



Global Warming of 1.5°C

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An IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty.

The report in numbers

91 Authors from **40** Countries

133 Contributing authors

6000 Studies

1 113 Reviewers

42 001 Comments

ipcc

INTERGOVERNMENTAL PANEL ON Climate change



WHO UNEP

A person wearing a light-colored long-sleeved shirt, dark pants, a wide-brimmed hat, and sunglasses is working on a white weather station instrument. The instrument is mounted on a pole and has various cables connected to it. The background is a clear blue sky with some light clouds.

Where are we?

Since pre-industrial times, human activities have caused approximately 1.0°C of global warming.

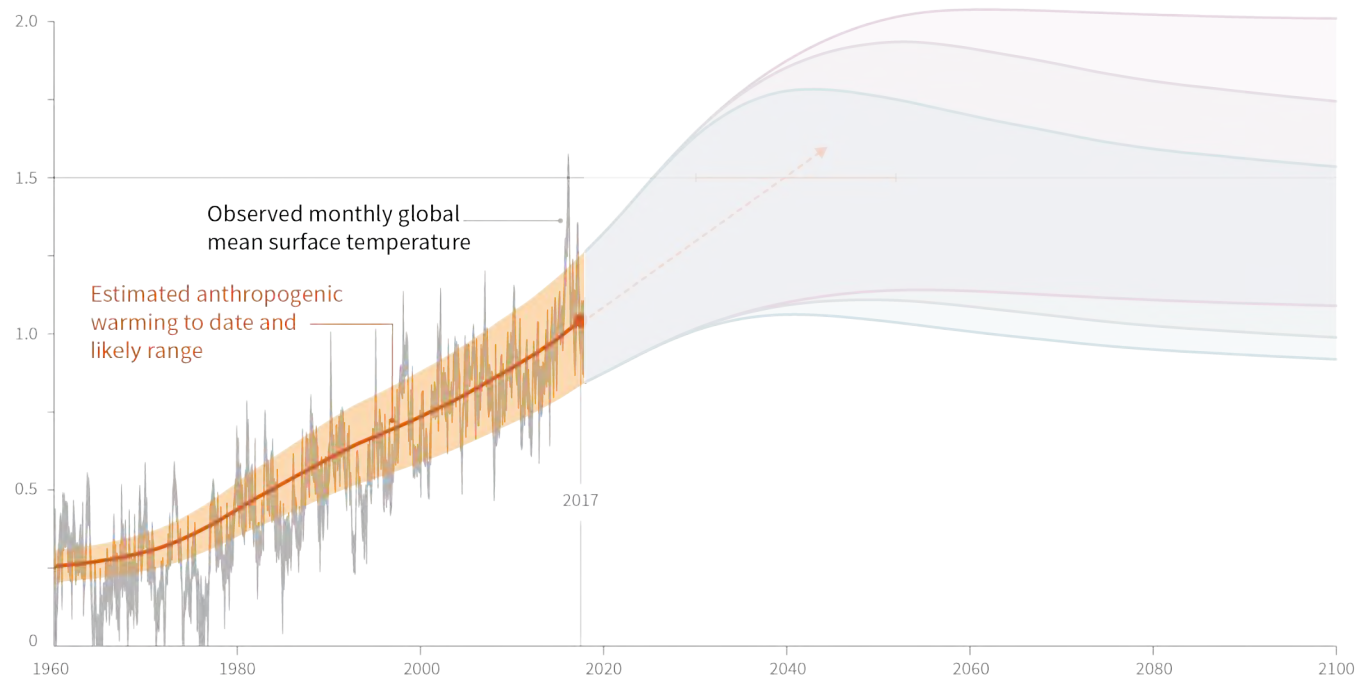
- Already seeing consequences for people, nature and livelihoods
- At current rate, would reach 1.5°C between around 2030 and 2050
- Past emissions alone do not commit the world to 1.5°C

Ashley Cooper / Aurora Photos

Cumulative emissions of CO₂ and future non-CO₂ radiative forcing determine the probability of limiting warming to 1.5°C

a) Observed global temperature change and modeled responses to stylized anthropogenic emission and forcing pathways

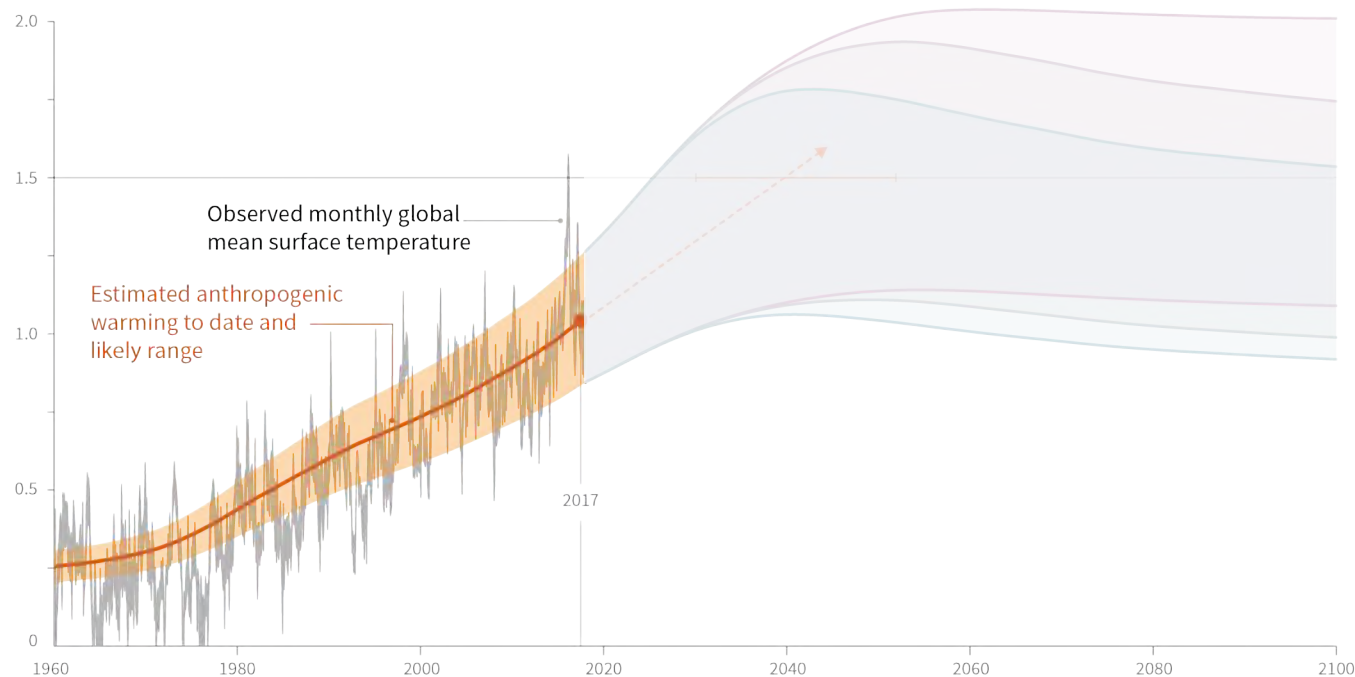
Global warming relative to 1850-1900 (°C)



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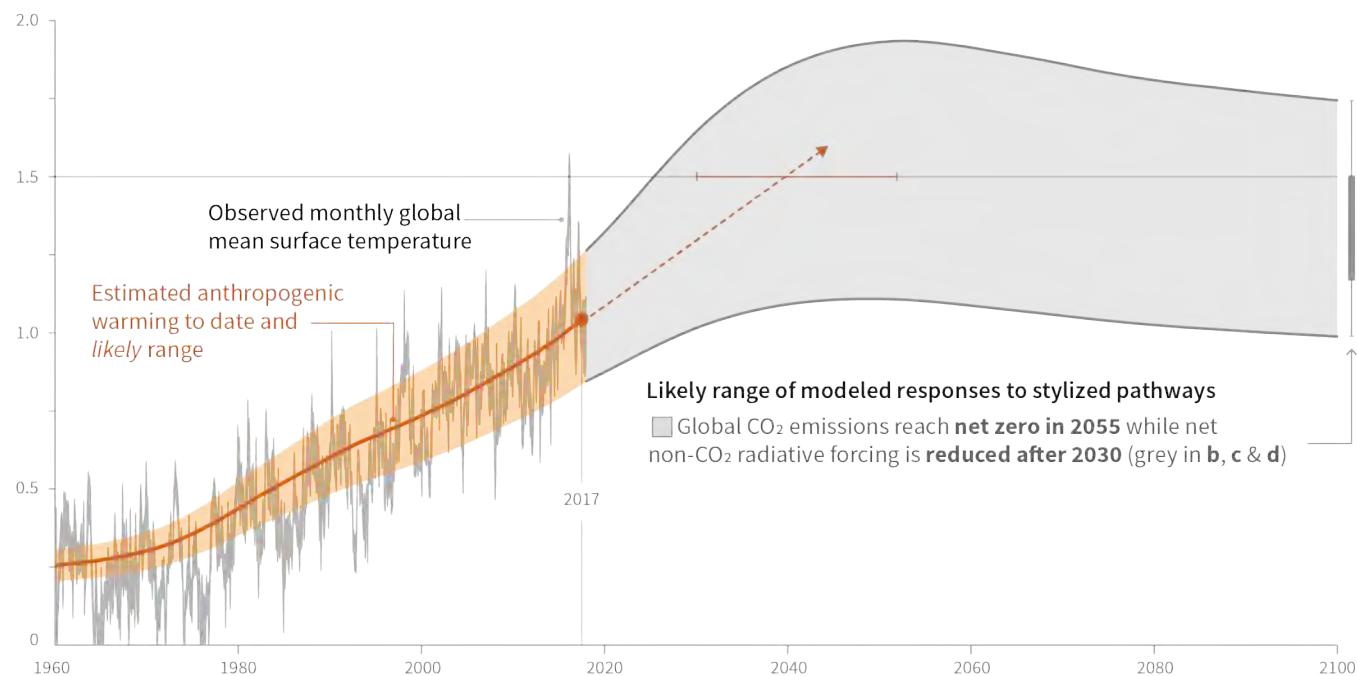
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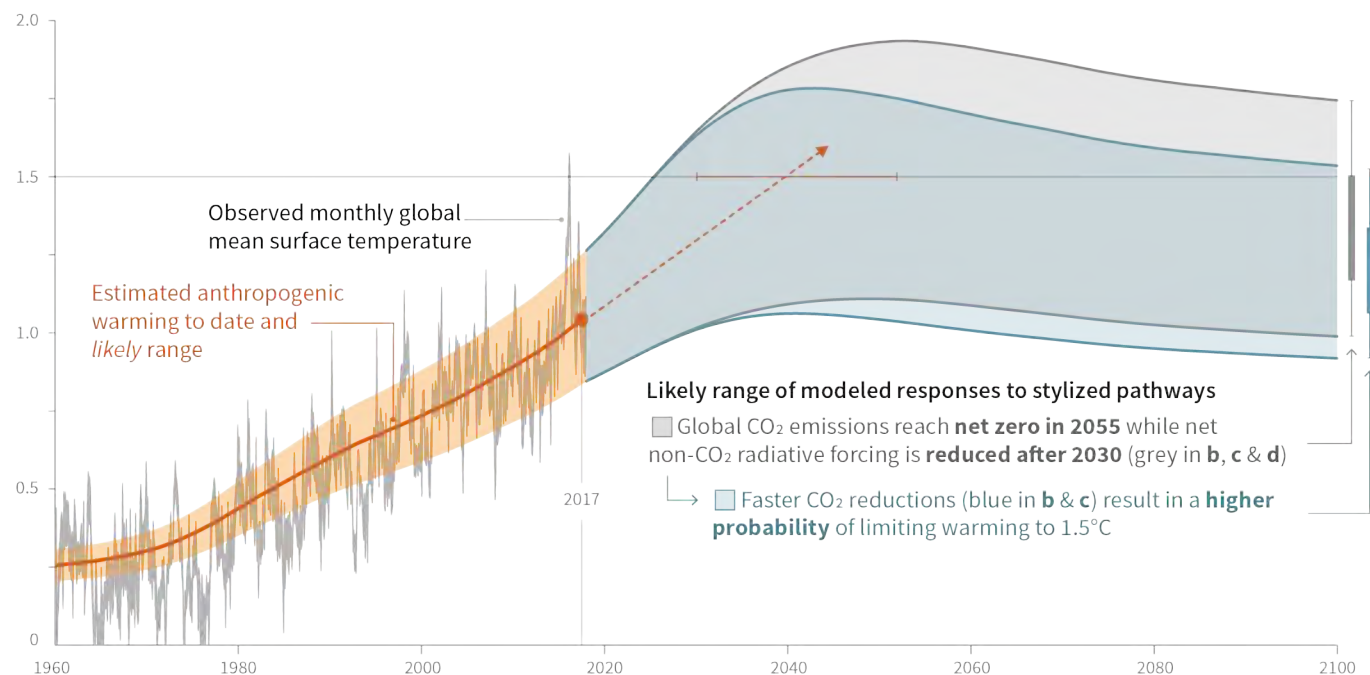
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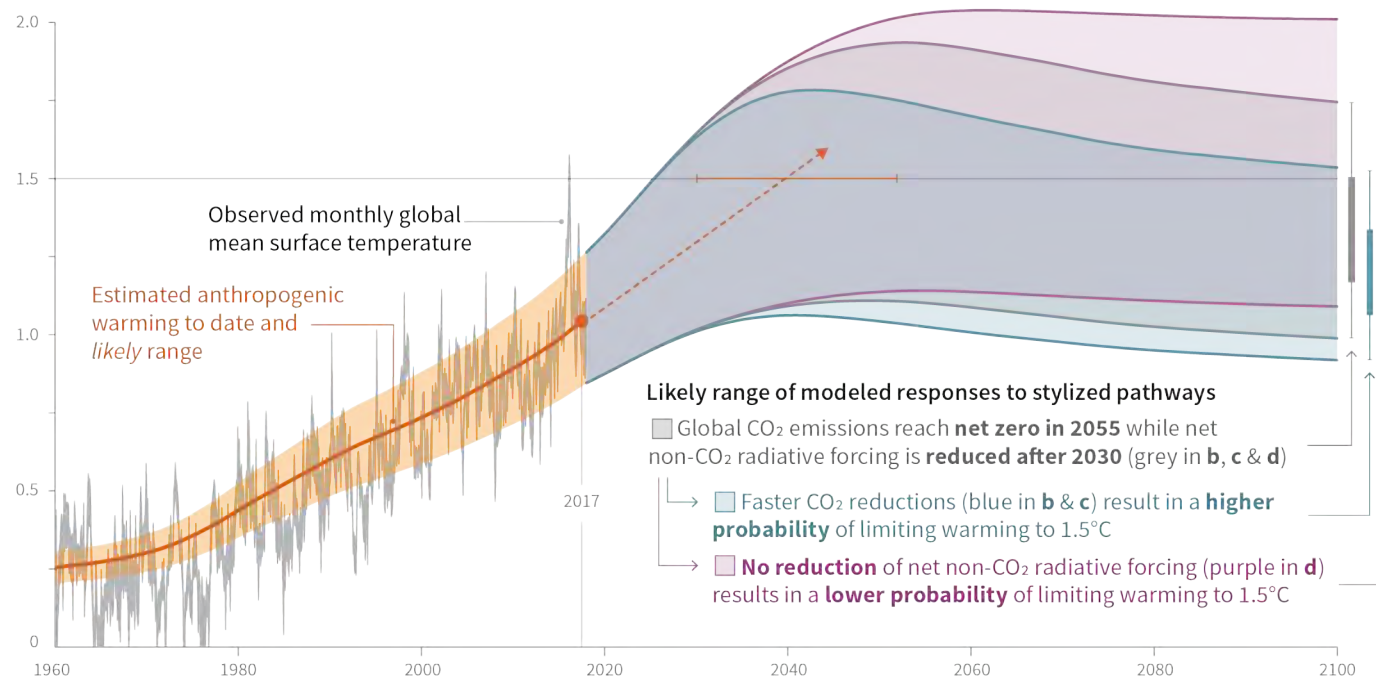
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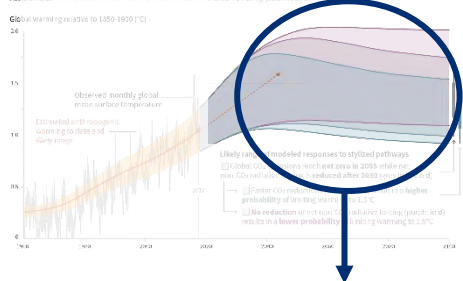
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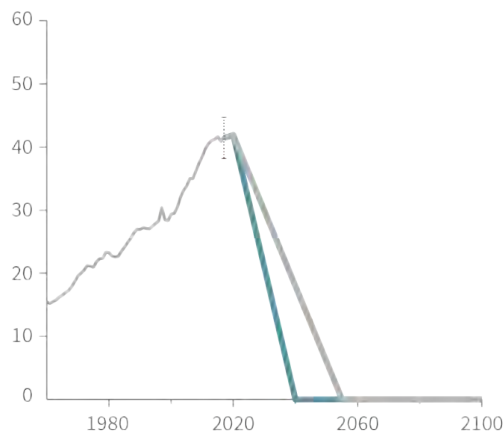


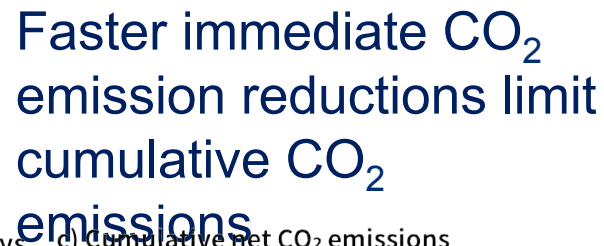
Cumulative emissions of CO₂ and future non-CO₂ radiative forcing determine the probability of limiting warming to 1.5°C

a) Observed global temperature change and modeled responses to various anthropogenic emissions and forcing pathways

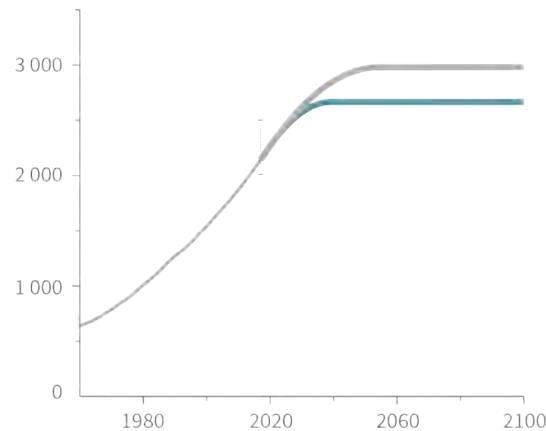


b) Stylized net global CO₂ emission pathways
Billion tonnes CO₂ per year (GtCO₂/yr)

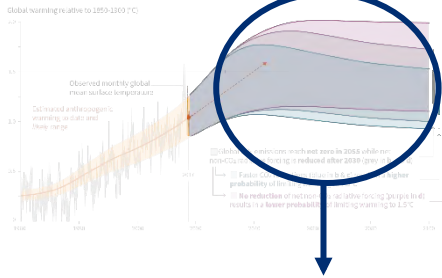




c) Cumulative net CO₂ emissions
Billion tonnes CO₂ (GtCO₂)

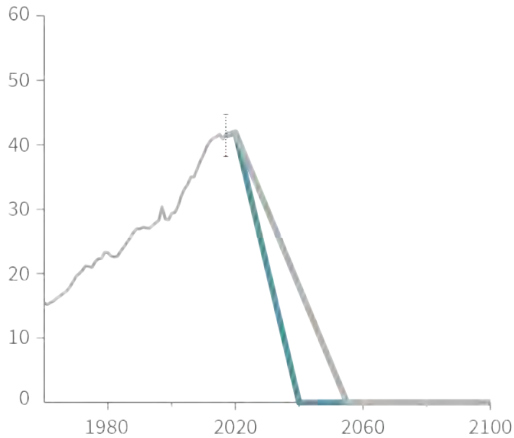


Cumulative emissions of CO₂ and future non-CO₂ radiative forcing determine the probability of limiting warming to 1.5°C

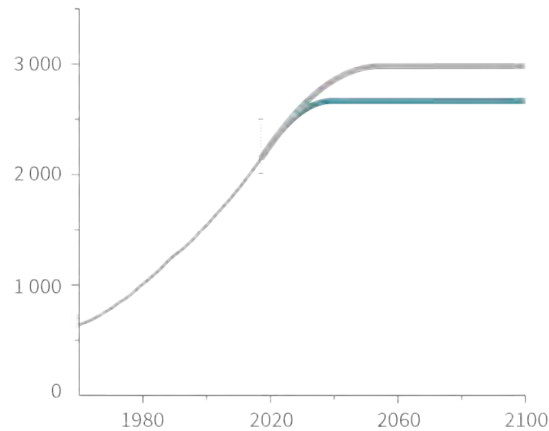


Maximum temperature rise is determined by cumulative net CO₂ emissions and net non-CO₂ radiative forcing due to methane, nitrous oxide, aerosols and other anthropogenic forcing agents.

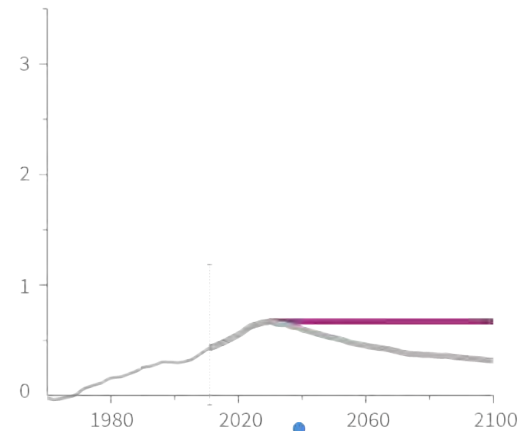
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Billion tonnes CO₂ per year (GtCO₂/yr)



c) Cumulative net CO₂ emissions
Billion tonnes CO₂ (GtCO₂)



d) Non-CO₂ radiative forcing pathways
Watts per square metre (W/m²)

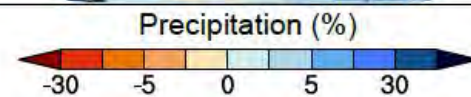
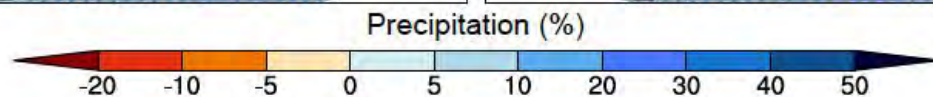
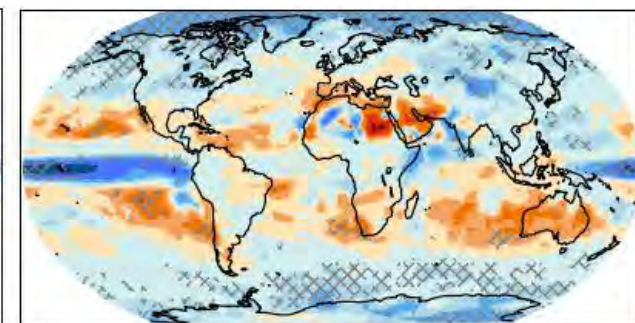
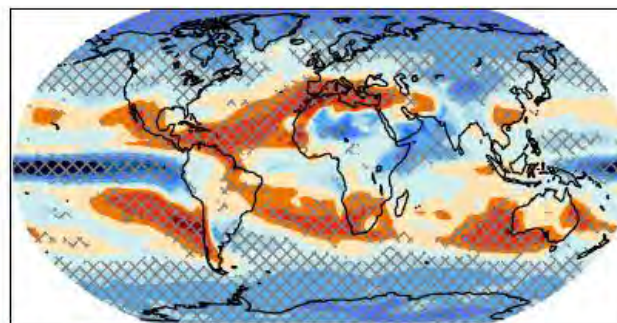
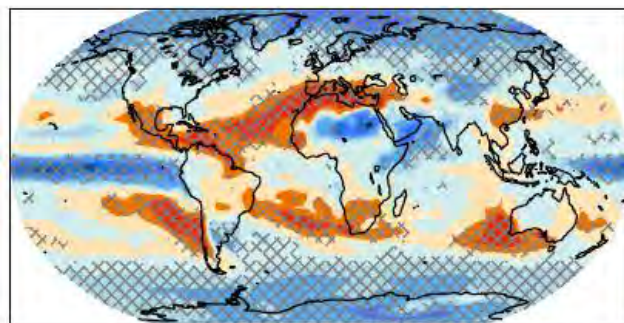
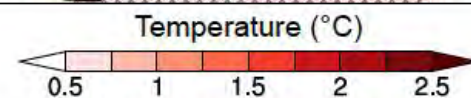
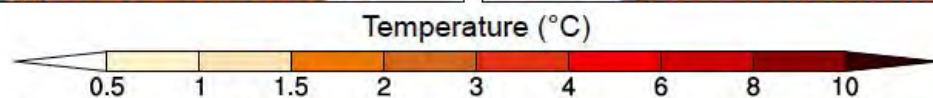
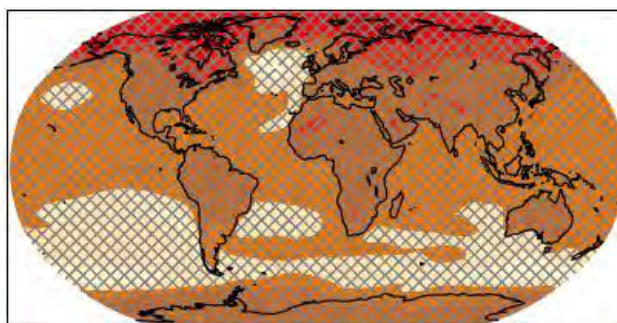


Spatial patterns of changes in mean temperature and precipitation

Global warming of 1.5°C

2°C

Difference



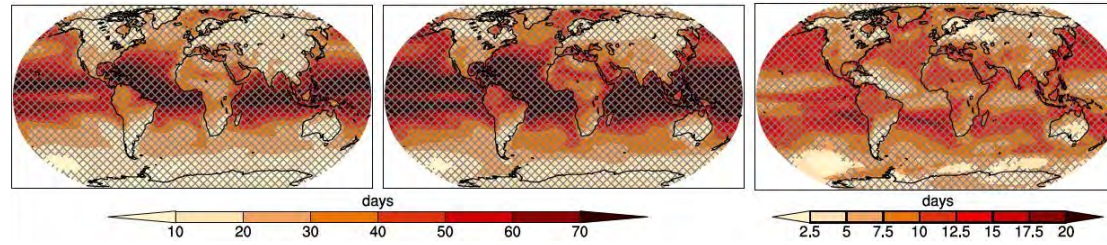
Spatial patterns of changes in extreme temperature and precipitation

Global warming of 1.5°C

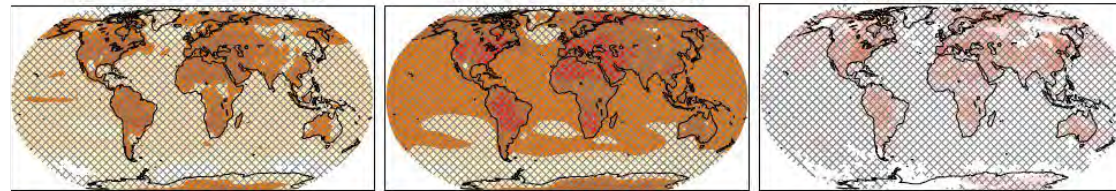
2°C

Difference

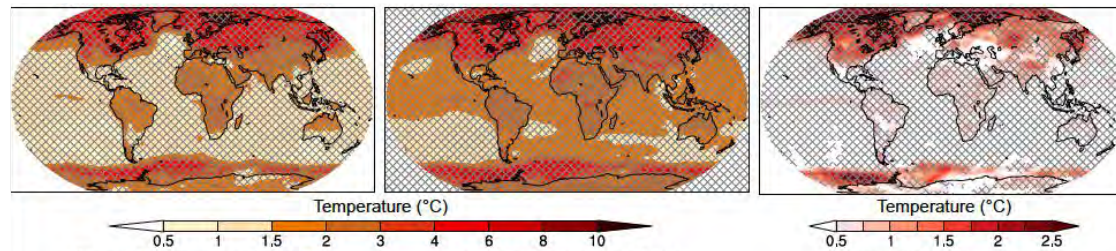
Number of hot days (days)



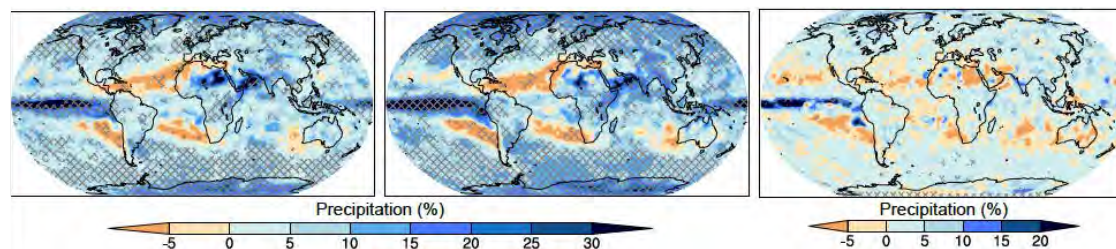
Temperature of hottest days (°C)



Temperature of coldest nights (°C)

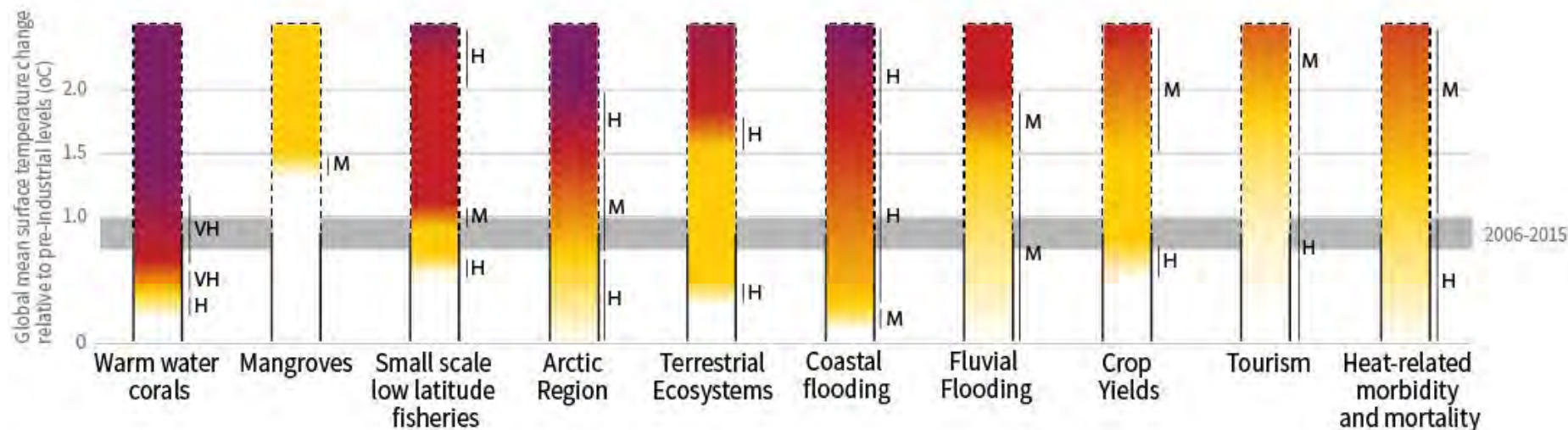


Extreme precipitation (%)



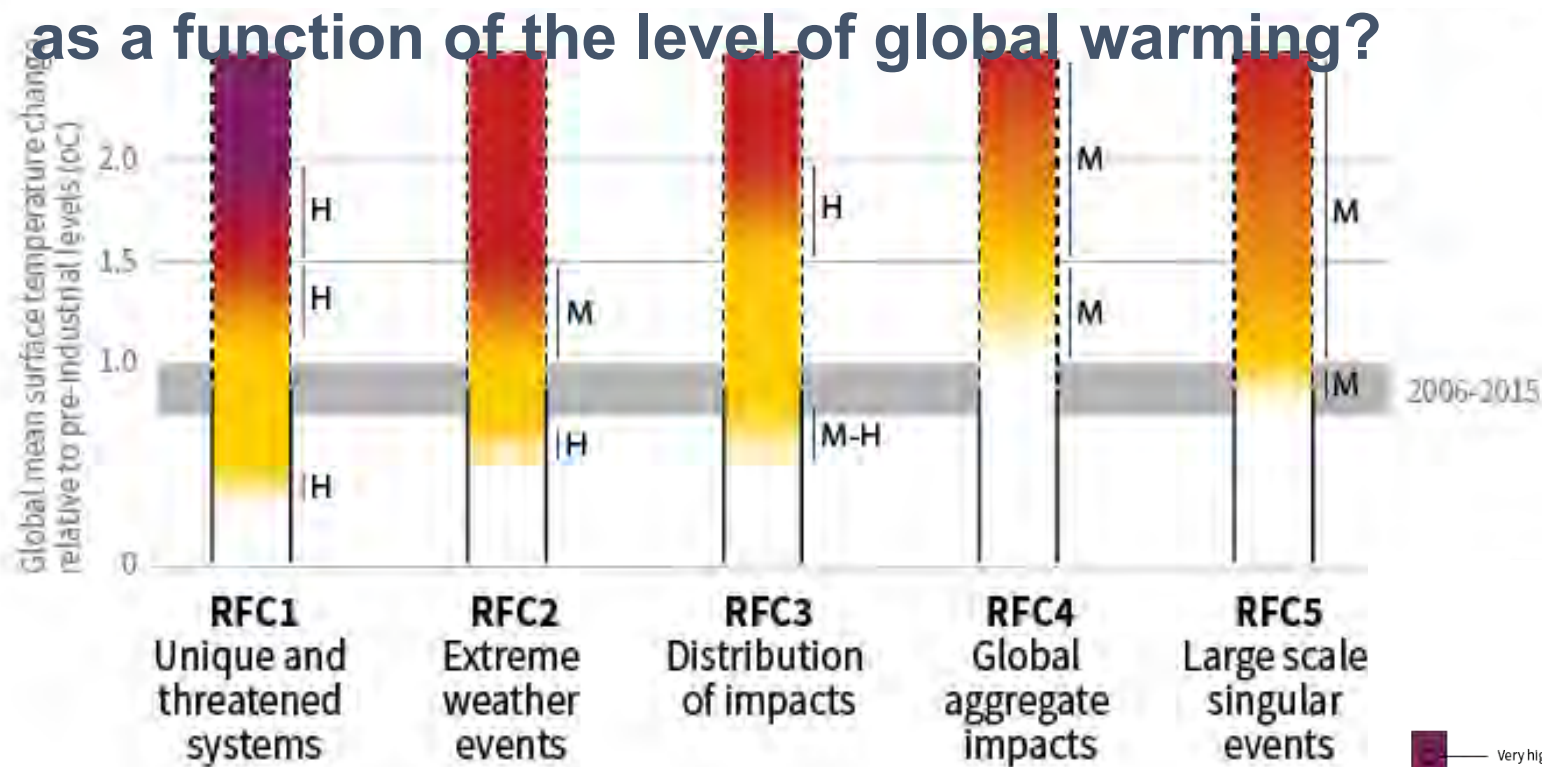
How do climate-related risks change as a function of the level of global warming?

Impacts and risks for selected natural, managed and human systems

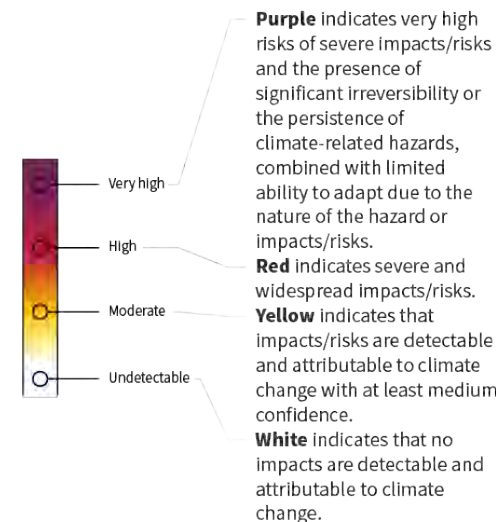


Confidence level : M, medium; H, high; VH; very high

How do climate-related risks for “Reasons For Concern” change as a function of the level of global warming?



Confidence level : M, medium; H, high; VH; very high





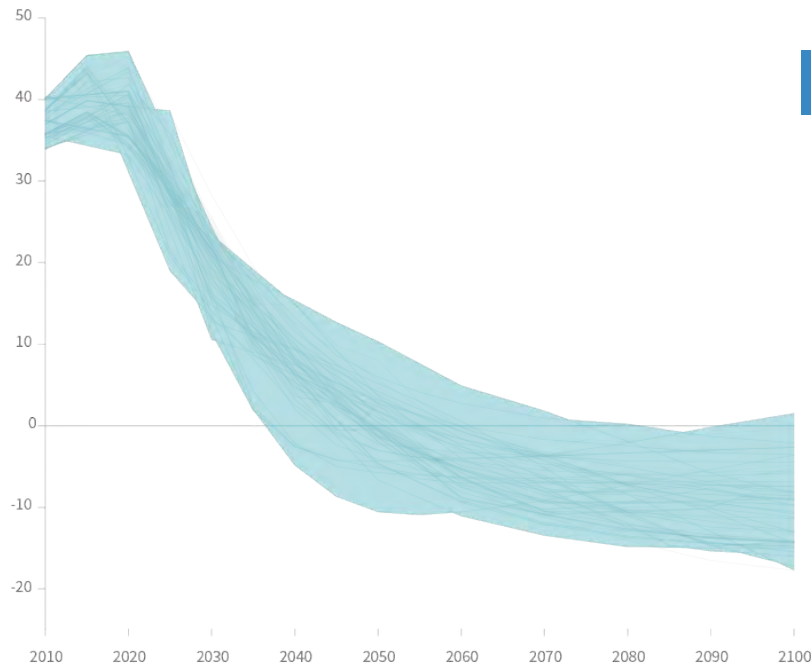
At 1.5°C compared to 2°C

- Up to several hundred million fewer people exposed to climate-related risk and susceptible to poverty by 2050
- Disproportionately high risk for Arctic, dryland regions, small island developing states and least developed countries
- Lower risks for health, livelihoods, food security, water supply, human security and economic growth
- Wide range of adaptation options which can reduce climate risks; less adaptation needs at 1.5°C

What are greenhouse gas emission pathways compatible with limiting warming to 1.5°C?

Global total net CO₂ emissions

Billion tonnes of CO₂/yr



<https://data.ene.iiasa.ac.at/iamc-1.5c->

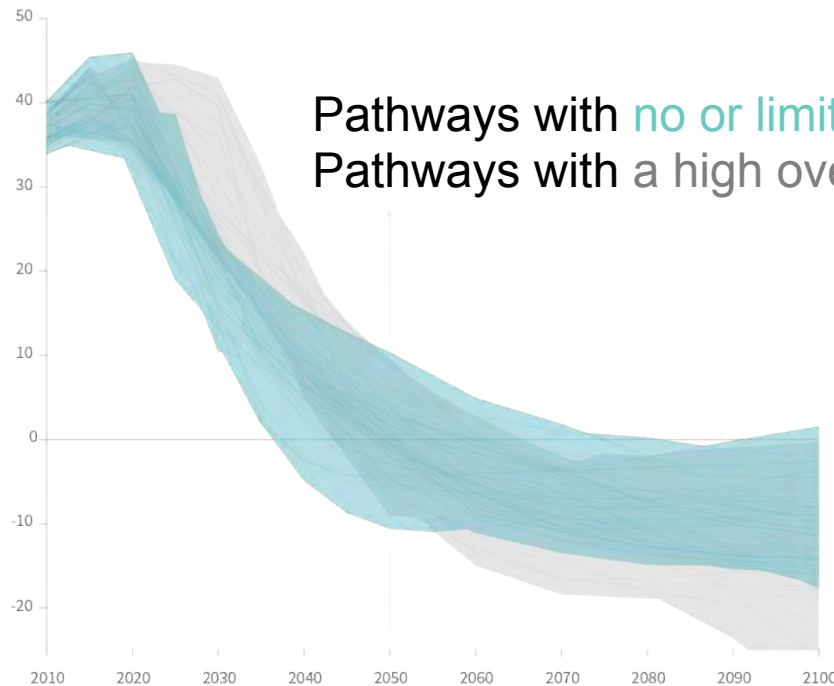
Timing of net zero CO₂
Line widths depict the 5-95th
percentile and the 25-75th
percentile of scenarios

Pathways limiting global warming to 1.5°C with no or low overshoot

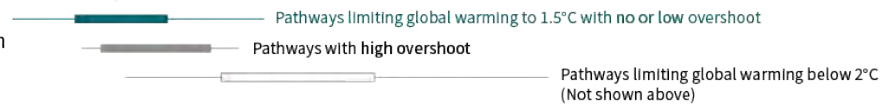
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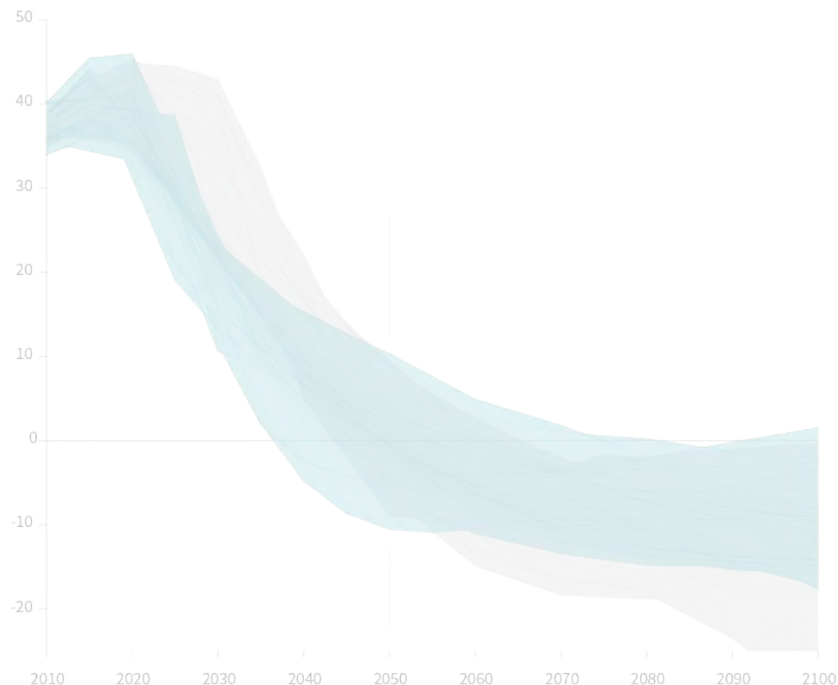
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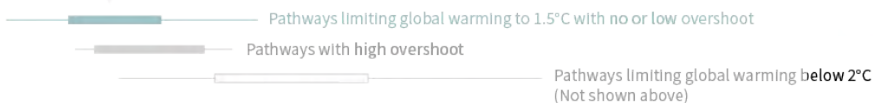
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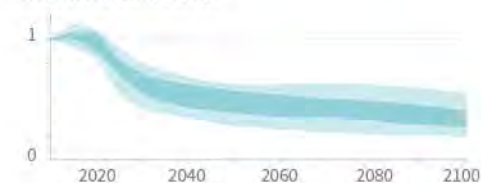


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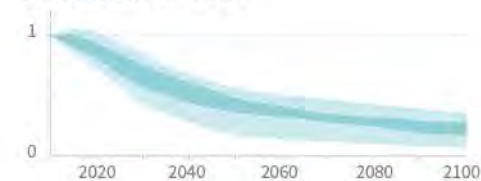


Non-CO₂ emissions relative to 2010

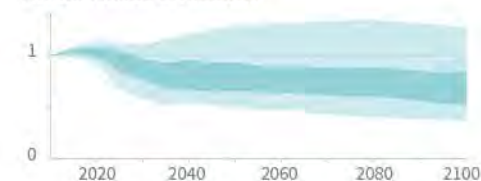
Methane emissions



Black carbon emissions



Nitrous oxide emissions





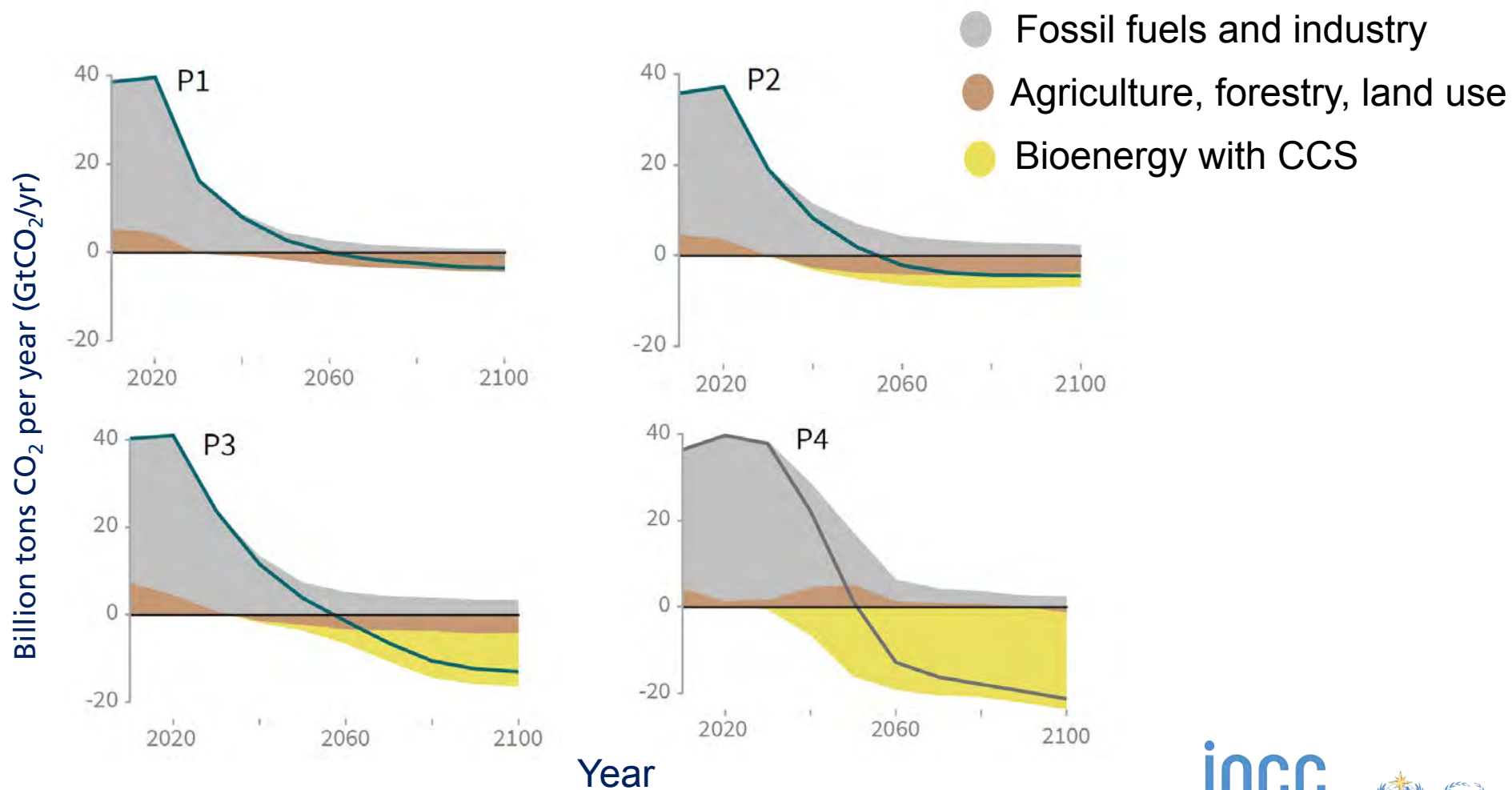
Limiting warming to 1.5°C

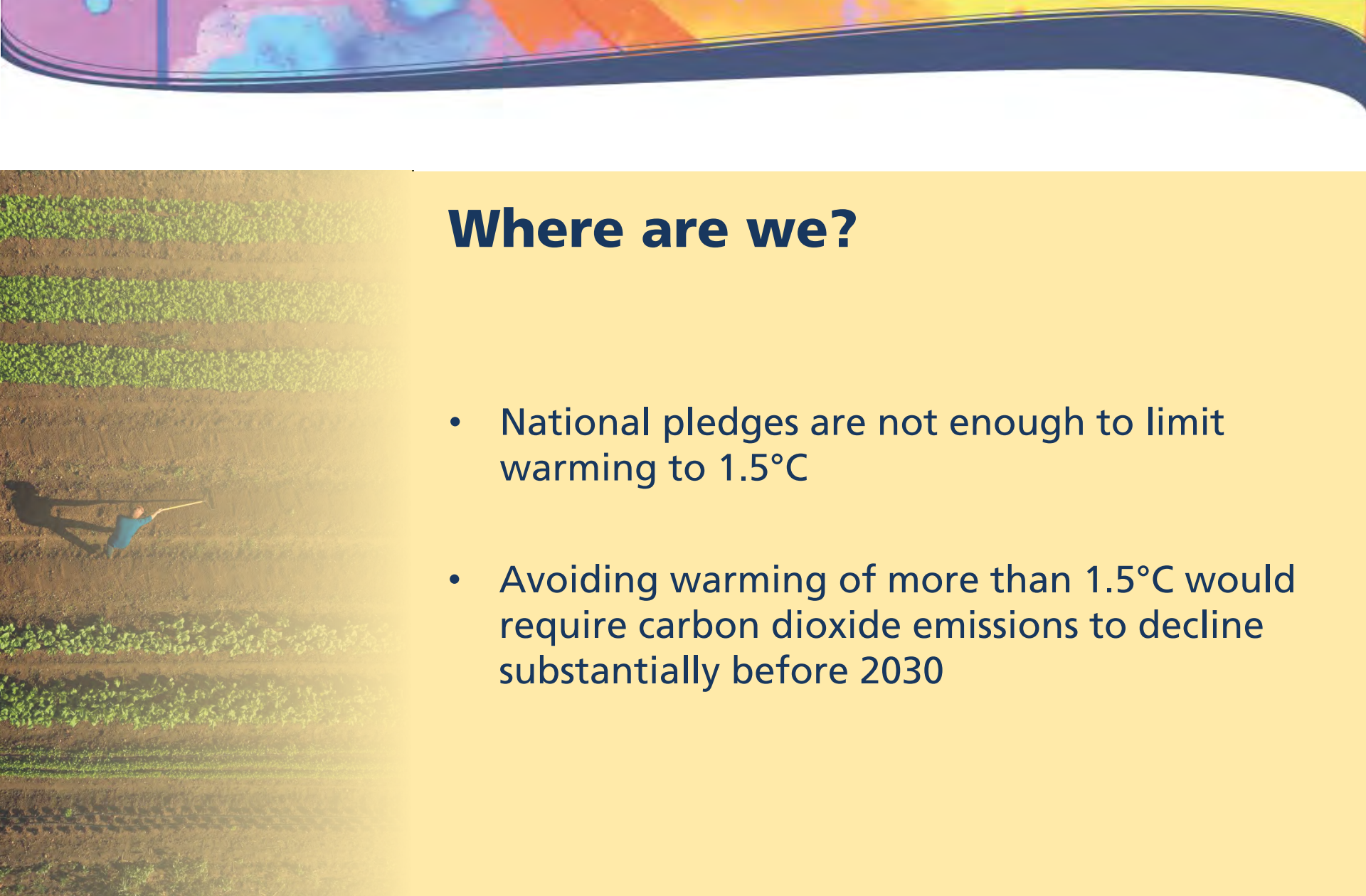
Would require rapid, far-reaching and unprecedented changes in all systems

- A range of technologies and behavioural changes
- Scale up in annual investment in low carbon energy and energy efficiency by factor of five by 2050
- Renewables supply 70-85% of electricity in 2050
- Coal declines steeply, ~zero in electricity by 2050
- Deep emissions cuts in transport and buildings
- Transitions in land use, scale depending on mitigation portfolio
- Urban and infrastructure system transitions, changes in urban planning practices

Mint Images / Aurora Photos

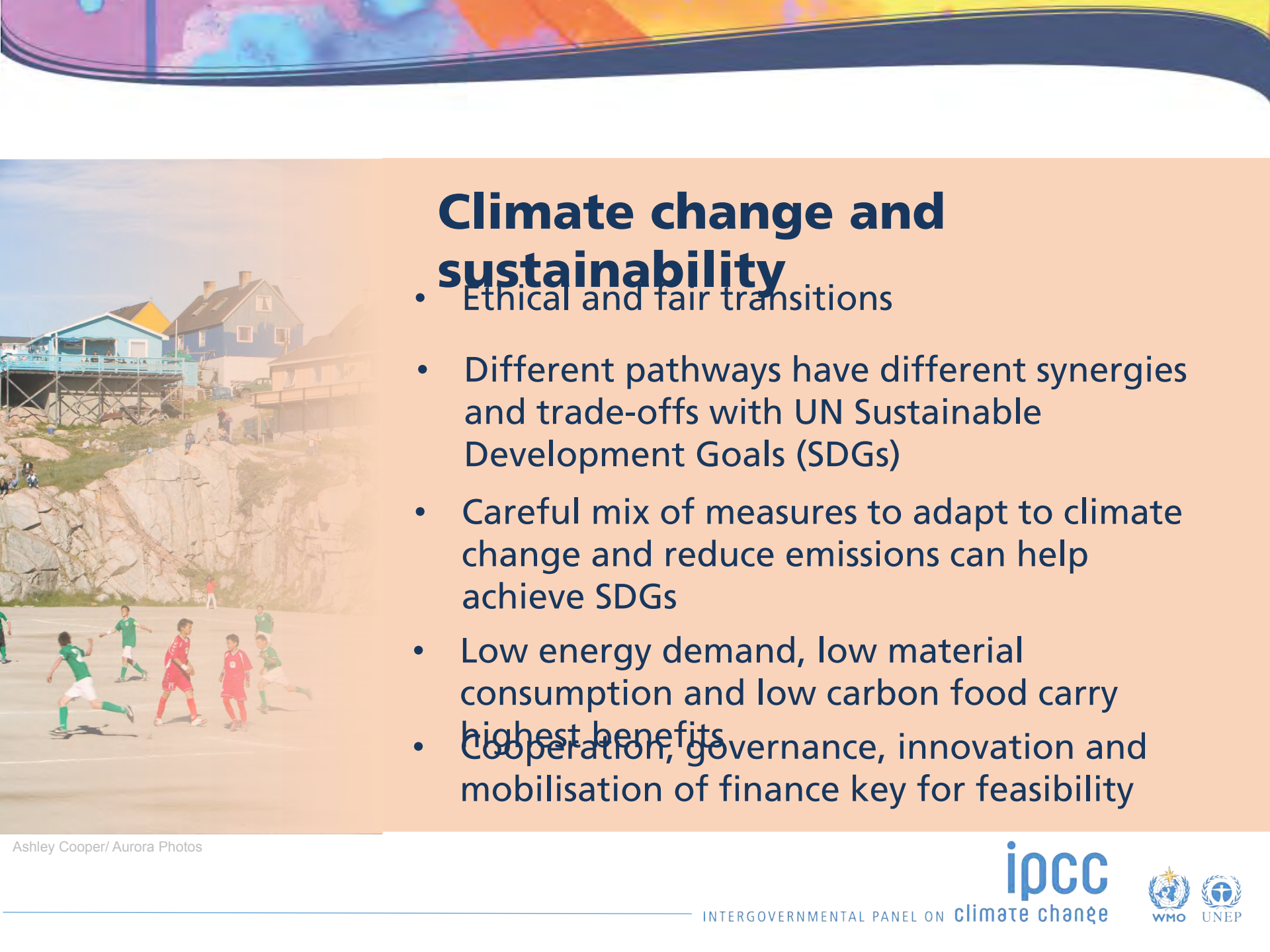
Four illustrative model pathways





Where are we?

- National pledges are not enough to limit warming to 1.5°C
- Avoiding warming of more than 1.5°C would require carbon dioxide emissions to decline substantially before 2030



Climate change and sustainability

- Ethical and fair transitions
- Different pathways have different synergies and trade-offs with UN Sustainable Development Goals (SDGs)
- Careful mix of measures to adapt to climate change and reduce emissions can help achieve SDGs
- Low energy demand, low material consumption and low carbon food carry highest benefits
- Cooperation, governance, innovation and mobilisation of finance key for feasibility

Ashley Cooper/ Aurora Photos



[ipcc.ch/report/sr15/](https://www.ipcc.ch/report/sr15/) :

Summary for Policy Makers

10 Frequently Asked Questions

5 Chapters

Glossary