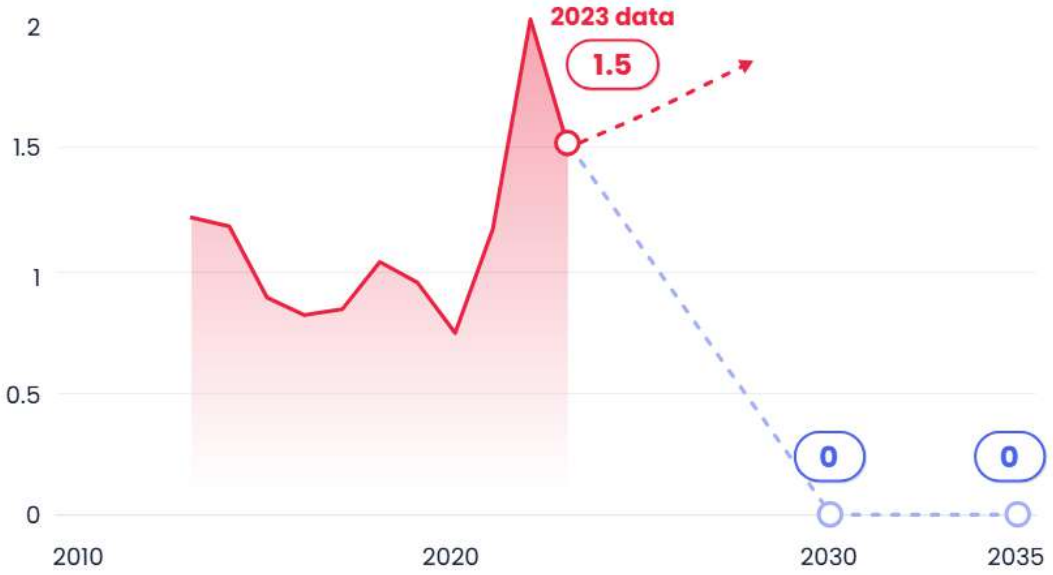
Public fossil fuel finance has grown by $75B/year on average since 2014

Historical data
Extension of current trend
Pace needed to reach targets

Public fossil fuel finance

Wrong Direction, U-Turn Needed | **S-Curve Unlikely**

trillion US$/yr

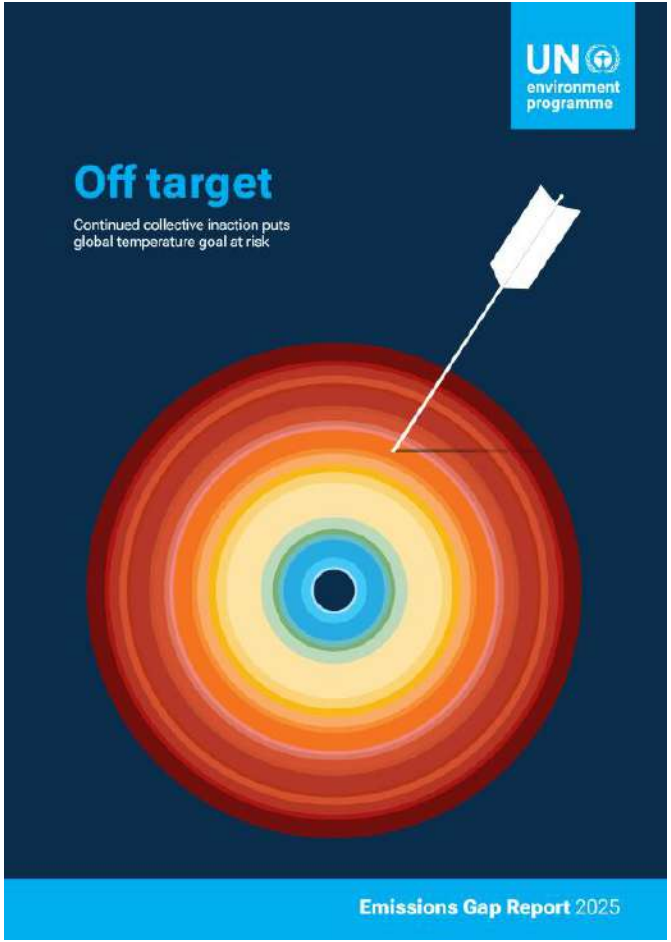


Source: Schumer et al. 2025, using data from OECD and IISD 2025, Laan et al. 2023, OCI 2025, and Gerasimchuk et al. 2024.

SYSTEMS CHANGE LAB

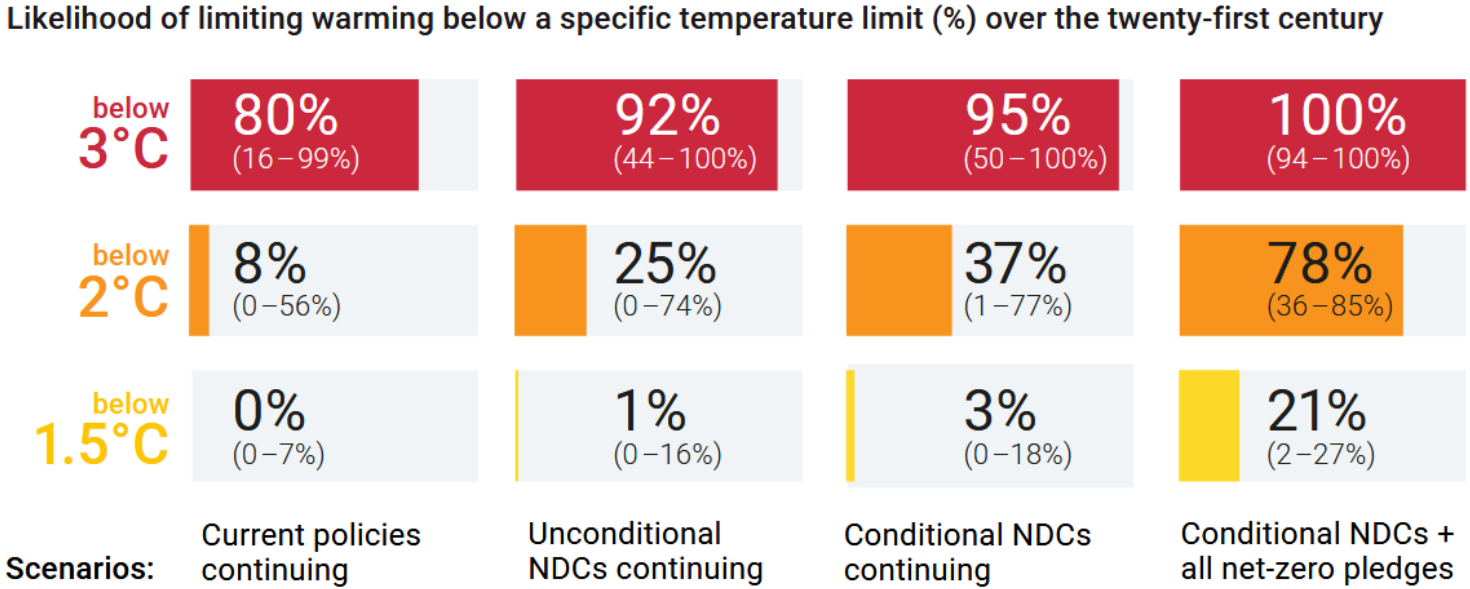
- The hope that the new Nationally Determined Contributions (NDCs) would demonstrate a step change in ambition and action **did not materialise**.

- Global temperatures now predicted to reach **2.3-2.5°C** (based on full implementation of NDCs), down from 2.6-2.8°C last year.



Implementing only **current policies would lead to up to 2.8°C** of warming, compared to 3.1°C last year.

However, methodological updates account for 0.1°C of the improvement, and the upcoming withdrawal of the US from the Paris Agreement will cancel another 0.1°C, meaning that the new NDCs themselves have **barely moved the needle**.



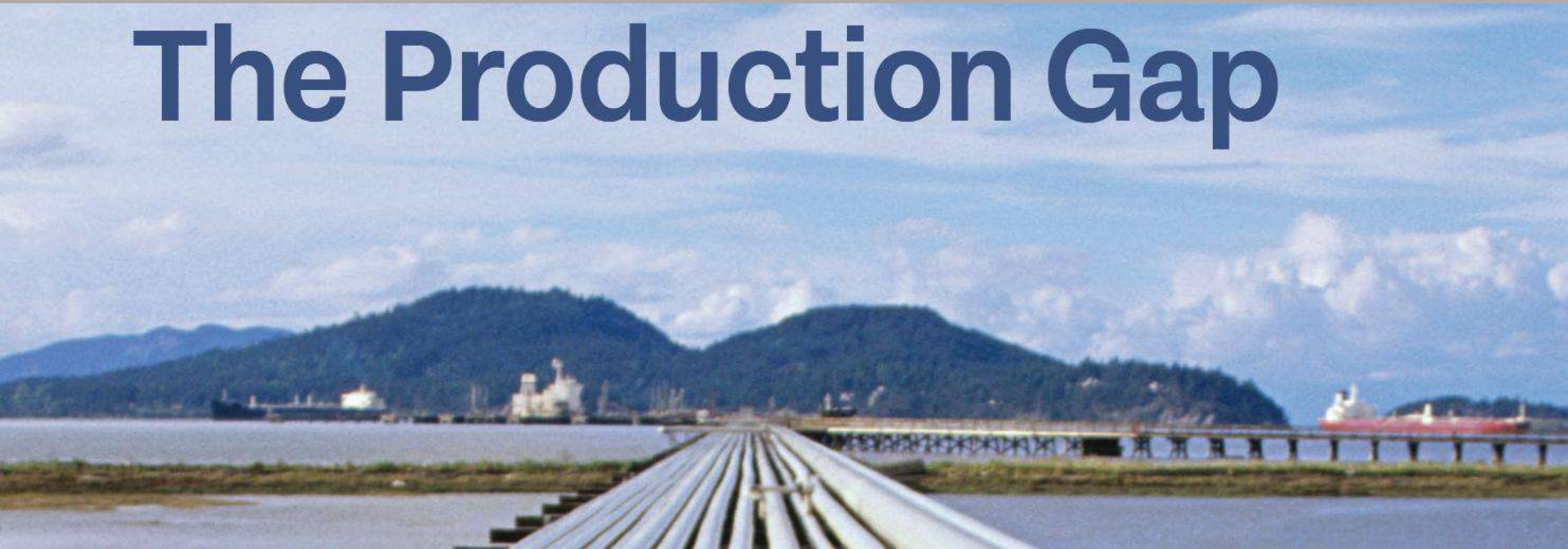
“underline the uncomfortable truth that surpassing 1.5°C is increasingly near, and that the risk of even higher levels of warming is rising fast.”

UNEP Emissions Gap Report, 2025

2025 Report

Governments, in aggregate, still plan to produce more than double the amount of fossil fuels in 2030 than would be consistent with limiting warming to 1.5°C – despite COP28 commitment to "transition away" from fossil fuels.

The Production Gap



FINANCIAL TIMES

Musk's space battle to grab radio spectrum

Are machines better at 'truth' than humans?

Saudis ready to ditch $100 oil target and raise output

- Kingdom aims to regain market share
- Long spell of subdued prices assumed

Washington focus Zelenskyy moves to soothe Trump anger after visiting swing-state factory

The Guardian

Int

News Opinion Sport Culture Lifestyle

Environment Climate crisis Wildlife Energy Pollution

BP

BP expected to scrap renewables target in shift back to fossil fuels

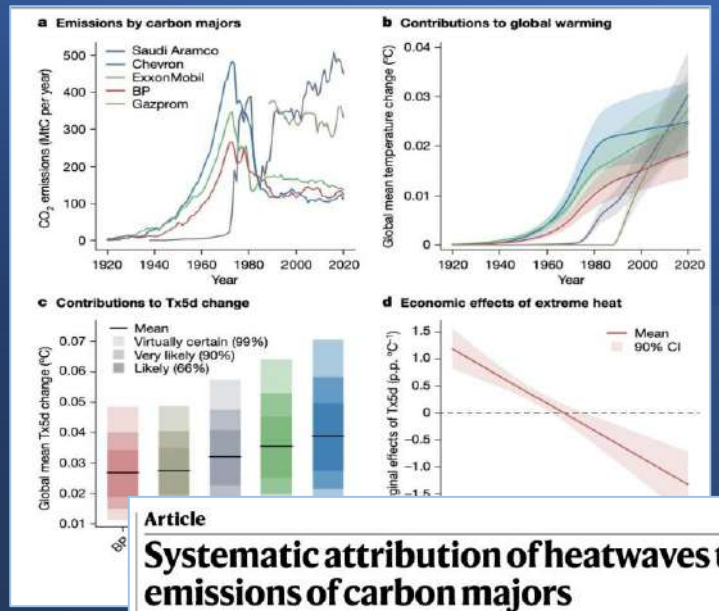
Goal of increasing renewable energy generation 20-fold to be ditched, shareholders to be told this week

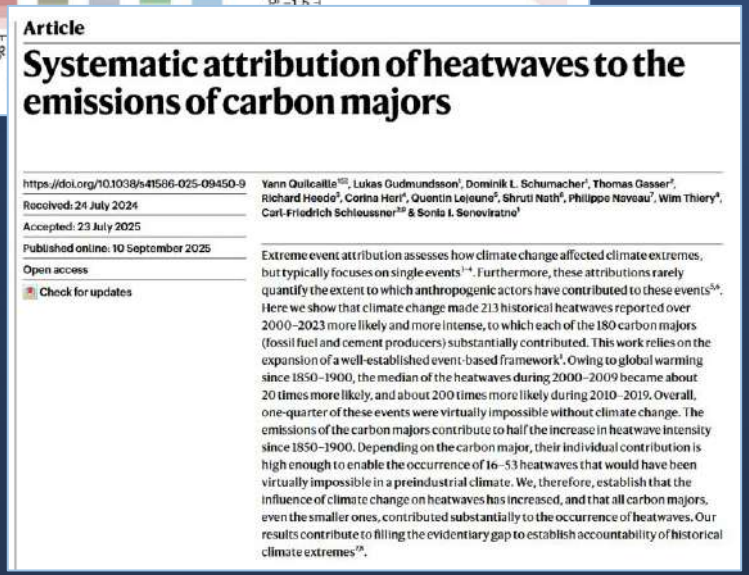
Julia Kollewe

Mon 24 Feb 2025 14.39 GMT

Share

BP's shares have fared worse than rivals in recent years and investors have become concerned about the company's direction. Photograph: Neil Hall/EPA





Article

Systematic attribution of heatwaves to the emissions of carbon majors

https://doi.org/10.1038/s41586-025-09450-9
Received: 24 July 2024
Accepted: 23 July 2025
Published online: 10 September 2025
Open access
Check for updates

Yann Quilcaille[1], Lukas Gudmundsson[2], Dominik L. Schumacher[2], Thomas Gasser[3], Richard Heede[4], Corina Heri[4], Quentin Lejeune[5], Shruti Nath[6], Philippe Naveau[7], Wim Thiery[8], Carl-Friedrich Schleussner[3,9] & Sonia I. Seneviratne[1]

Extreme event attribution assesses how climate change affected climate extremes, but typically focuses on single events[1–4]. Furthermore, these attributions rarely quantify the extent to which anthropogenic actors have contributed to these events[5,6]. Here we show that climate change made 213 historical heatwaves reported over 2000–2023 more likely and more intense, to which each of the 180 carbon majors (fossil fuel and cement producers) substantially contributed. This work relies on the expansion of a well-established event-based framework[1]. Owing to global warming since 1850–1900, the median of the heatwaves during 2000–2009 became about 20 times more likely, and about 200 times more likely during 2010–2019. Overall, one-quarter of these events were virtually impossible without climate change. The emissions of the carbon majors contribute to half the increase in heatwave intensity since 1850–1900. Depending on the carbon major, their individual contribution is high enough to enable the occurrence of 16–53 heatwaves that would have been virtually impossible in a preindustrial climate. We, therefore, establish that the influence of climate change on heatwaves has increased, and that all carbon majors, even the smaller ones, contributed substantially to the occurrence of heatwaves. Our results contribute to filling the evidentiary gap to establish accountability of historical climate extremes[7,8].

Callahan, C.W., Mankin, J.S. **Carbon majors and the scientific case for climate liability**. *Nature* **640**, 893–901 (2025).

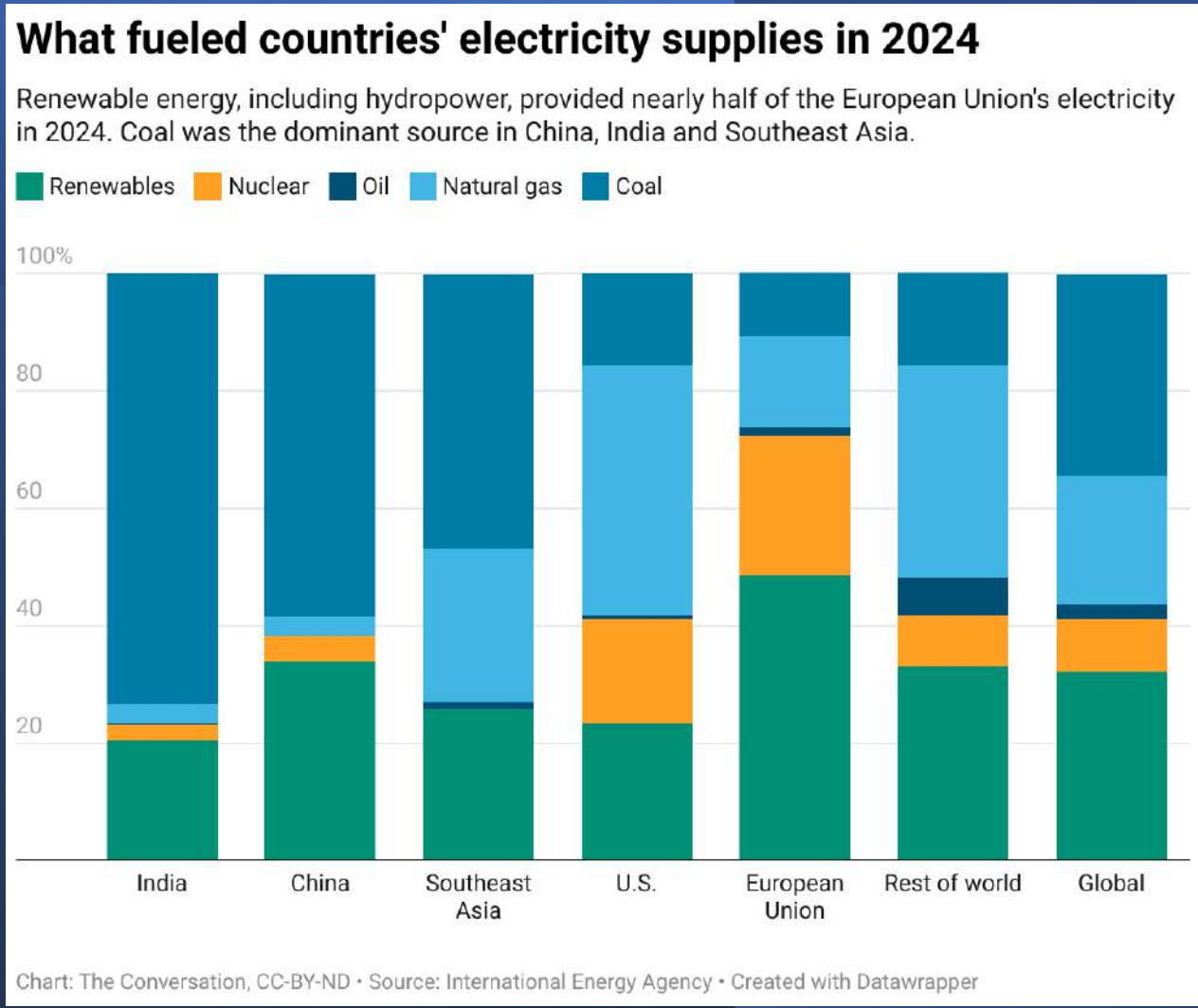
- The paper estimates that $**28 trillion** in global economic losses can be directly attributed to extreme heat.
- Chevron alone is responsible for between **$791 billion and $3.6 trillion** in climate damage.
- Every additional 1% share of historical emissions equates to $**834 billion** in heat-related economic losses.

Quilcaille et. al. (2025)

- The emissions of the carbon majors contribute **to half the increase in heatwave intensity** since 1850–1900.

The IEA (2025): Global coal demand rose by 1.5% in 2024 to reach 8.79 billion tonnes, a new record.

Could remain at near-record levels until 2027.



Commentary Commodities

Fossil fuels show staying power as EU clean energy output dips

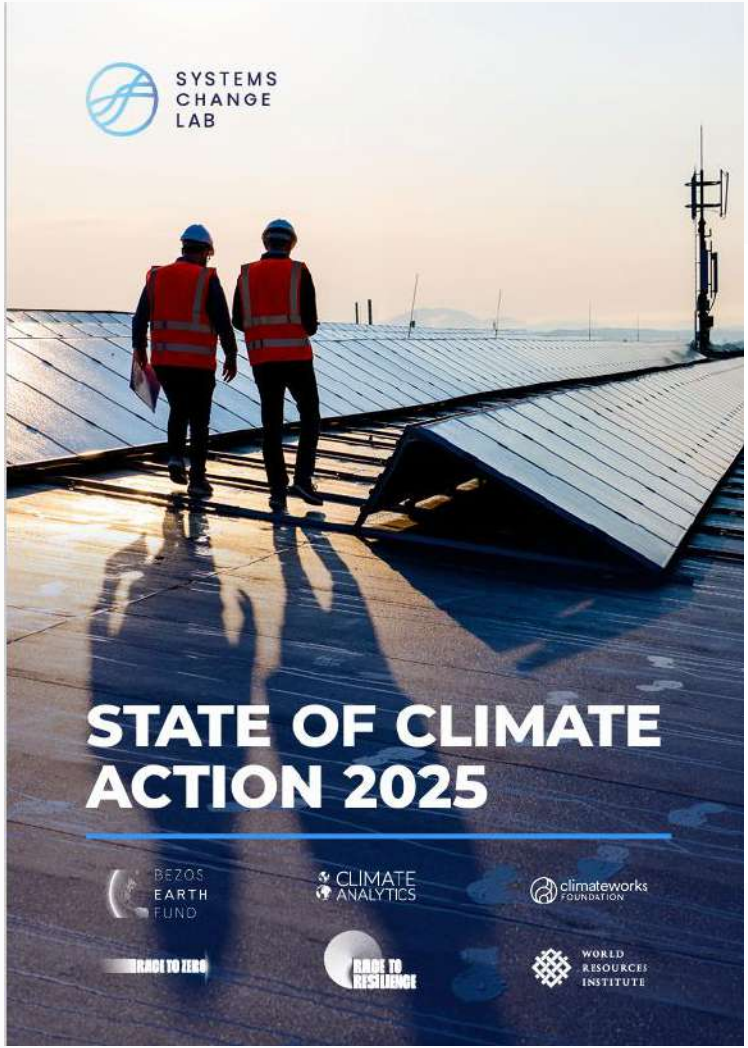
Gavin Maguire

July 10, 2025 1:00 PM GMT+2 · Updated July 10, 2025

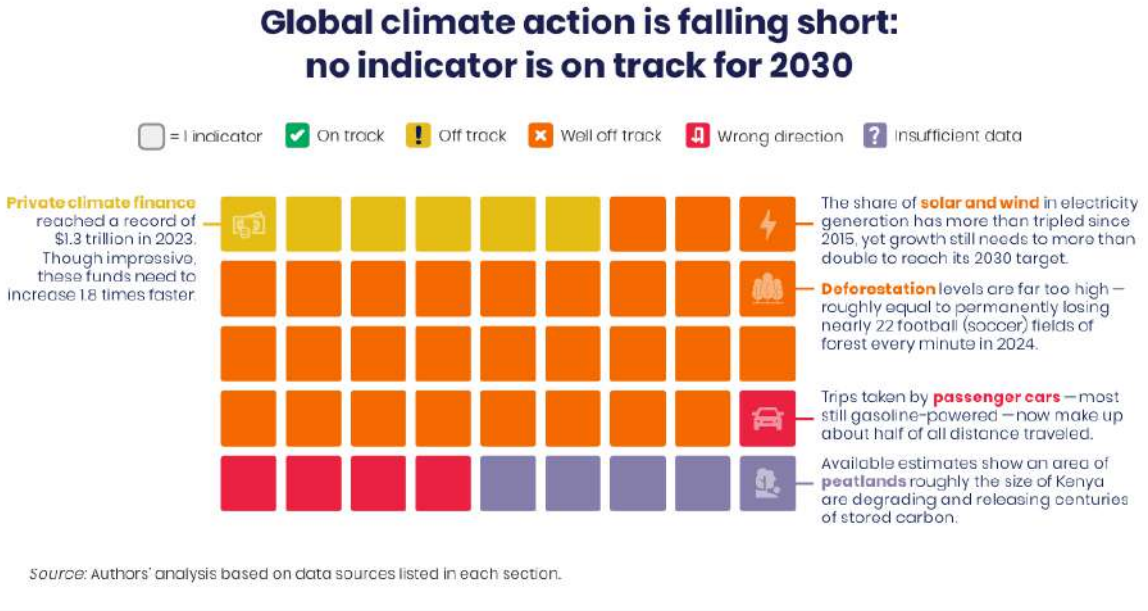
The Astora natural gas depot, which is the largest natural gas storage in Western Europe, is pictured in Rehden, Germany, March 16, 2022. REUTERS/Fabian Bimmer/File Photo Purchase Licensing Rights

EU utilities generated 13% more electricity from fossil fuels during January to June 2025 compared to the same period in 2024, which was the largest annual increase in fossil output for that period since 2017.

Due to low wind (wind droughts) and hydro output (reduced snow and rainfall) and higher gas prices.



State of Climate Action 2025: translates the 1.5°C limit into actionable targets for 2030, 2035 and 2050



The Copernicus Climate Change Service

2024 was the warmest year in global temperature records going back to 1850

📈 2024 is the first calendar year that has reached **more than 1.5°C** above the pre-industrial level; for ERA5 it was **1.6°C** above pre-industrial levels (**WMO** confirmed 2024 as warmest year on record at **about 1.55°C** above pre-industrial level.)

🌡️ Each of the past 10 years (2015–2024) was one of the 10 warmest years on record.

🌡️ The combined average temperature for **2023 and 2024 is 1.54°C** above the pre-industrial level.

nature climate change

Brief Communication

https://doi.org/10.1038/s41558-025-02246-9

A year above 1.5 °C signals that Earth is most probably within the 20-year period that will reach the Paris Agreement limit

Received: 6 August 2024

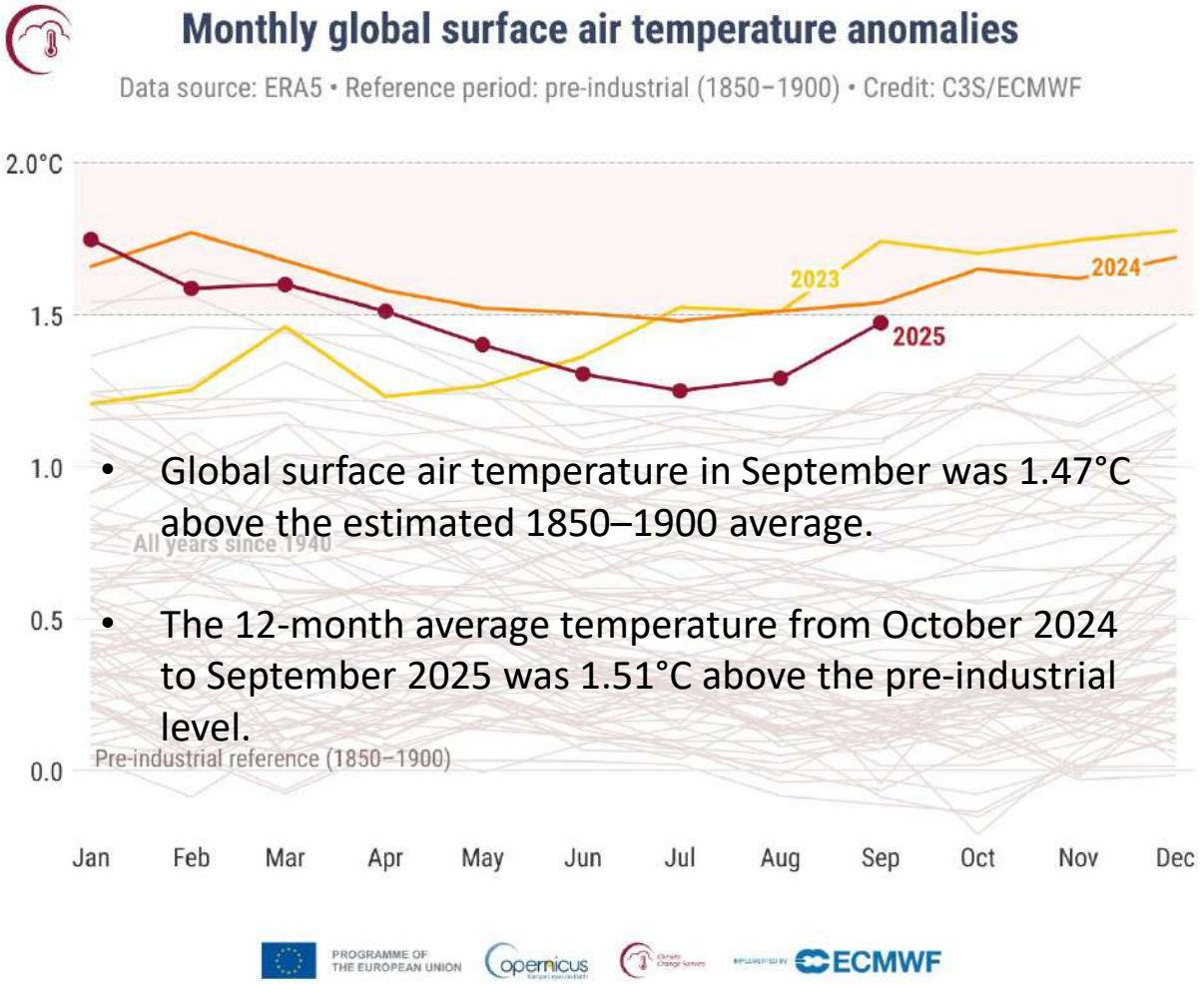
Accepted: 14 January 2025

Published online: 10 February 2025

Check for updates

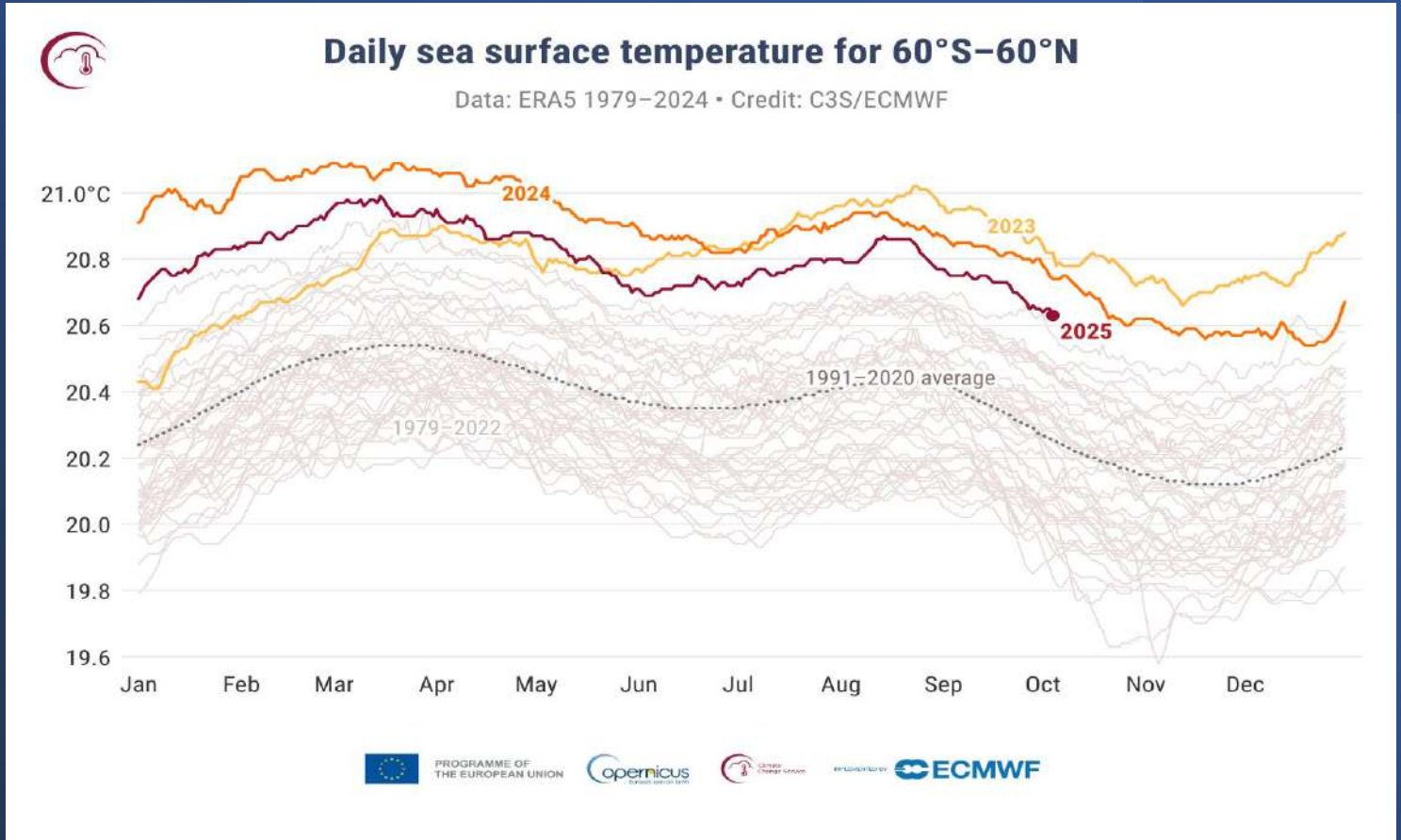
Emanuele Bevacqua[1], Carl-Friedrich Schleussner[2,3] & Jakob Zscheischler[1,4]

The temperature goals of the Paris Agreement are measured as 20-year averages exceeding a pre-industrial baseline. The calendar year of 2024 was announced as the first above 1.5 °C relative to pre-industrial levels, but the implications for the corresponding temperature goal are unclear. Here we show that, without very stringent climate mitigation, the first year above 1.5 °C occurs within the first 20-year period with an average warming of 1.5 °C.



- Global surface air temperature in September was 1.47°C above the estimated 1850–1900 average.
- The 12-month average temperature from October 2024 to September 2025 was 1.51°C above the pre-industrial level.

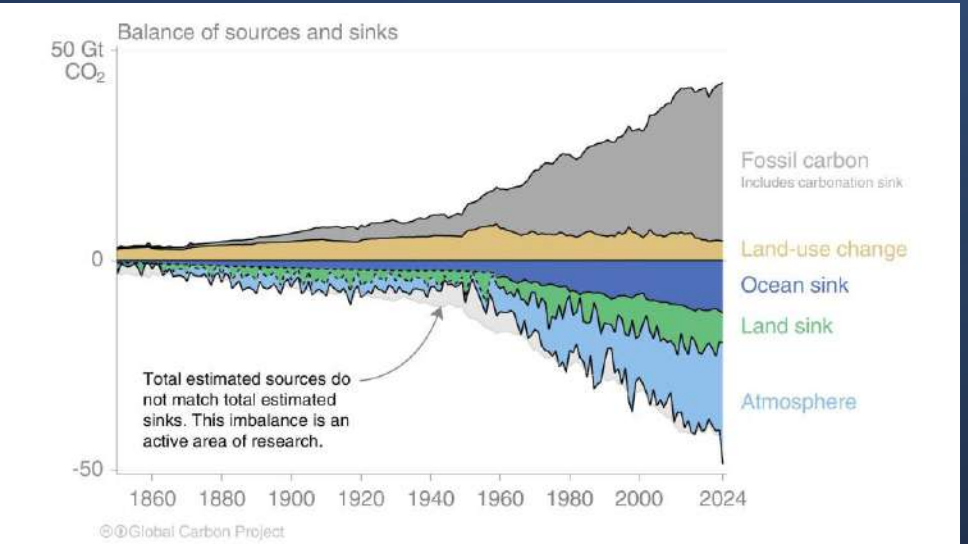
Unprecedented sea surface temperatures - monthly SSTs in 2023 and 2024 were significantly higher when compared to other years, despite the El Niño event not being as strong as the events of 1982–1983, 1997–1998 and 2015–2016.



World reaches first climate tipping point – widespread mortality of coral reefs

Unless global heating is reduced to 1.2C ‘as fast as possible’, warm water coral reefs will not remain ‘at any meaningful scale’ – affects hundreds of millions of people.

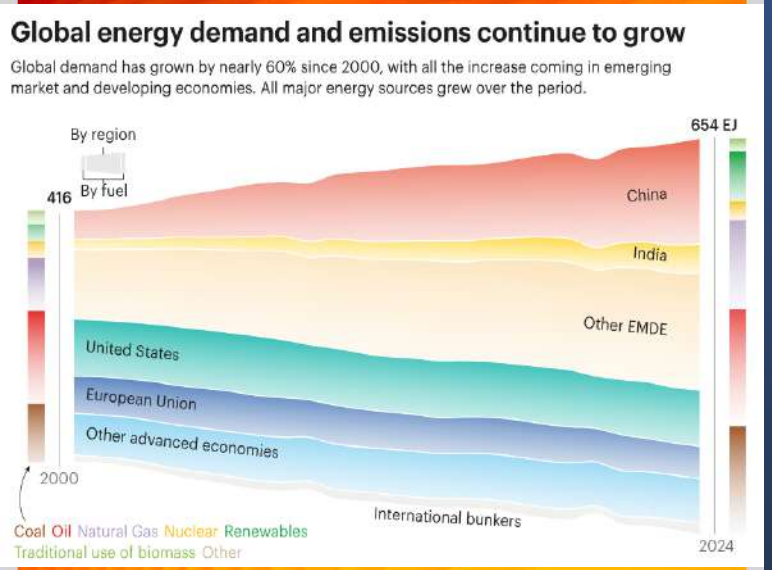
Acropora coral turns white due to high sea surface temperature and climate change. Photo by Canva.



Global Carbon Budget 2025

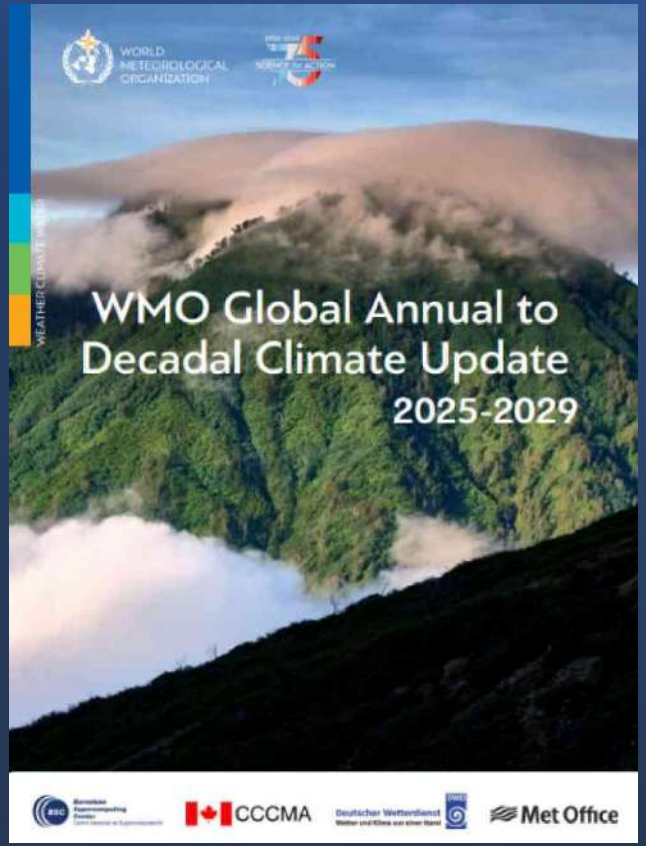
- Global CO_2 emissions from fossil use are projected to **rise 1.1%** in 2025 (range 0.2% to 2.2%).
- The concentration of CO_2 in the atmosphere is set to reach **425.7ppm in 2025**.
- The remaining carbon budget to limit global warming to 1.5°C is **virtually exhausted**.

World Energy Outlook 2025



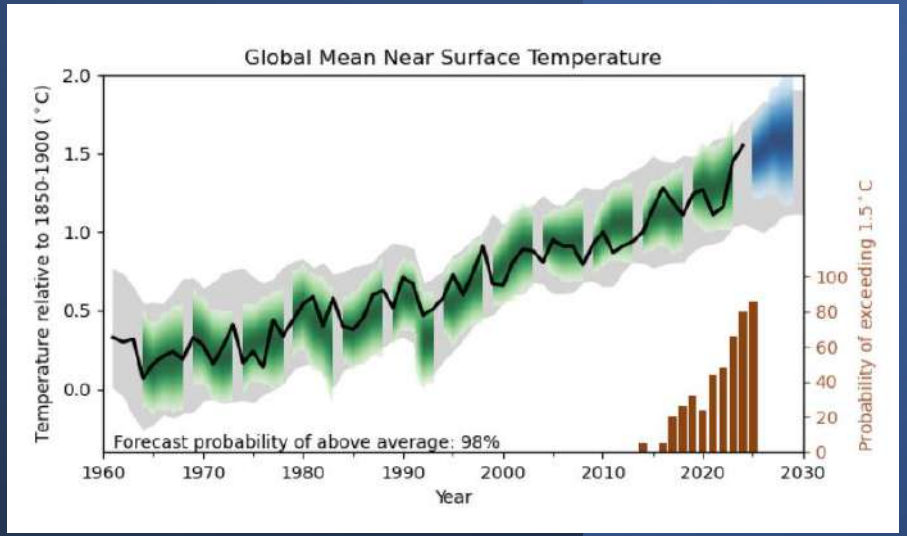
iea

- A limited overshoot **pathway to 1.5 °C has slipped out of reach**, but avoiding the worst climate outcomes is still possible.
- Fossil fuels accounted for **nearly four-fifths of total energy demand** – a share that has decreased only marginally since 2000.
- Global demand for oil and natural gas **could grow until 2050.**
- Growth from data centres and AI is helping drive up electricity use in advanced economies. Global investment in data centres is expected to **reach $580 billion in 2025** - surpasses the $540 billion being spent on global oil supply (“data is the new oil”).



Global mean **temperatures are likely to continue at or near record levels in the five-year period 2025-2029**. The annually averaged global mean near-surface temperature for each year between 2025 and 2029 is predicted to **be between 1.2°C and 1.9°C higher** than the average over the years 1850-1900.

70% chance that 5-year average warming for 2025-2029 **will be > 1.5 °C**



ipcc

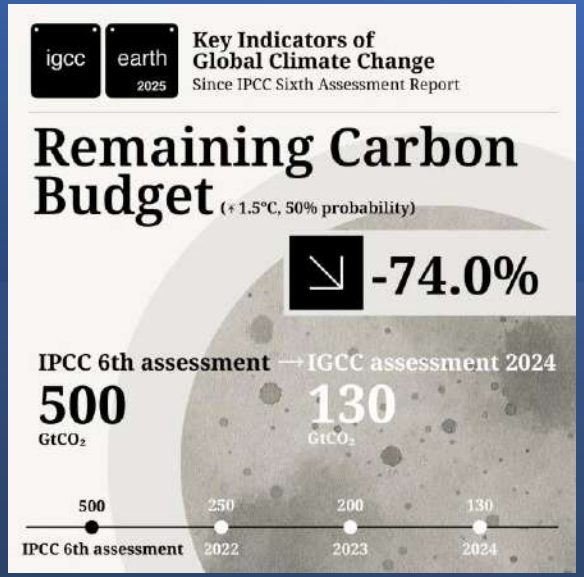
MOST important number in the Synthesis Report: By 2035 global emissions need to be 60% below 2019 levels

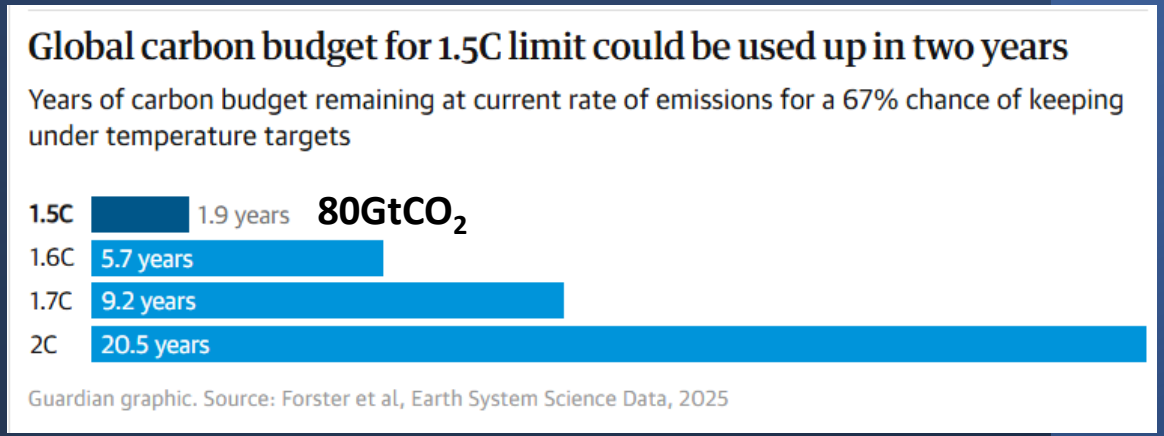
Table XX: Greenhouse gas and CO_2 emission reductions from 2019, median and 5-95 percentiles {3.3.1; 4.1; Table 3.1; Figure 2.5; Box SPM1}

		Reductions from 2019 emission levels (%)			
		2030	2035	2040	2050
Limit warming to1.5°C (>50%) with no or limited overshoot	GHG	43 [34-60]	60 [49-77]	69 [58-90]	84 [73-98]
	CO_2	48 [36-69]	65 [50-96]	80 [61-109]	99 [79-119]
Limit warming to 2°C (>67%)	GHG	21 [1-42]	35 [22-55]	46 [34-63]	64 [53-77]
	CO_2	22 [1-44]	37 [21-59]	51 [36-70]	73 [55-90]

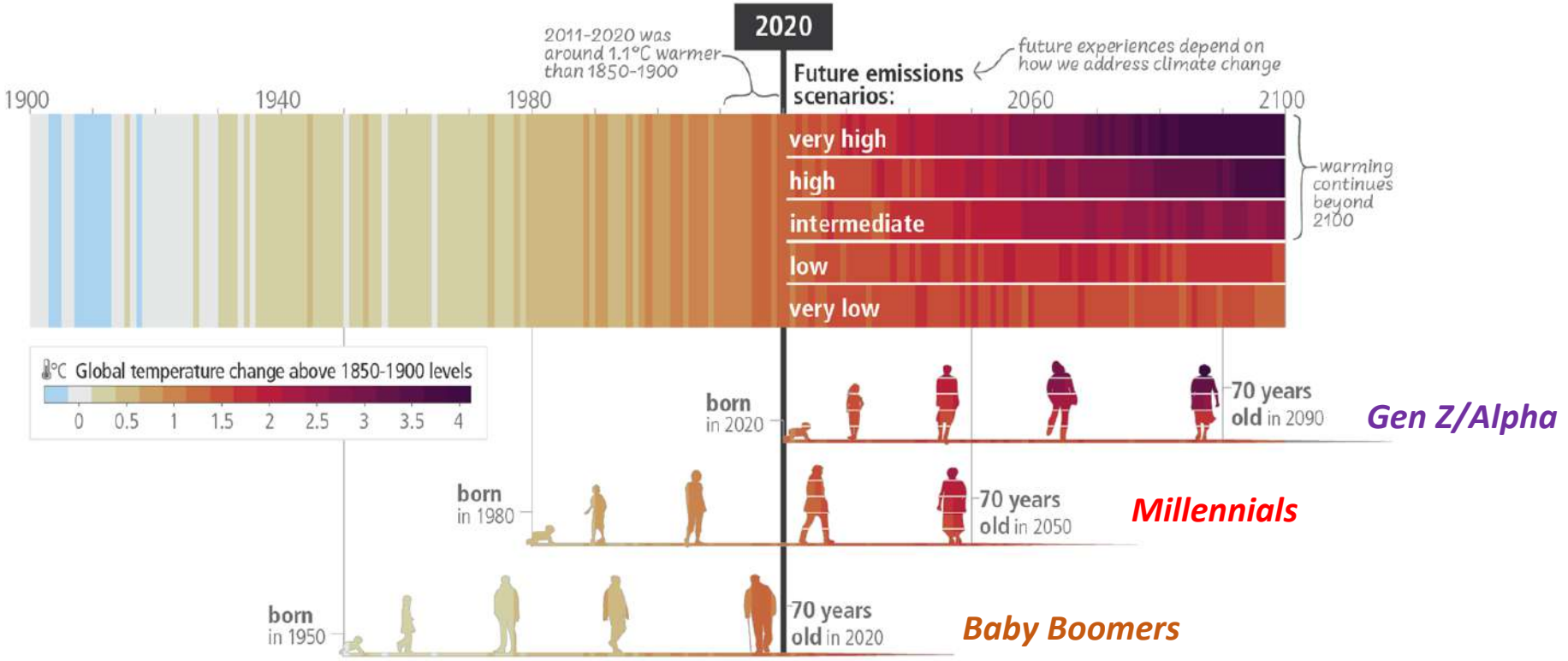
- 2035: end date for 2nd Nationally Determined Contributions (2025)
- Note 60% is median in wide range and global number
- What each country does depends on equity

“There is no historical precedent or scenario where emissions would reduce sufficiently rapidly to keep global emissions within this carbon budget.” (Reisinger et al 2025)





The extent to which current and future generations will experience a hotter and different world depends on choices now and in the near-term

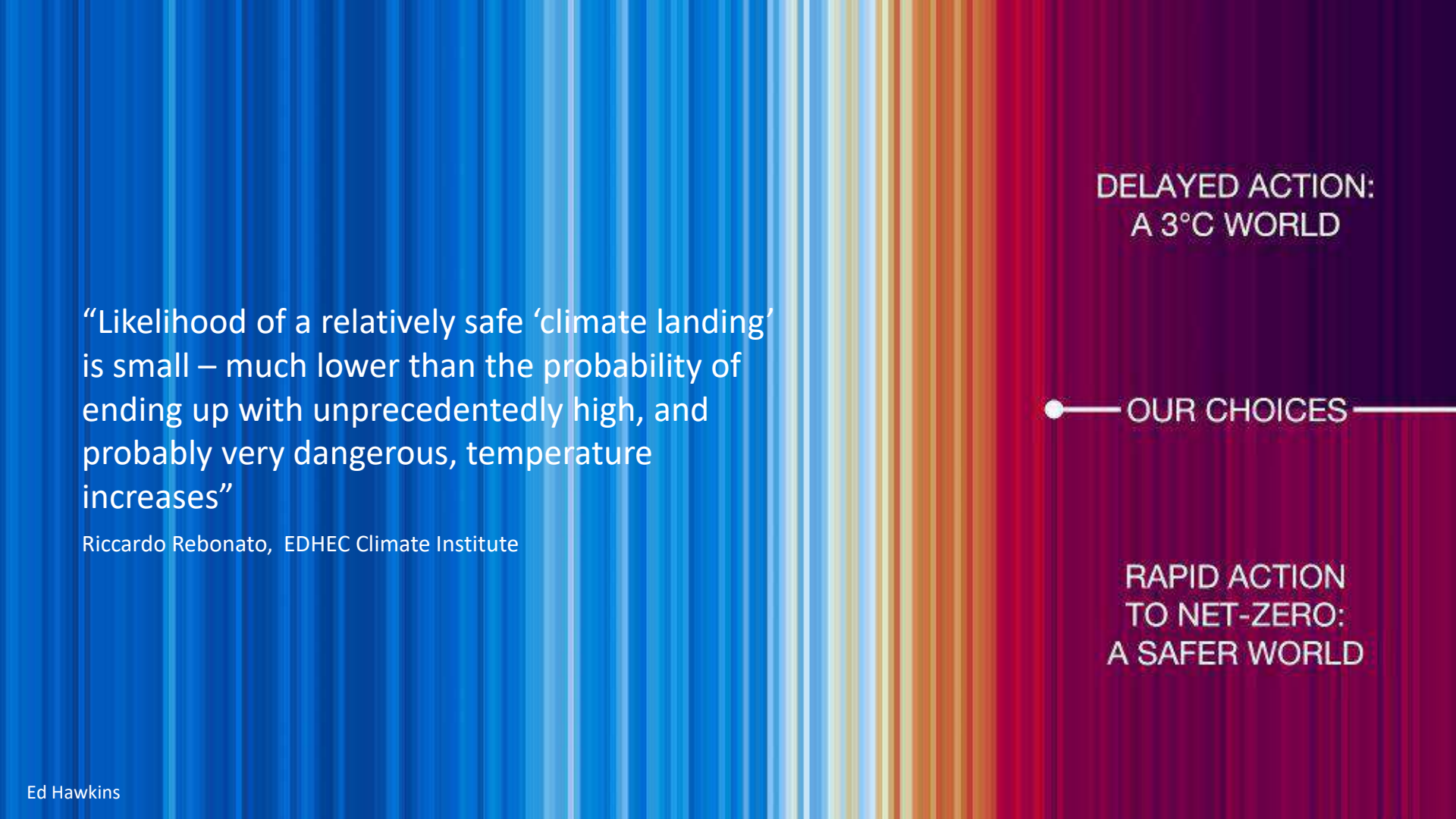


IPCC AR6 SYR Figure SPM.1c

Reality Check….

Theoretical vs Pragmatic approach

- Fossil fuels resurgence
- Far-right populism
- Attacks on civil society and protest rights
- AI accelerating disinformation and corporate power
- Polarisation and deep economic insecurity

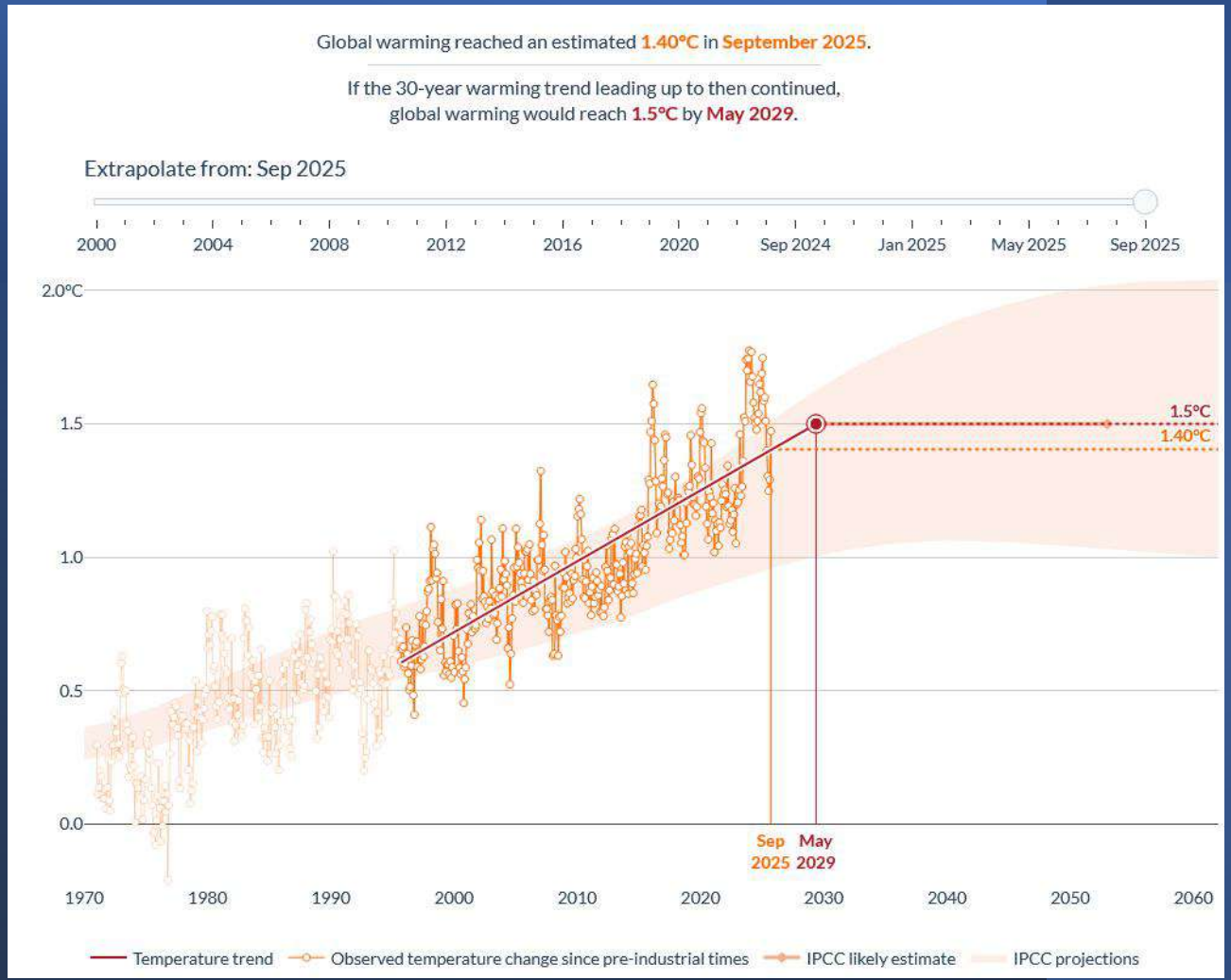


"Likelihood of a relatively safe 'climate landing' is small – much lower than the probability of ending up with unprecedentedly high, and probably very dangerous, temperature increases"

Riccardo Rebonato, EDHEC Climate Institute

Ed Hawkins

The question is increasingly not whether global warming will exceed 1.5°C, but by how much it will exceed this level and for how long.



Graph from Copernicus: Global Temperature Trend Monitor

communications earth & environment

Article

A Nature Portfolio journal

https://doi.org/10.1038/s43247-025-02368-0

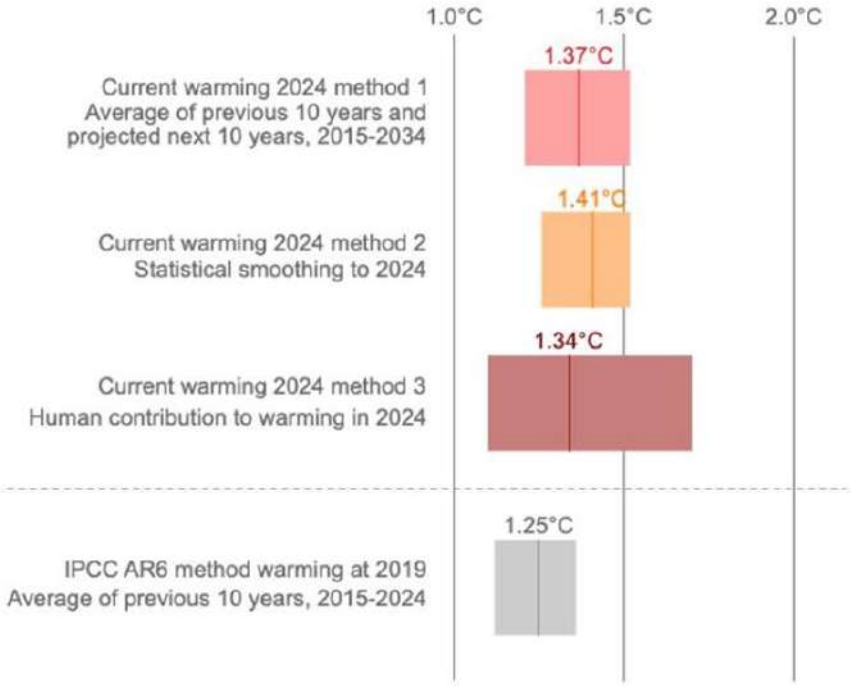
A traceable global warming record and clarity for the 1.5 °C and well-below-2 °C goals

Check for updates

Gottfried Kirchengast [1,2] ✉ & Moritz Pichler [1]

Global surface air temperature change versus preindustrial level is a primary metric of global warming. Its 20-year mean serves as the indicator of the Intergovernmental Panel on Climate Change to monitor threshold crossings like of the 1.5 °C target of the Paris Agreement. Here we introduce a new benchmark timeseries 1850–2024 and projection to 2034 for this key metric, which shows a clear exceedance of 1.5 °C in 2024 by the annual mean (1.62 [1.55–1.69] °C). The 20-year mean still stayed below 1.5 °C (1.39 [1.29–1.49] °C) but is set to cross this threshold in 2028 [2025–2032]. Given this imminence, we propose improved quantification of the Paris goals by a simple four-classes definition (Paris compliance Target-1.5 °C, Well-below-2 °C; exceedance Risky-below-2 °C, Exceedance-2 °C) combined with a reliable tracking of goal compliance based on current and projected global warming levels. Such clear quantification can help spur climate action in the policy and legal domains and further standardization can help to also underpin the Paris Agreement's global stocktake process.

The best estimates of current global warming are between 1.34 °C and 1.41 °C compared to the 1850–1900 baseline; however, given the uncertainty ranges**, the possibility that we have already exceeded 1.5 °C cannot be ruled out**.



Three methods for establishing an up-to-date estimate of current global warming as of 2024, compared with the IPCC AR6 method, which uses averages over the previous 10 years and is representative of warming to 2019. The best estimate resulting from each method is shown as a dark vertical line, and the uncertainty range is shown by the shaded area.

State of the Global Climate 2024 WMO

‘Radical realism’

Climate change action is happening, **but** it is not fast or transformative enough.

Progress is **not the same** as success.

We have avoided the worst-case scenario(s) but **missed the best-case scenario(s).**

Limiting global warming to <1.5°C or 1.5°C (without or limited overshoot of up to 1.6°C) **virtually no longer possible.**

‘Radical realism’

Raises **key question**: where temperature might peak and how quickly we may be able to return to 1.5°C? The limit now needs to be **pursued from above.**

Need to avoid permanent exceedance: **limited (up to 1.8°C**) **and temporary** with return to 1.5°C or below as soon as possible - **by 2100 at the latest**.

But there are also real questions around **reversibility** - “*temperature reversal could be undercut by **strong Earth-system feedbacks** resulting in high near-term and continuous long-term warming*” (Schleussner et al., 2024).

‘Radical realism’

It is a story of a 2nd or 3rd best world – raises **ethical questions.**

Poor and vulnerable: deal with the pain of exceedance and the pain of attempted reversal.

Not all risks and impacts will reverse with global average temperature, and some **impacts will be irreversible** as limits to adaptation are passed (e.g. lives lost and species extinction).

Tipping points?

‘Radical realism’

There have only been **limited efforts to understand** risks and impacts under overshoot pathways. We need **public and political debate** about this expanded risk landscape.

We need **a new model of development/ toolbox** that factors overshoot into the global/national agenda. **Near-term realities/long-term reversal**.

We **must not backslide** on ambition. The goal doesn’t change – even with overshoot. Must keep doing as much as we can and as **ambitiously as we can.**

‘Radical realism’:

If we are looking at a scenario where:

- ✓ we will almost certainly exceed 1.5°C
- ✓ 2°C probably won’t be achieved either
- ✓ 3°C more likely

Do More of everything: overdeliver on mitigation, adaptation, finance, addressing loss and damage.

Need a response that is developmental, fair and equitable - measure success in terms of human and ecosystem well-being.

Mitigate for 1.5°C.
Adapt for 2°C.
Build resilience for 3°C.

The first steps in the conversation.....

IIASA: First Overshoot Conference 2025

UNEP: Spotlight Report on Overshoot - 2026

UN environment programme

Climate crisis

‘Change course now’: humanity has missed 1.5C climate target, says UN head

Exclusive: ‘Devastating consequences’ now inevitable but emissions cuts still vital, says António Guterres in sole interview before Cop30

I am the first Indigenous journalist to exclusively interview António Guterres. How many others will listen?

Jonathan Watts *and* Wajā Xipai

Tue 28 Oct 2025 00.01 GMT

Share

A flooded village in the low-lying island nation of Kiribati. The UN secretary general says Indigenous communities must be better represented at Cop climate summits. Photograph: Jonas Gratzer/LightRocket/Getty Images

UN secretary general António Guterres speaks to the Guardian and Sumaúma about the 'failure' of the Cop process to limit global heating to 1.5C, that overshooting is now 'inevitable', and why defending the rights of indigenous communities should be a top priority for global leaders

THANK YOU

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