Global Warming of 1.5° C

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INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

The report in numbers

91 Authors from **40** Countries

133 Contributing authors

6000 Studies

1 113 Reviewers

42 001 Comments

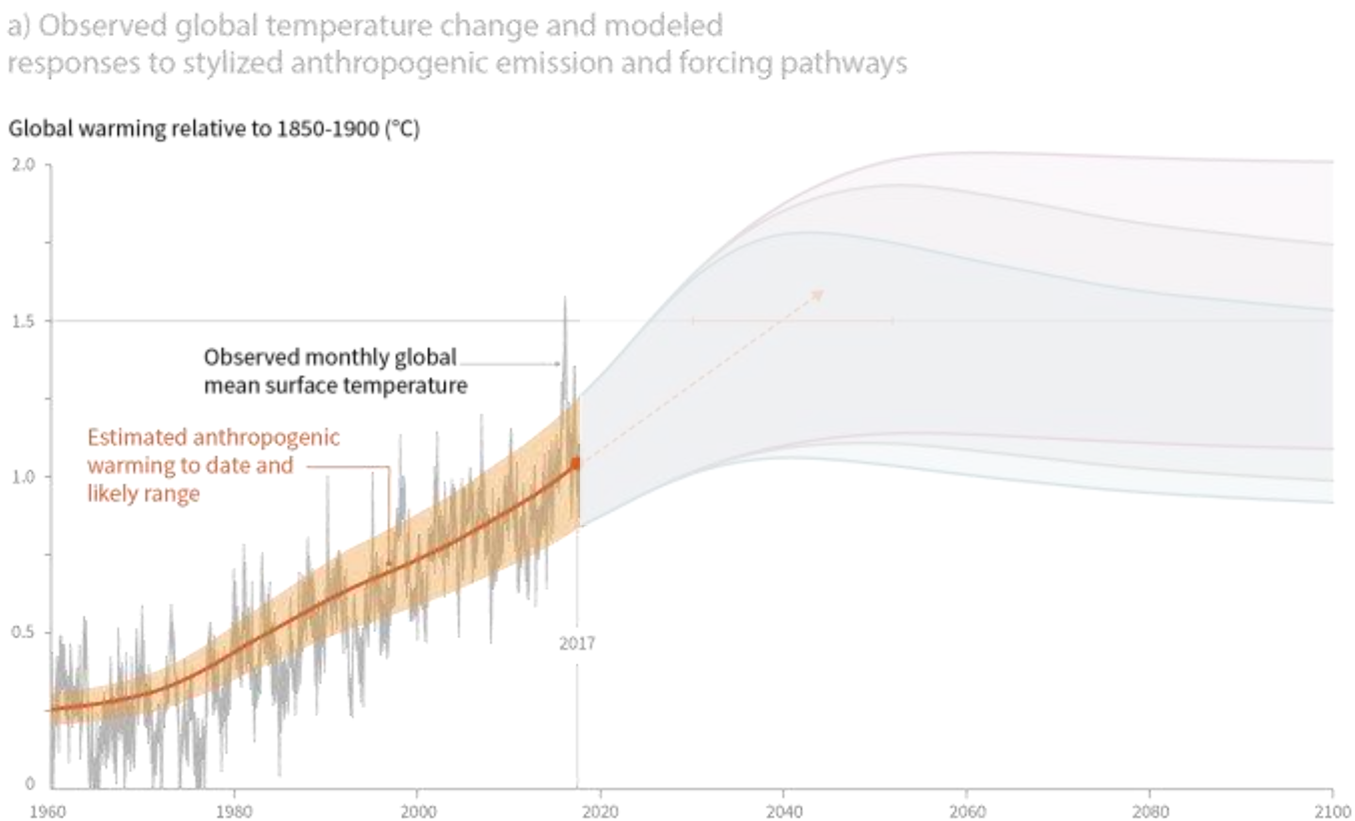
Ashley Cooper / Aurora Photos

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

Cumulative emissions of CO_2 and future non-CO_2 radiative forcing determine the probability of limiting warming to 1.5°C



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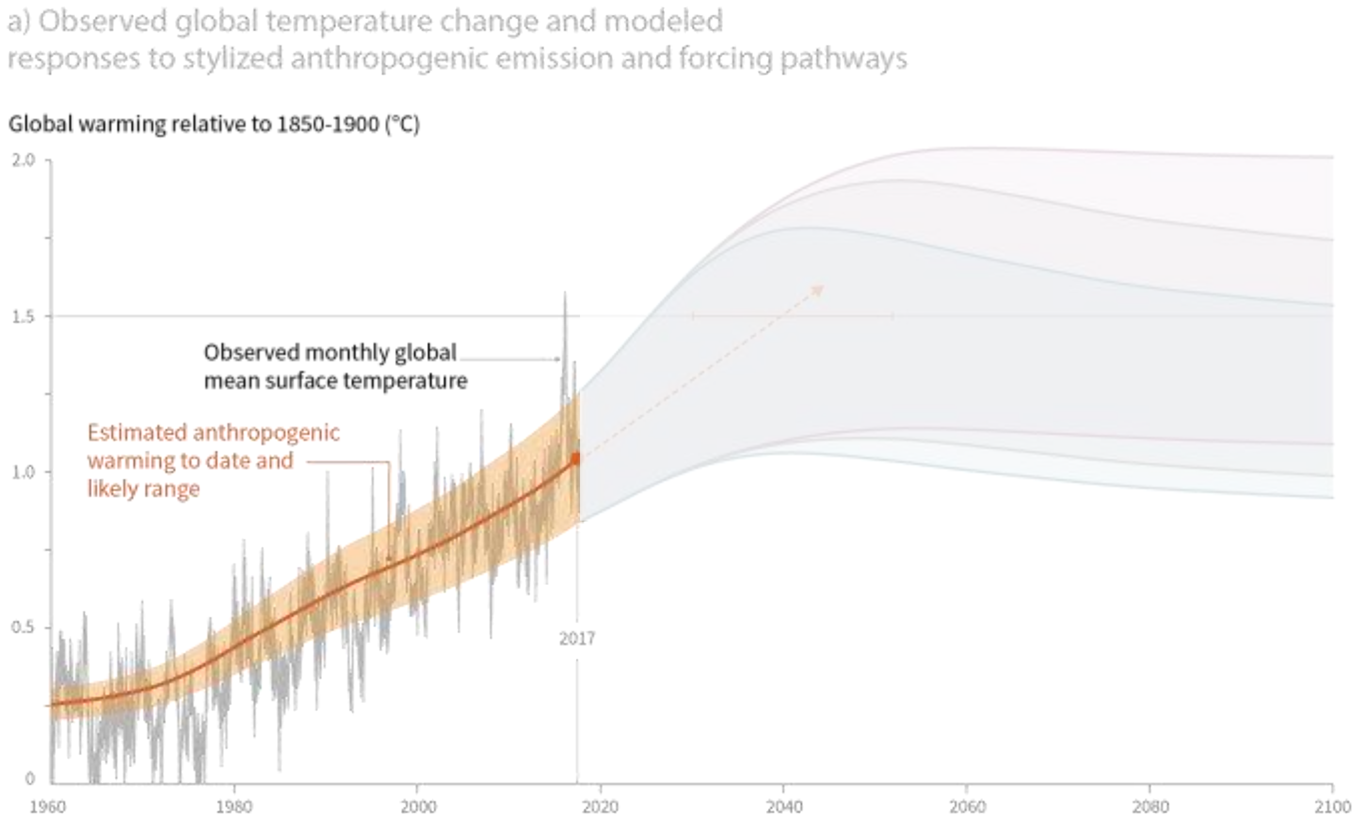

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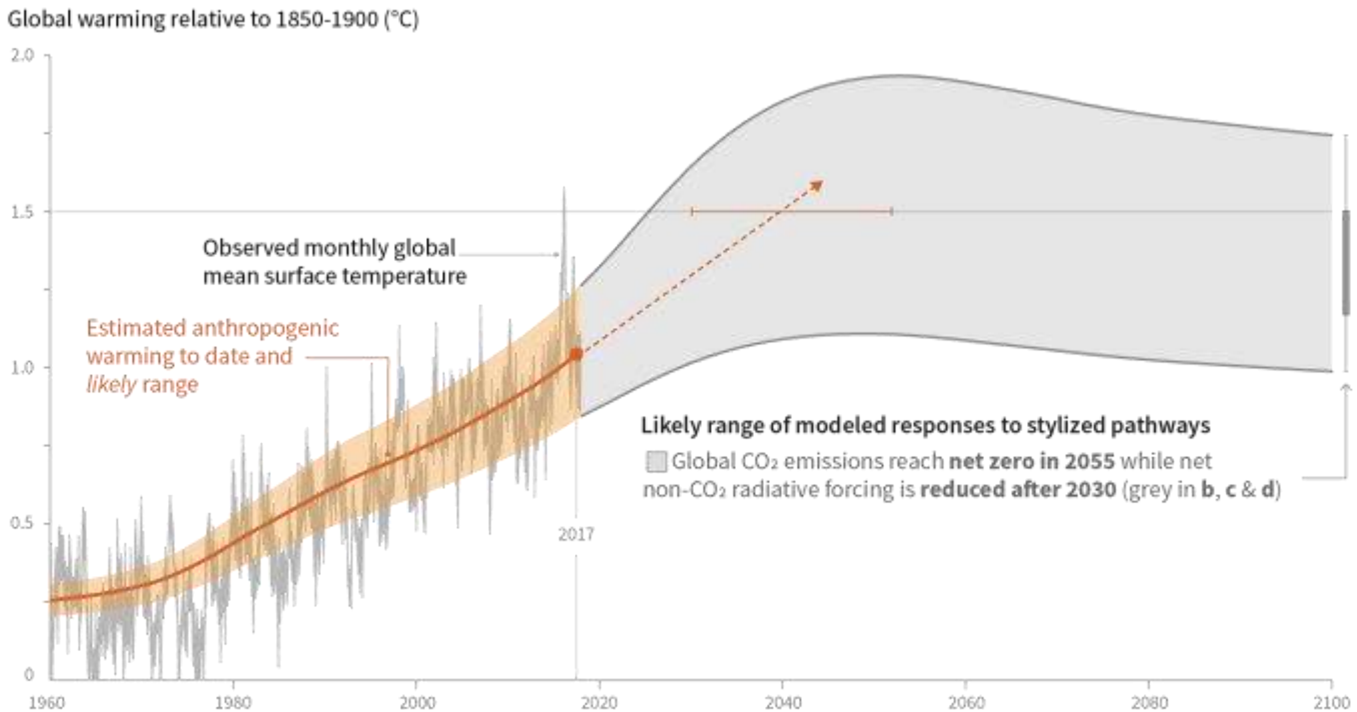
a) Observed global temperature change and modeled responses to stylized anthropogenic emission and forcing pathways



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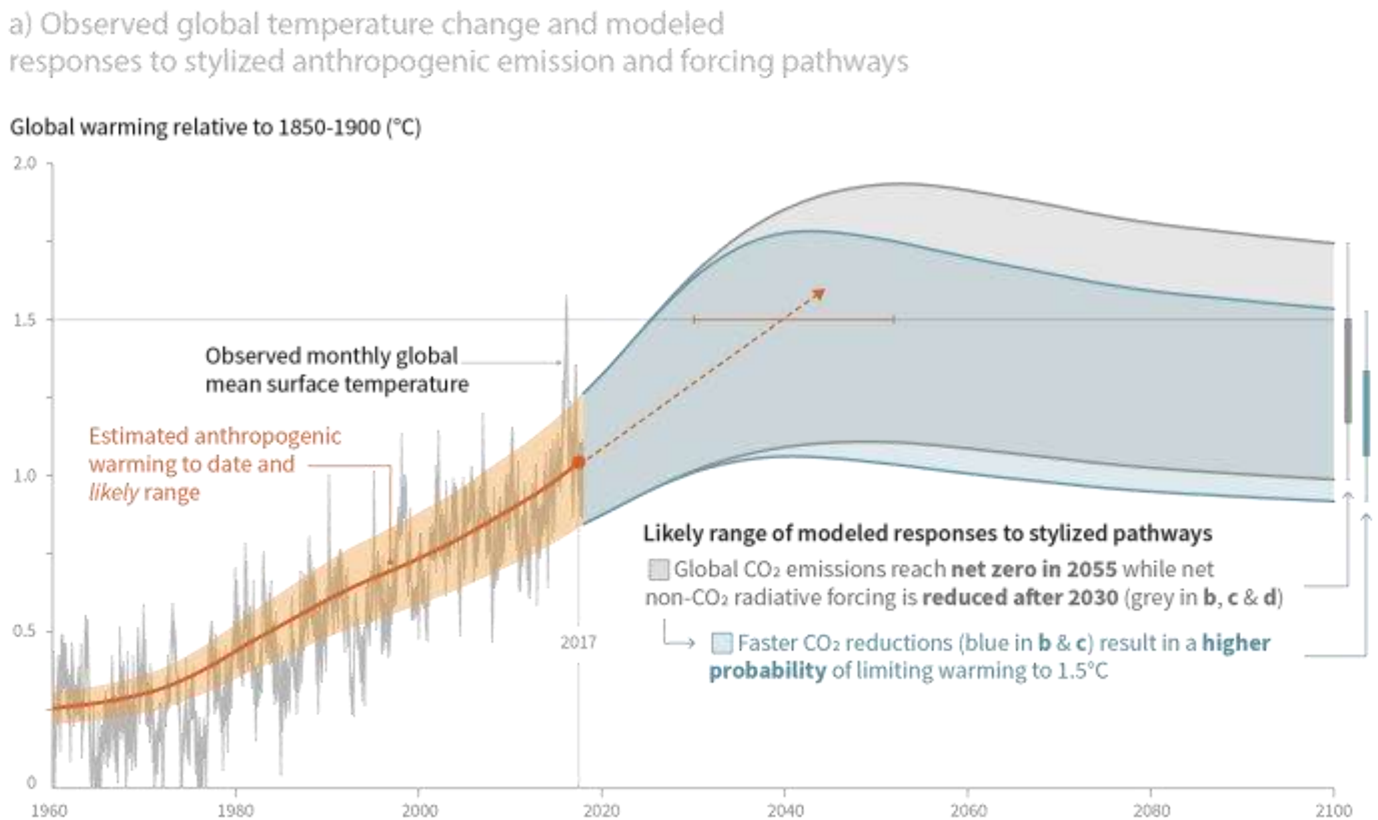

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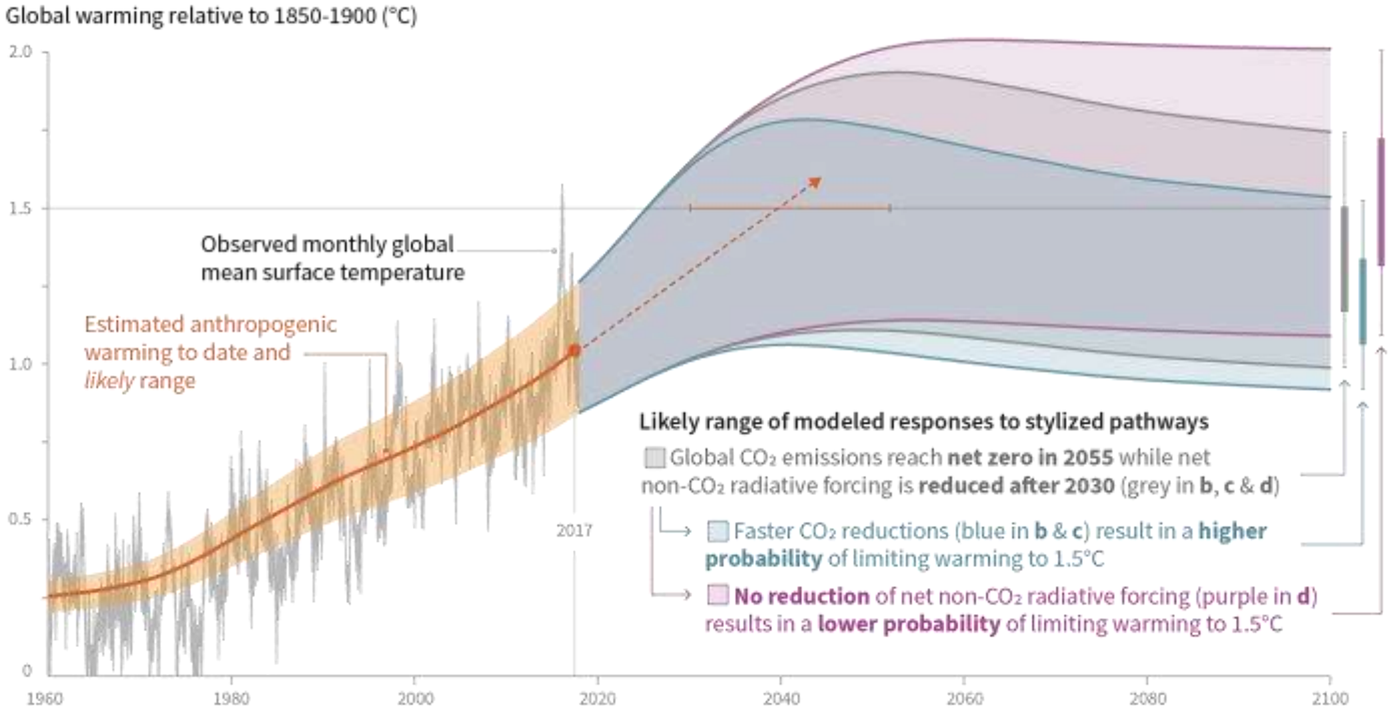

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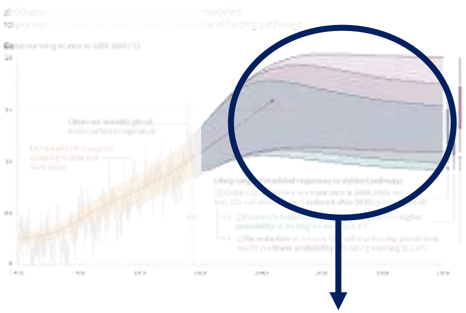

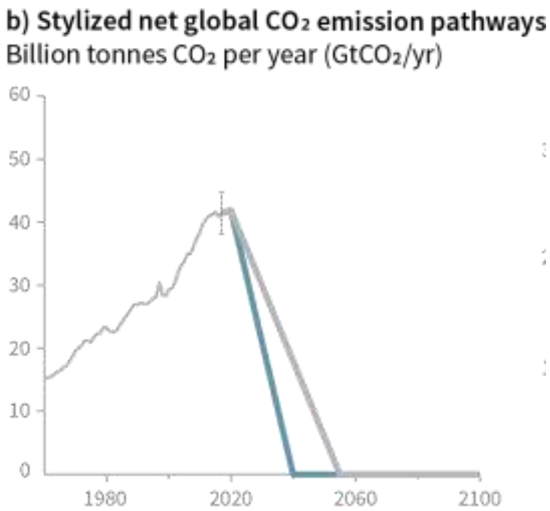

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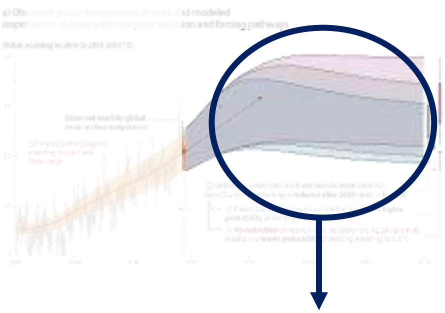
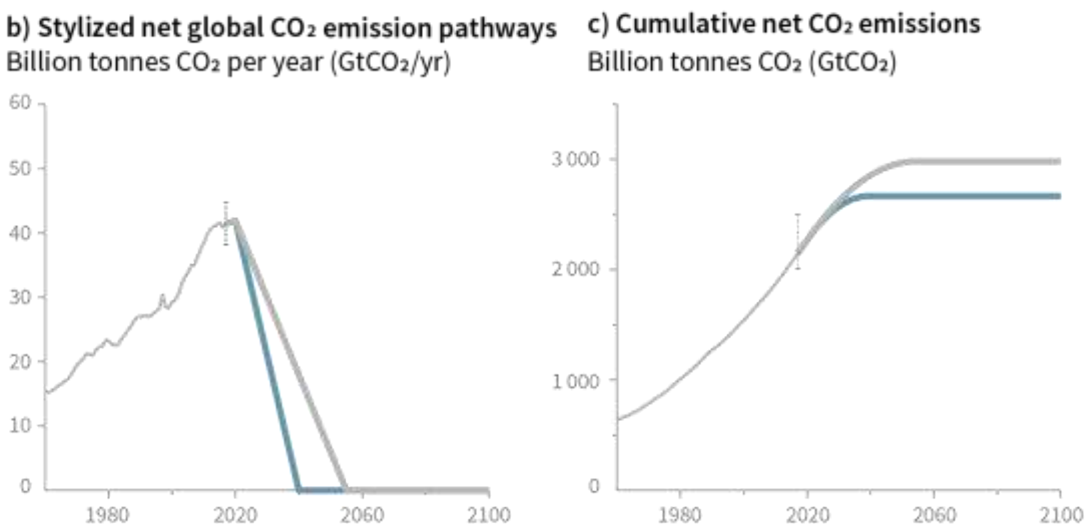


Faster immediate CO_2 emission reductions limit cumulative CO_2 emissions



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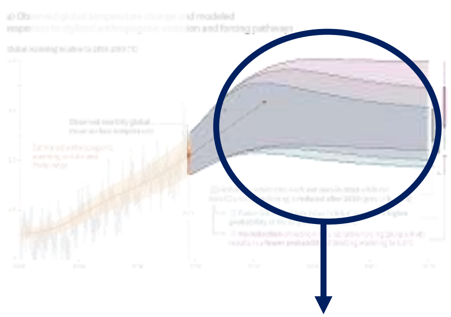
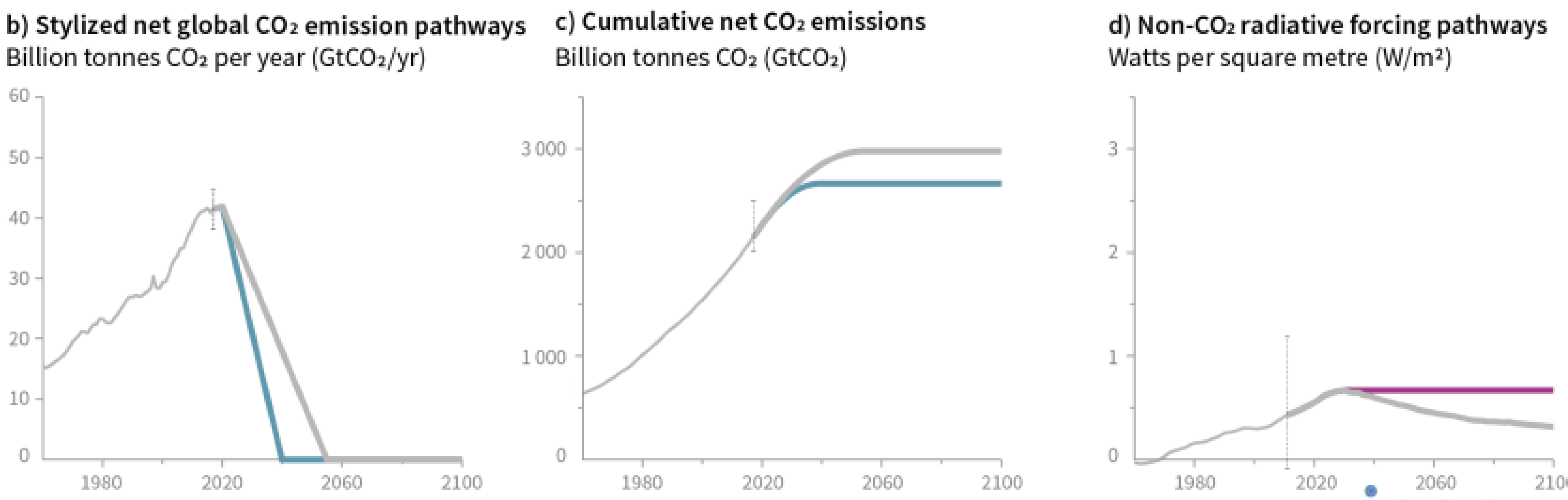
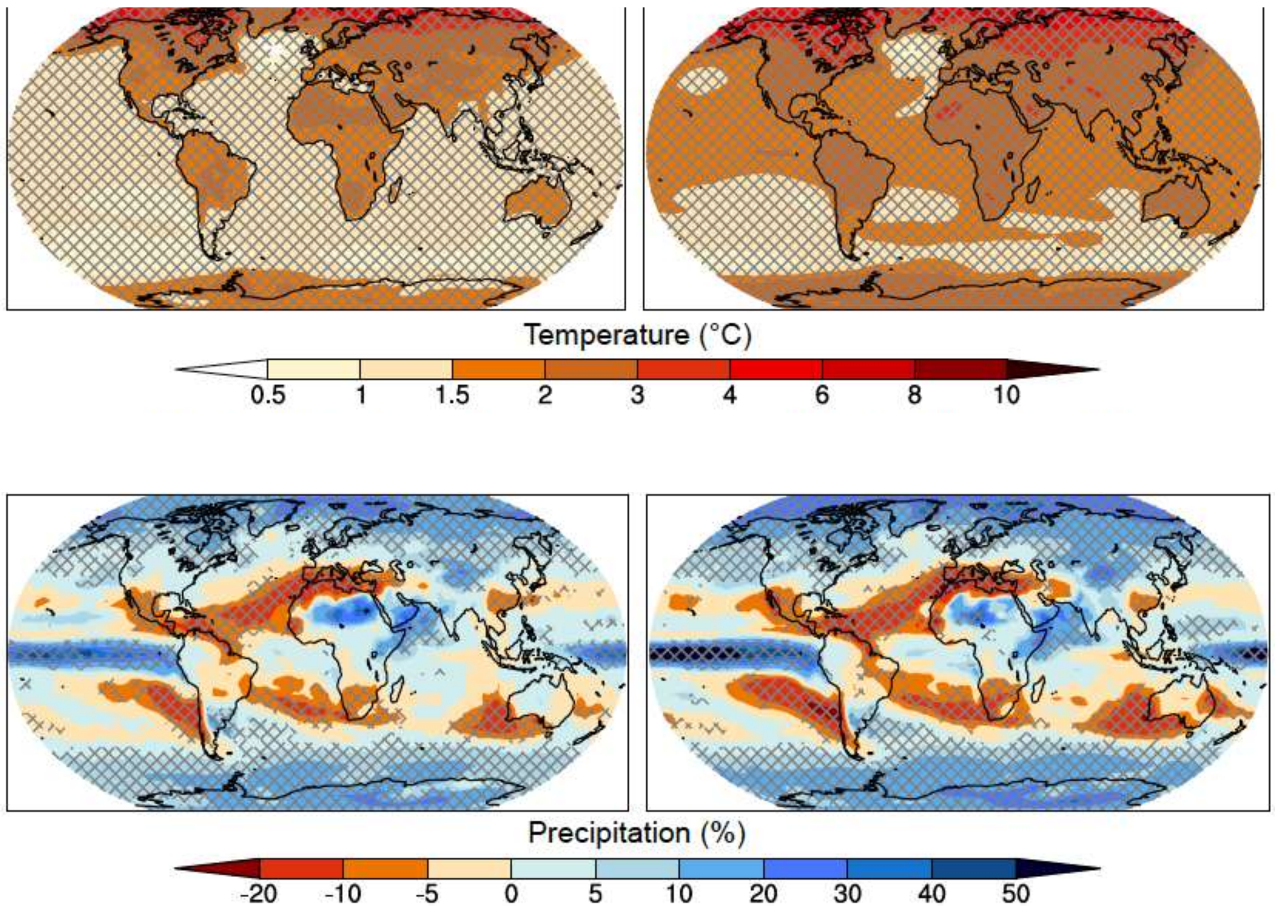


Maximum temperature rise is determined by cumulative net CO_2 emissions and net non-CO_2 radiative forcing due to methane, nitrous oxide, aerosols and other anthropogenic forcing agents.



Spatial patterns of changes in annual mean temperature and precipitation

Global warming of 1.5°C **2°C**



26 CMIP5 models; hatching : 66% model agreement

Spatial patterns of changes in extreme temperature and precipitation

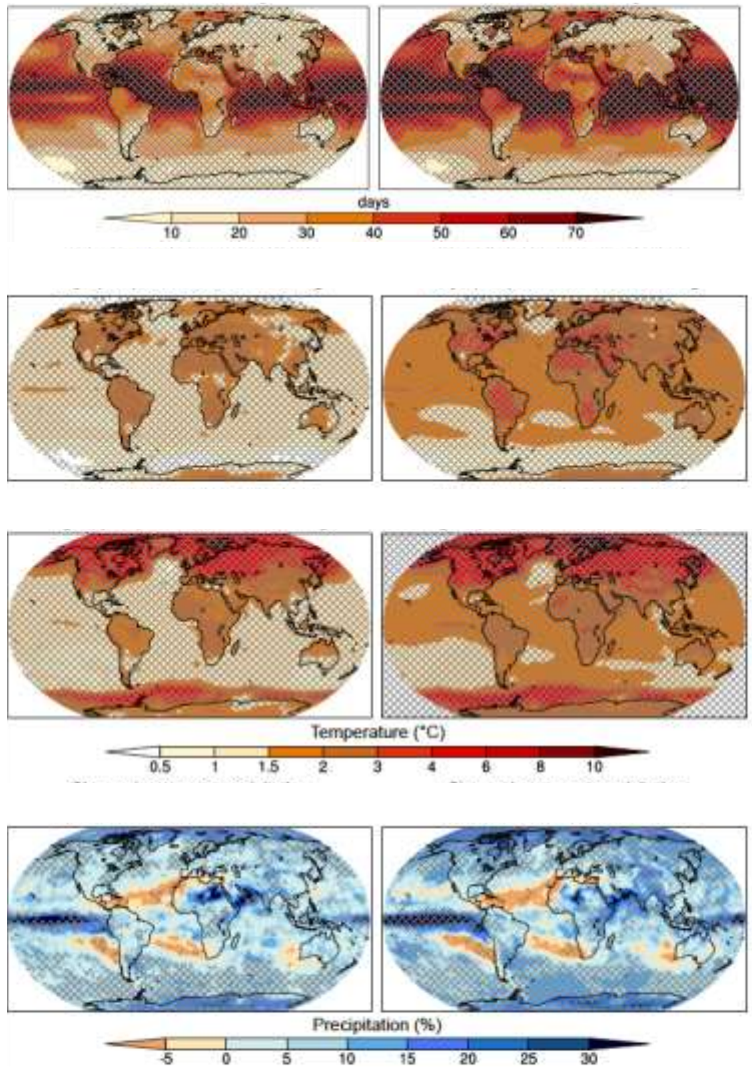
Global warming of 1.5°C **2°C**

Number of hot days (days)

Temperature of hottest days (°C)

Temperature of coldest nights (°C)

Extreme precipitation (%)



Emergence and intensity of regional climate change hot spots

Arctic summer sea-ice

- *L* maintained; 50% or higher risk to be ice free; *VL* to be ice free
- Habitat (polar bear, whales, seals, sea birds) : losses; losses; critical losses
- Arctic fisheries : benefits; benefits; benefits

Warming of 1.5° C or less
Warming of 1.5ºC-2° C
Warming > 2° C

L, likely
VL, very likely
LC, low confidence
MC, medium confidence
HC, high confidence

Emergence and intensity of regional climate change hot spots

Arctic land regions

- Cold extreme: warm up to 4.5° C *(HC)*; warm up to 8° C *(HC)*; *VL* drastic warming
- Tundra : *L* biome shifts; *L* more shifts; drastic biome shift possible *(LC)*
- Permafrost : *L* 17-44% reduction; *L* larger (28-53%); potential for collapse *(LC)*
- Boreal forest *:* increased mortality at S. boundary *(MC);* further *(MC);* potential dieback *(LC)*

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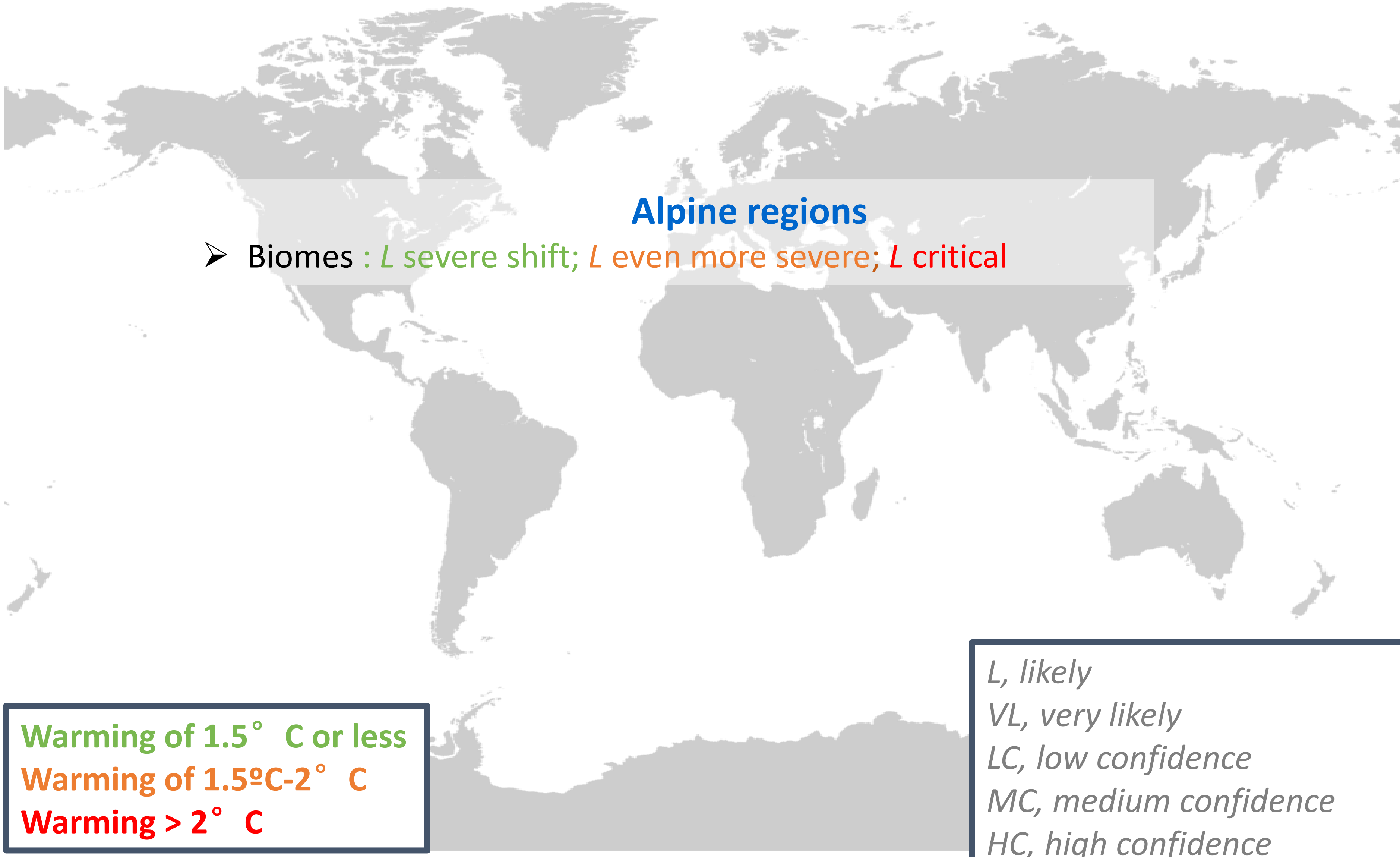

Alpine regions

- Biomes : *L* severe shift; *L* even more severe; *L* critical

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Mediterranean

- Extreme drought: increase probability*(MC)*; robust increase*(MC)*; robust and large increase*(MC)*
- Runoff decrease: about 9% *(MC)*; about 17% *(MC)*; substantial reductions *(MC)*
- Water deficit: risk *(MC)*; higher risks *(MC)*; very high risks *(MC)*

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Tropics

- # hot days and nights, heatwaves: increases *(HC)*; largest increase; oppressive, *VL* health impact
- Livestock heat stress : increased; onset of persistent *(MC)*; *L* persistent
- Crop yields: risks; extensive risks (W. Africa, SE Asia, S. America); *VL* substantial reductions
- Rainforests : reduced biomass; larger reductions; reduced extent, potential forest dieback *(MC)*

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Southeast Asia

- ➚ flooding related to sea-level rise: risks; higher risks *(MC)*; substantial increases in risk
- Asian monsoon : *LC*; *LC*; *L* increase in precipitation intensity
- Heavy precipitation: increase; stronger increase *(MC)*; substantial increase
- Crop yield reductions: -; one third decline in per capita *(MC)*; substantial reduction

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West African and the Sahel

- Monsoon : uncertain ; uncertain ; strengthening *(LC)*
- Hot nights, longer, more frequent heat waves: *L* ↗; *L* further ↗; *VL* substantial ↗
- ↘ in maize and sorghum production: *L,* about 40% ↘ suitable area; *L* larger ↘; major regional food insecurities *(MC)*
- Undernutrition risks : increased; higher; high

Emergence and intensity of regional climate change hot spots

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Southern Africa

- Water availability: reductions *(MC)*; larger reductions *(MC)*; large reductions *(MC)*
- # of hot nights and ↗ heat waves : increases *(HC)*; further increase *(HC)*; drastic increase *(HC)*
- Increased mortality from heat-waves: high risks; higher risks *(HC)*;
  sustantial impact on health and mortality *(HC)*
- Undernutrition / dryland agriculture and livestock: high risk; higher risk *(HC)*; very high risks

Emergence and intensity of regional climate change hot spots

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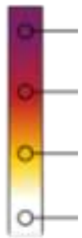
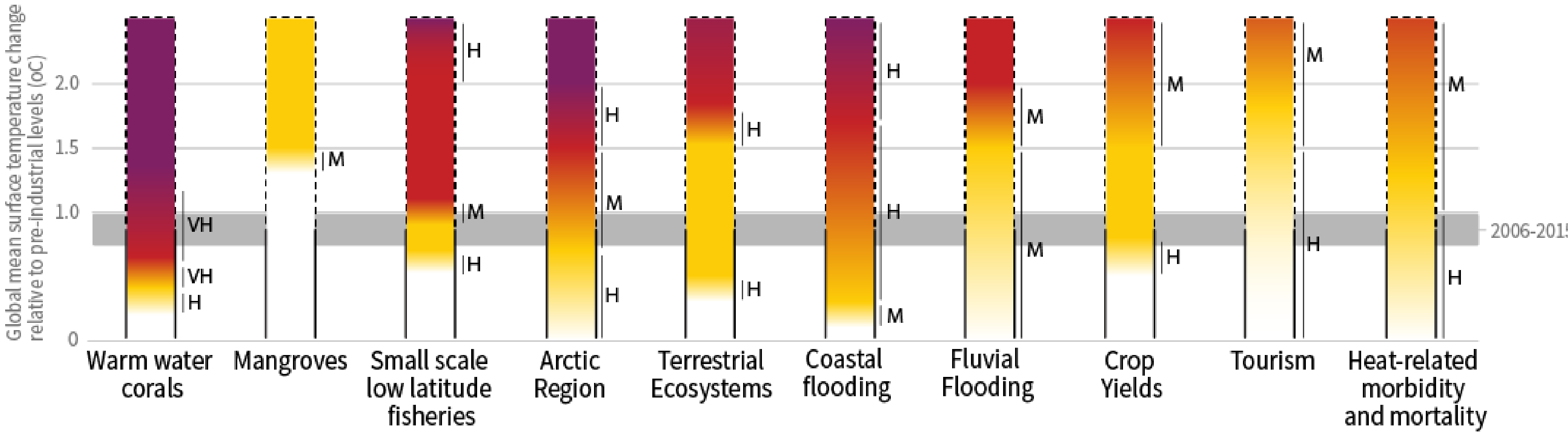
Small islands:

- Inundation risk : land exposed; tens of thousands displaced ; substantial, widespread impacts
- Coastal flooding: risks; high risks ; substantial and widespread impacts
- Fresh water stress : increased; projected aridity; substantial and widespread impacts
- # of warm days : increase; further increase (70 warm days/year), persistent heat stress in cattle ; persistent heat stress
- Loss of coral reefs: 70-90%; most coral reefs ; loss of most coral reefs *(VL)*

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

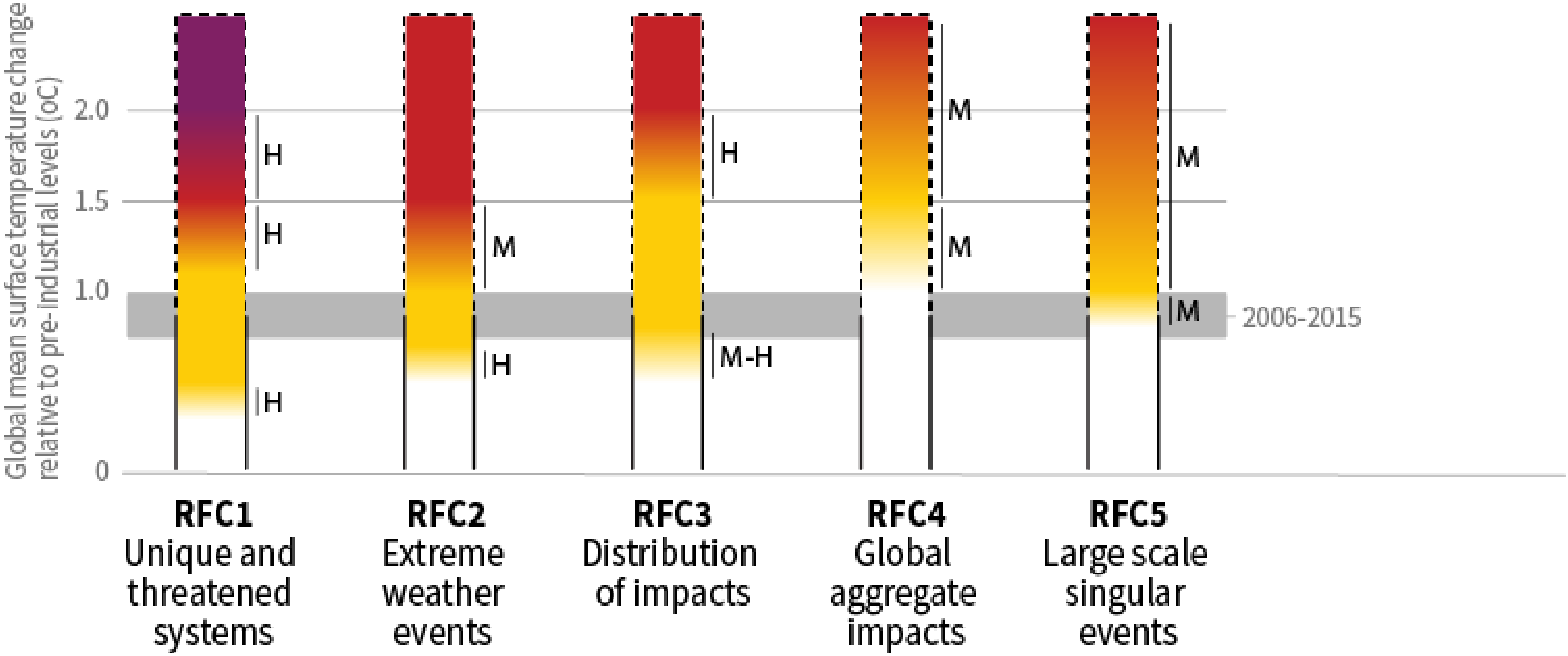


Impacts and risks for selected natural, managed and human systems



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?



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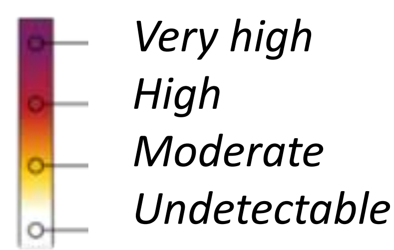
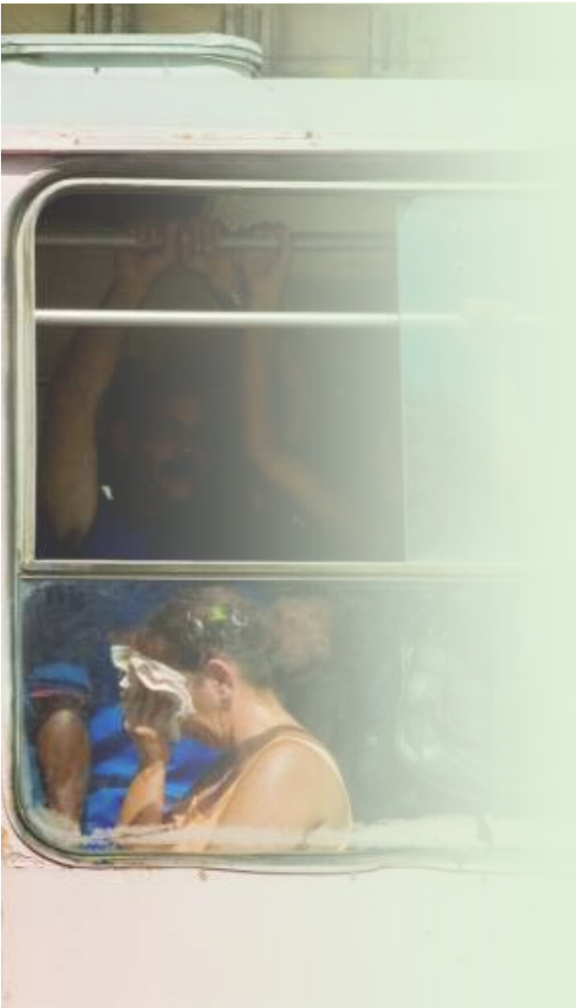


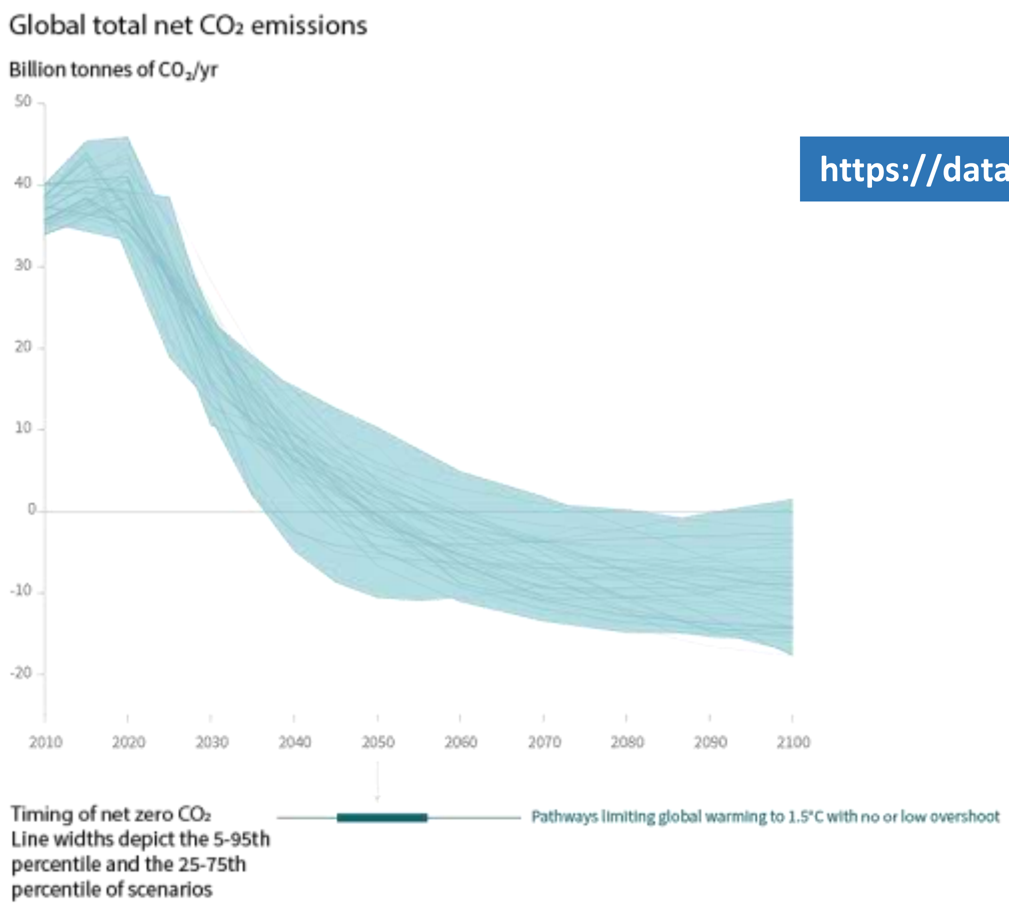


Jason Florio / Aurora Photos

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?



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

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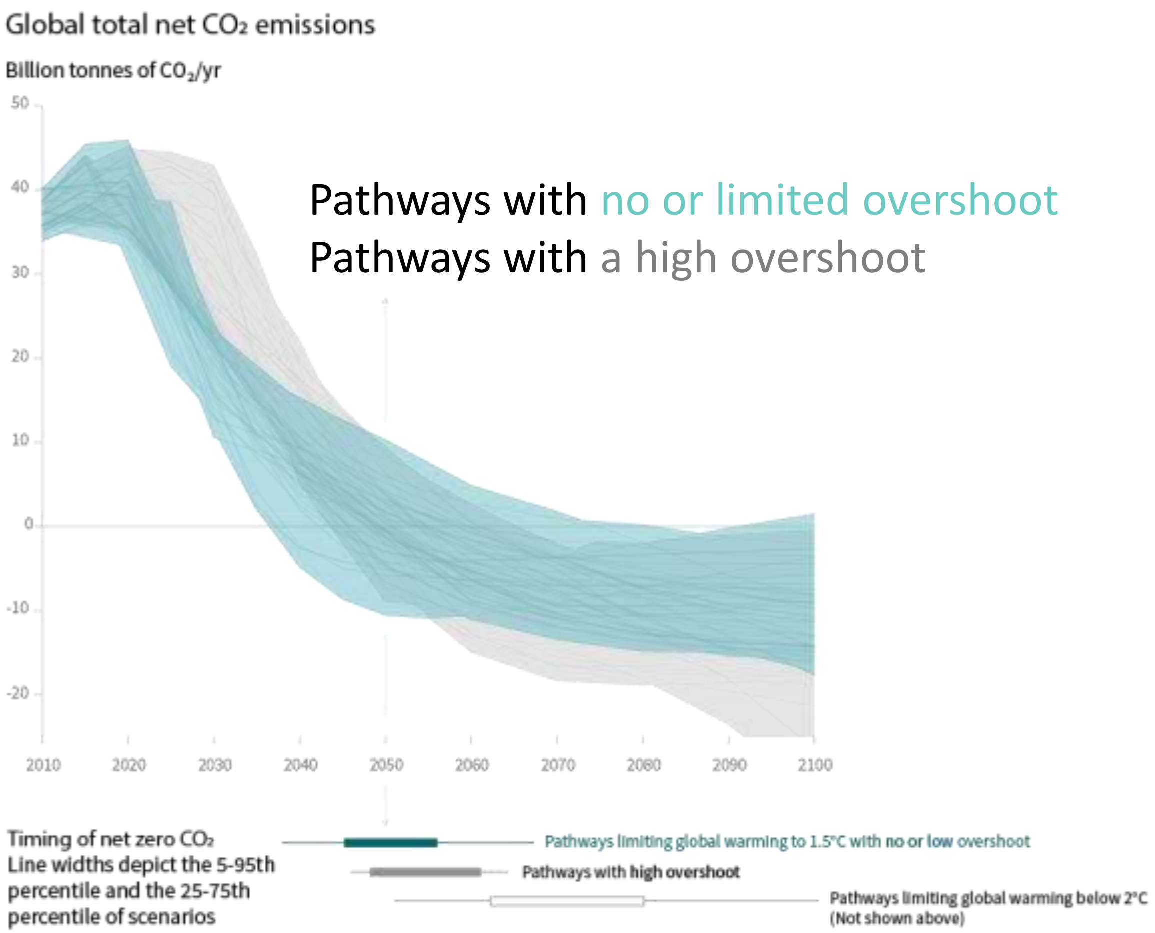

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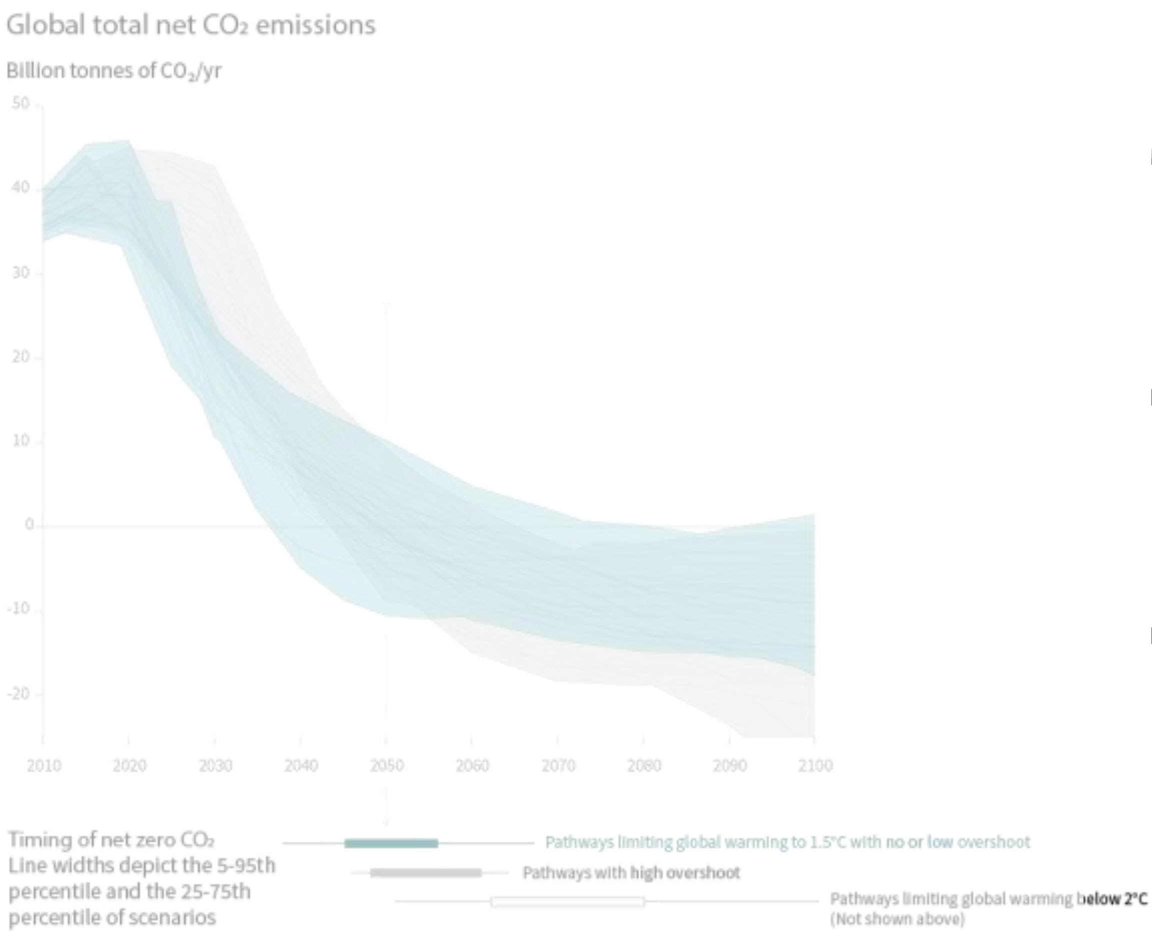
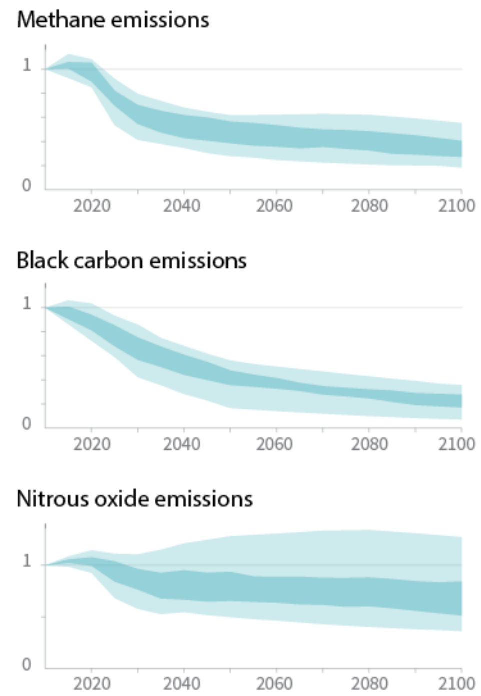
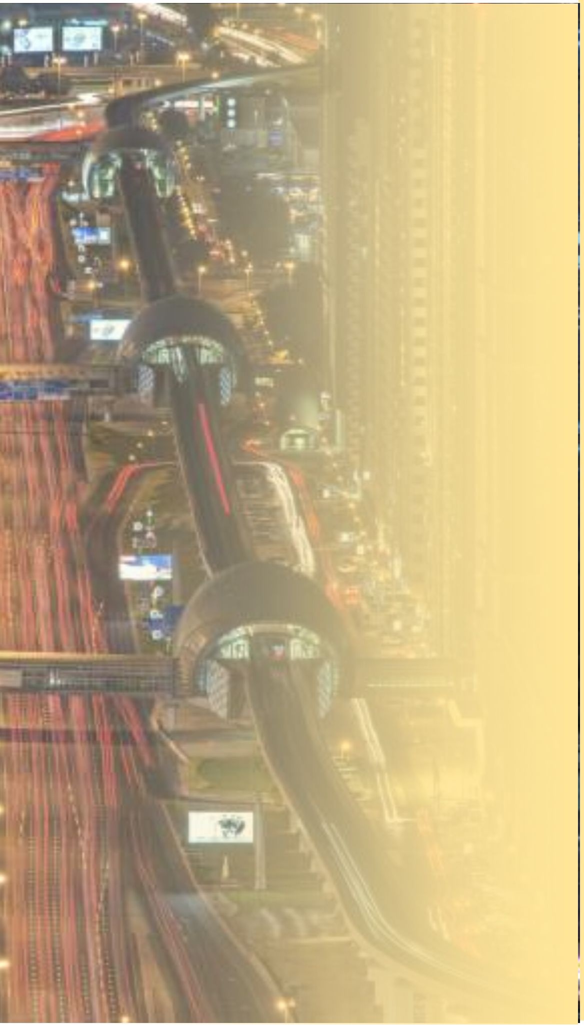


Non-CO_2 emissions relative to 2010





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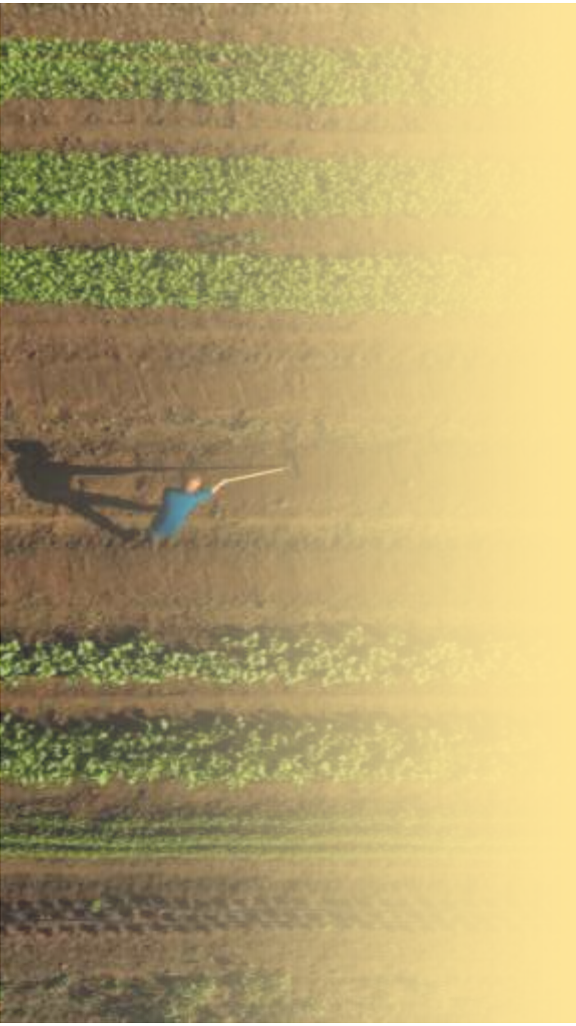
Limiting warming to 1.5°C

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



Peter Essick / Aurora Photos

Where are we?

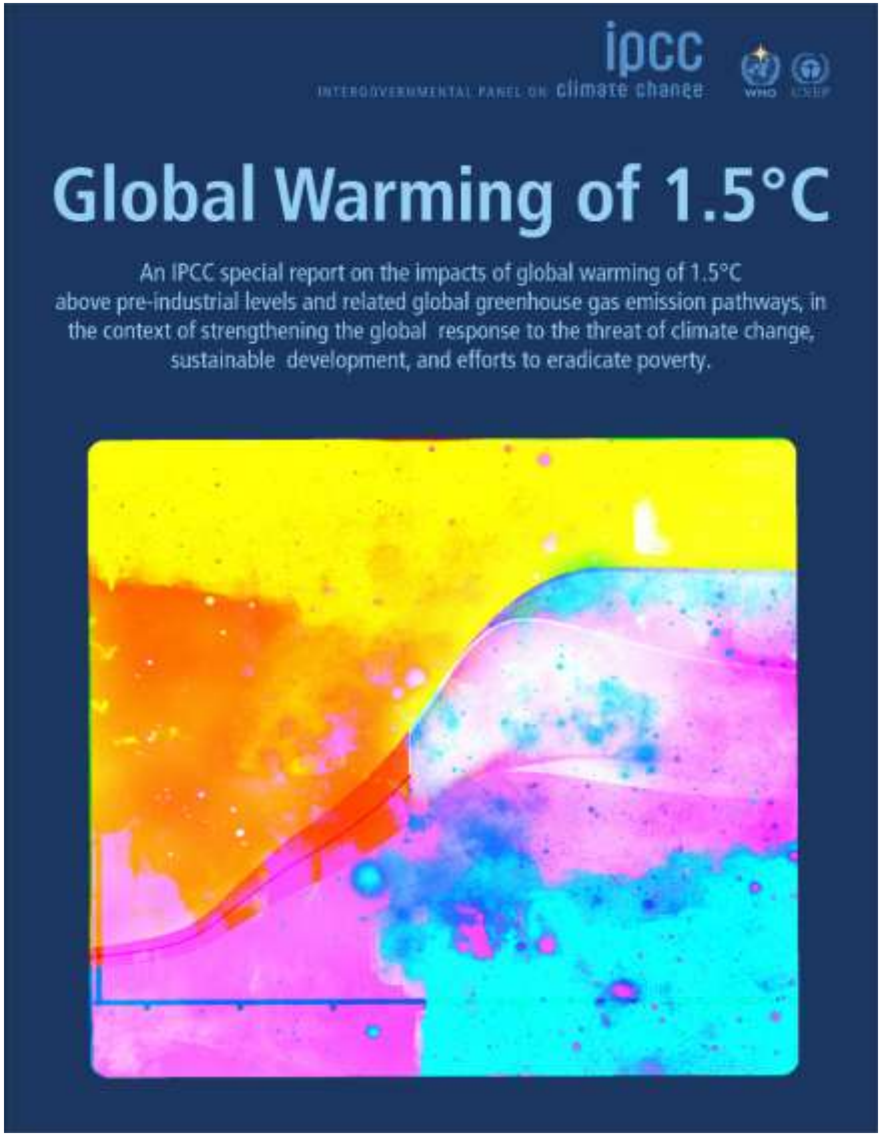
- National pledges are not enough to limit warming to 1.5°C

- Avoiding warming of more than 1.5°C would require carbon dioxide emissions to decline substantially before 2030

Ashley Cooper/ Aurora Photos

Climate change and sustainability

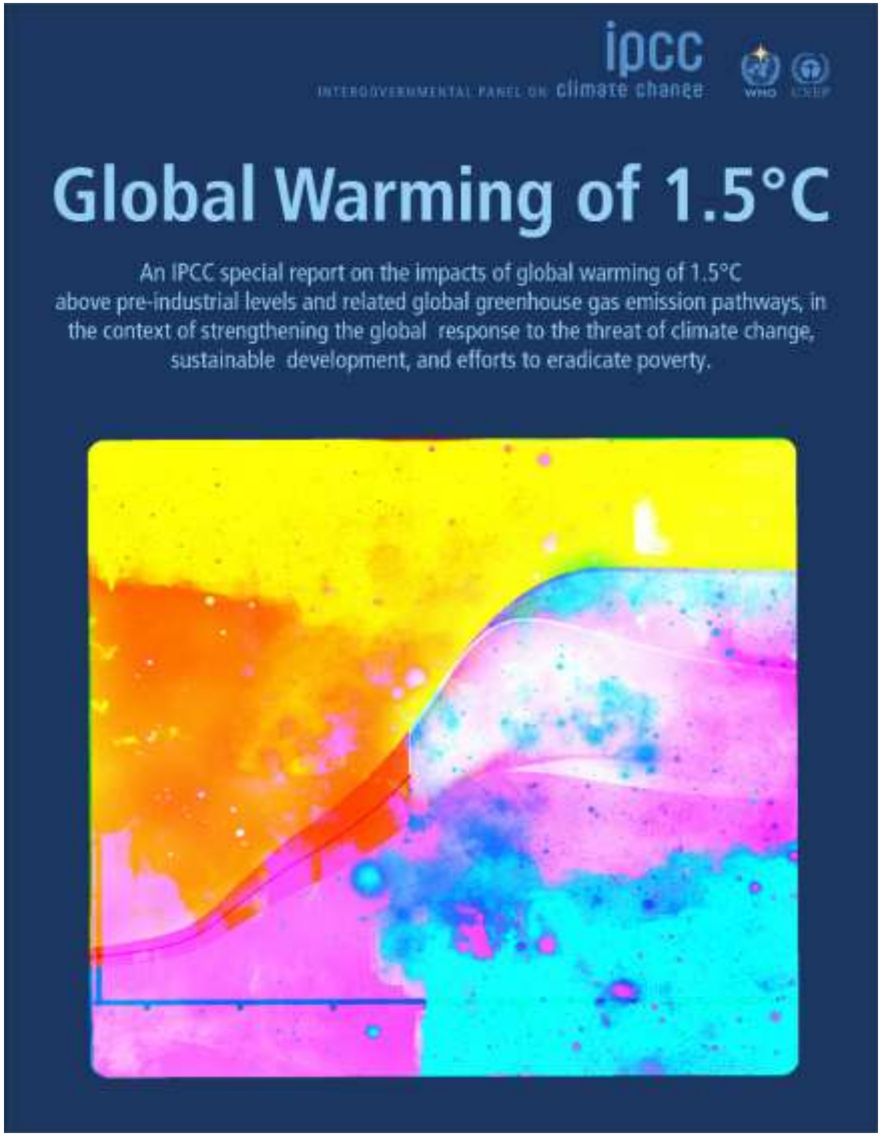
- Ethical and fair transitions
- Different pathways have different synergies and trade-offs with UN Sustainable Development Goals (SDGs)
- Careful mix of measures to adapt to climate change and reduce emissions can help achieve SDGs
- Low energy demand, low material consumption and low carbon food carry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



Every half a degree matters

Every year matters

Every choice matters



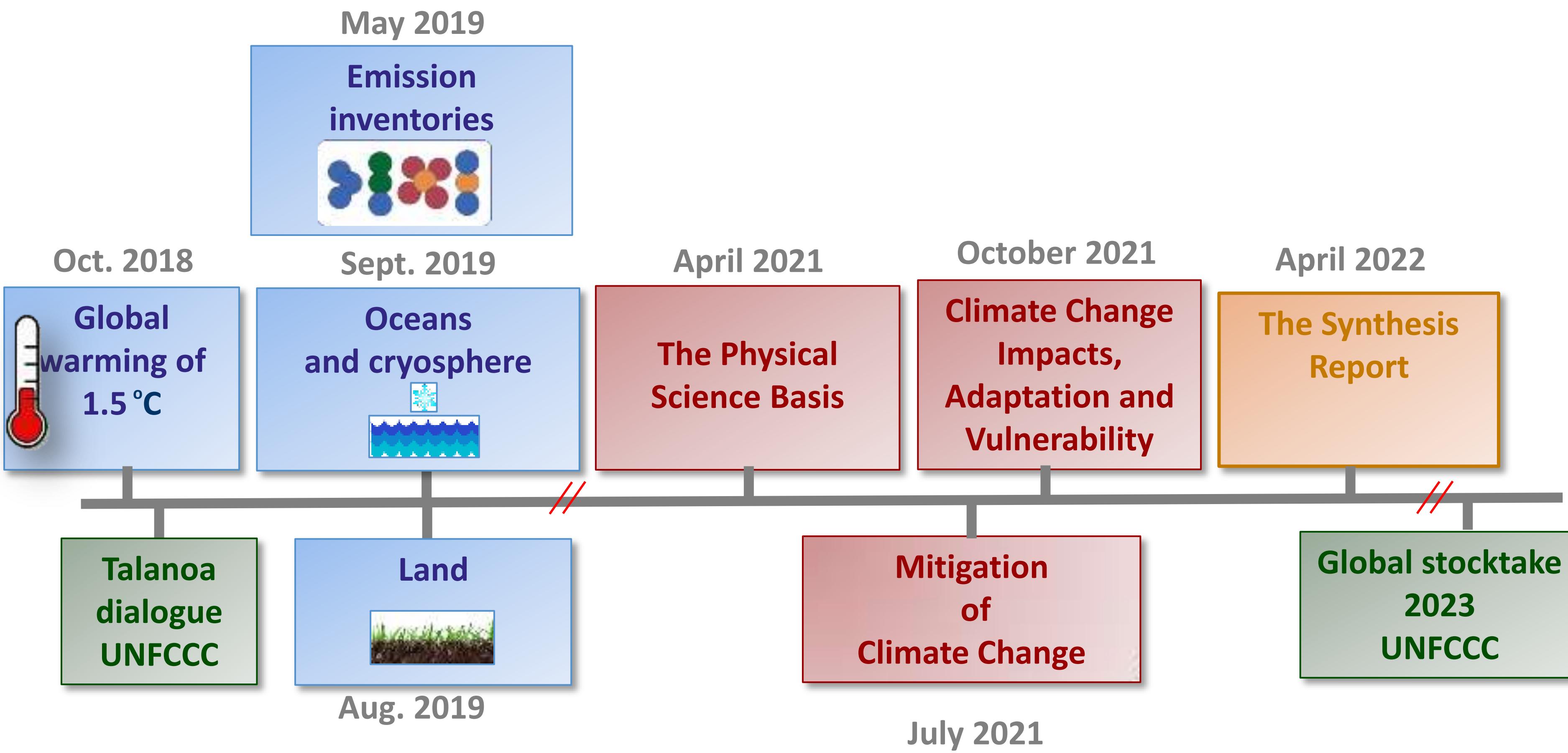
ipcc.ch/report/sr15 :

Summary for Policy Makers

10 Frequently Asked Questions

5 Chapters

Glossary



The IPCC Sixth Assessment Cycle

Thank you for your attention

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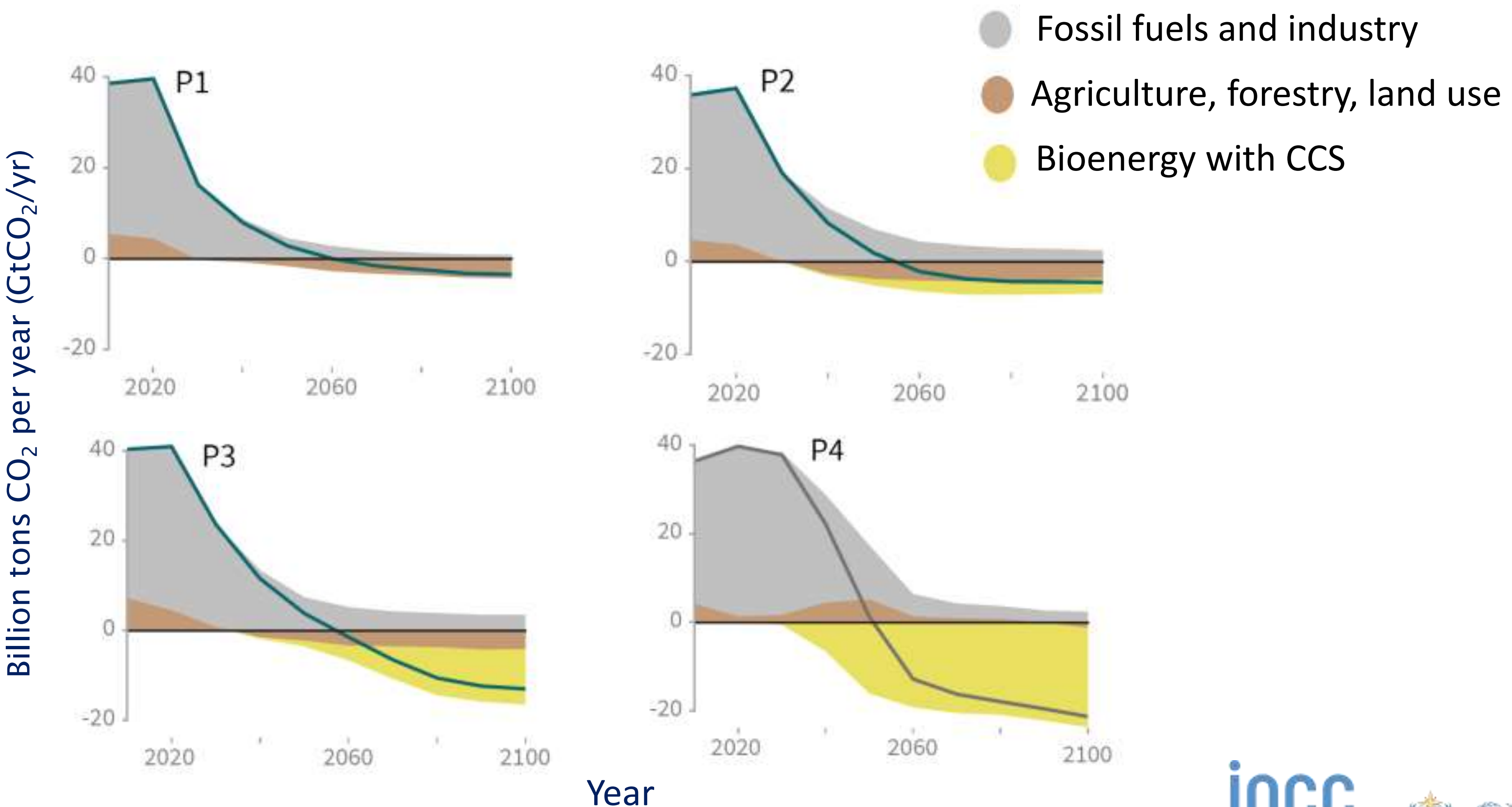
Four illustrative model pathways



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