Global Warming of 1.5° C

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valmasdel

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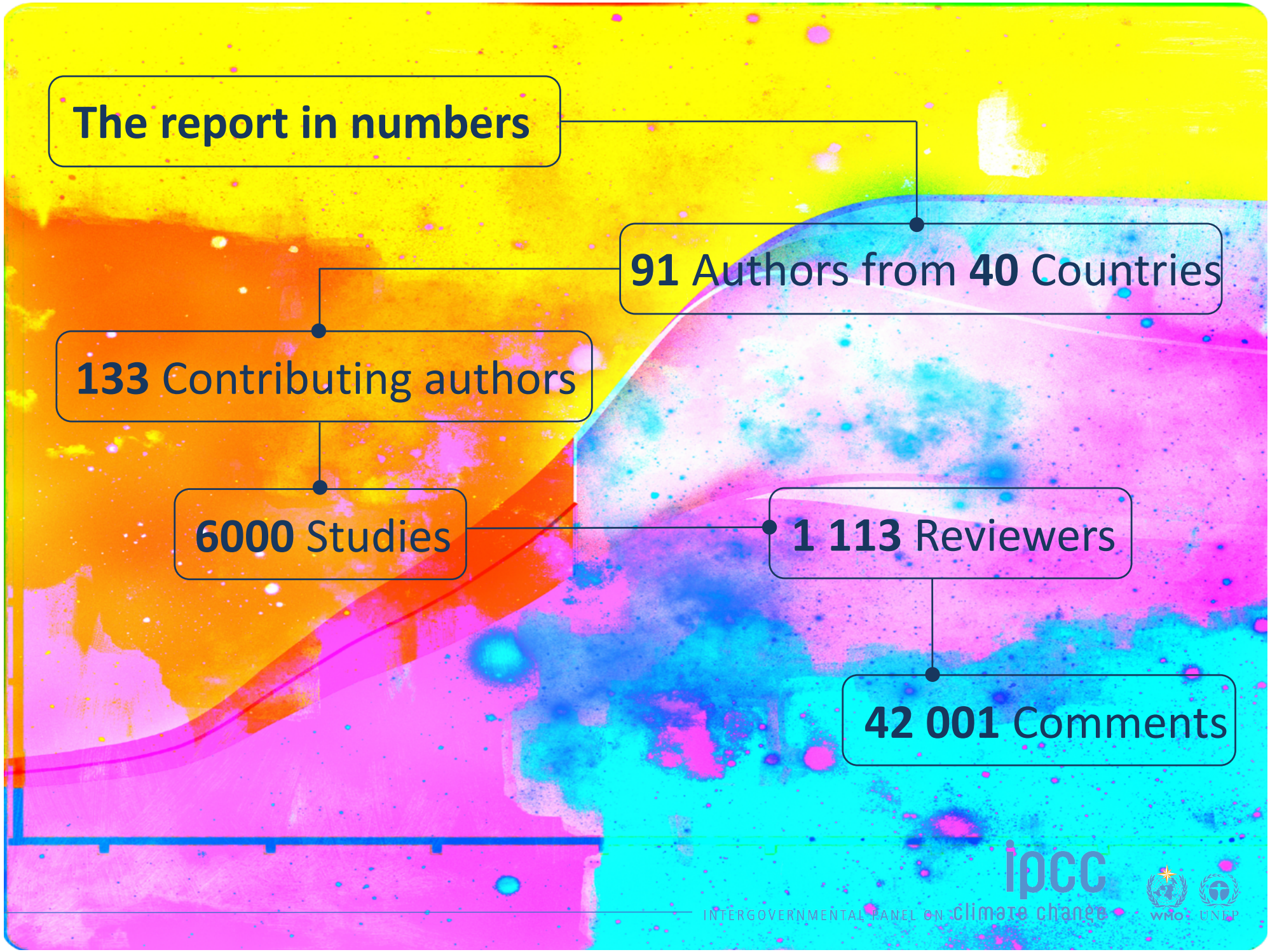
INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

Global Warming of 1.5°C

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
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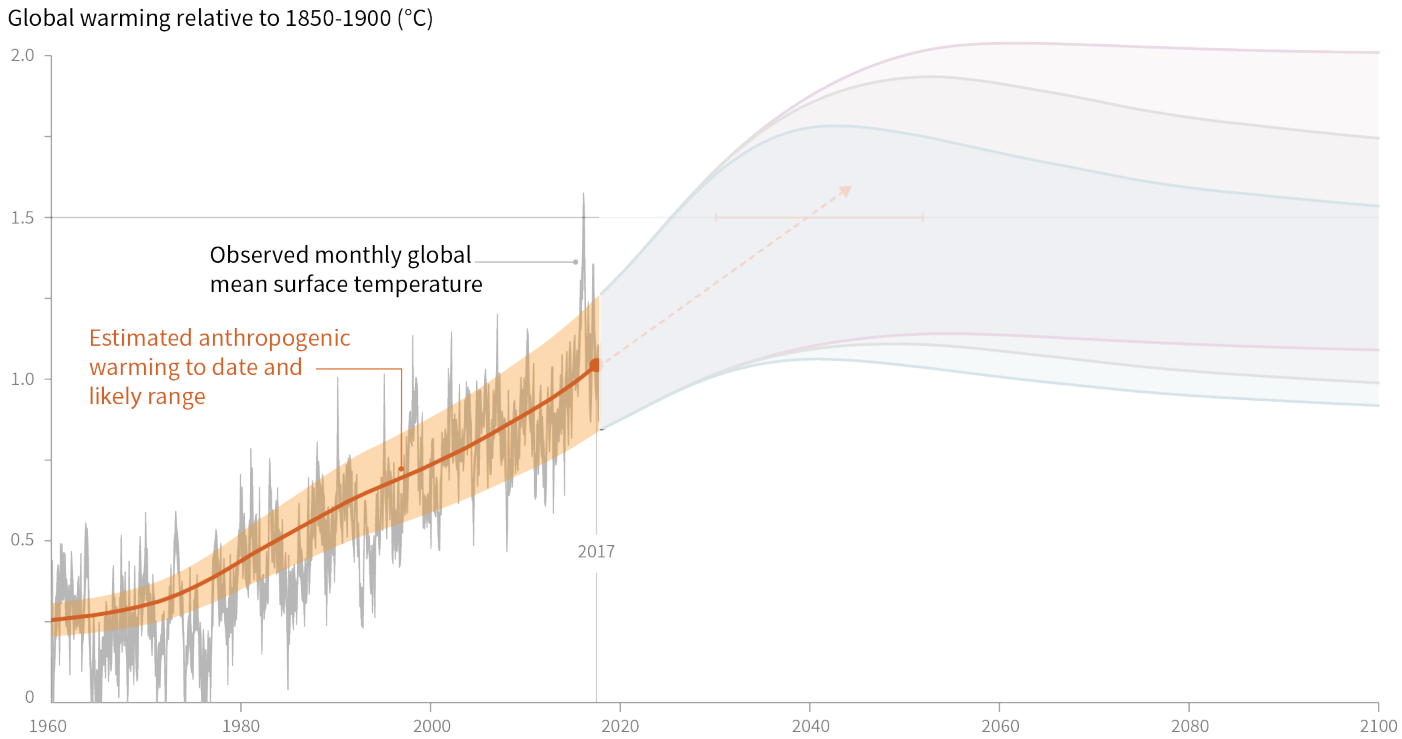
Where are we?

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

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



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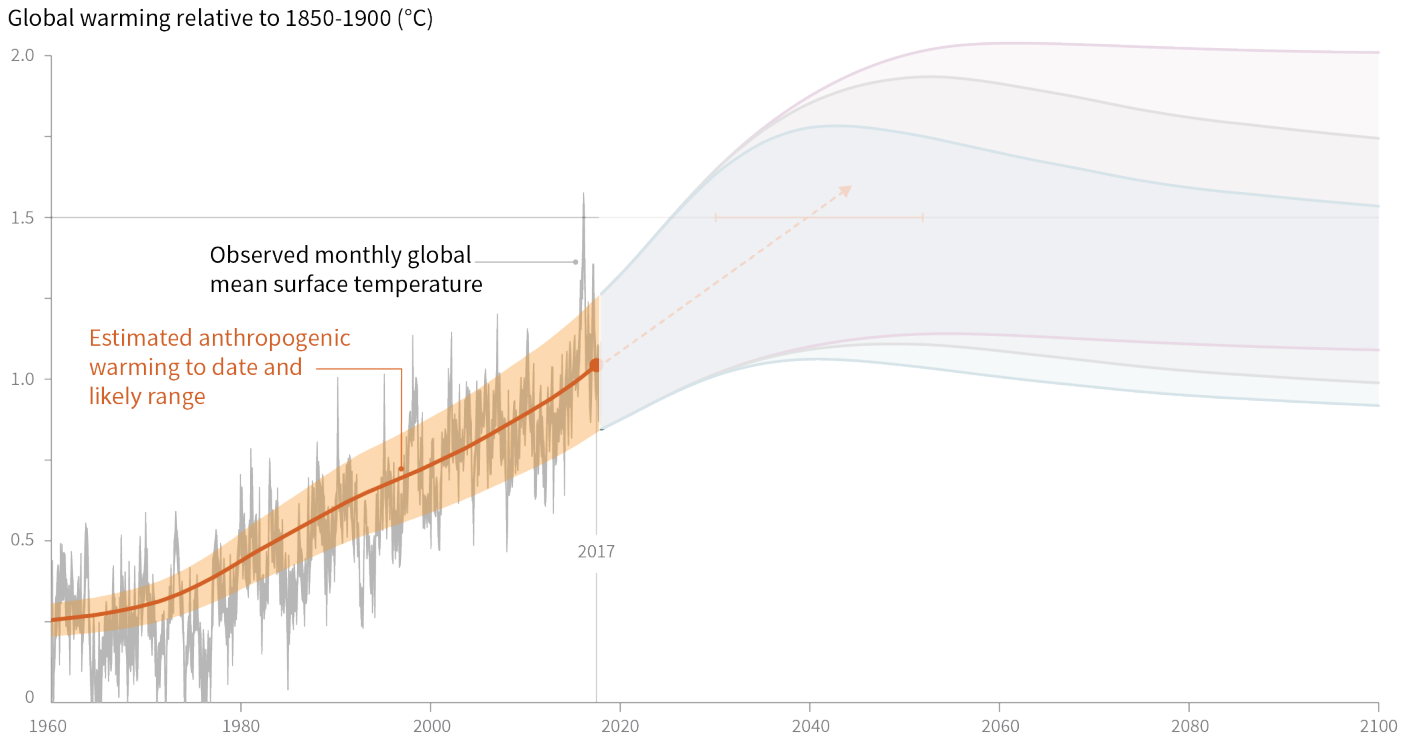

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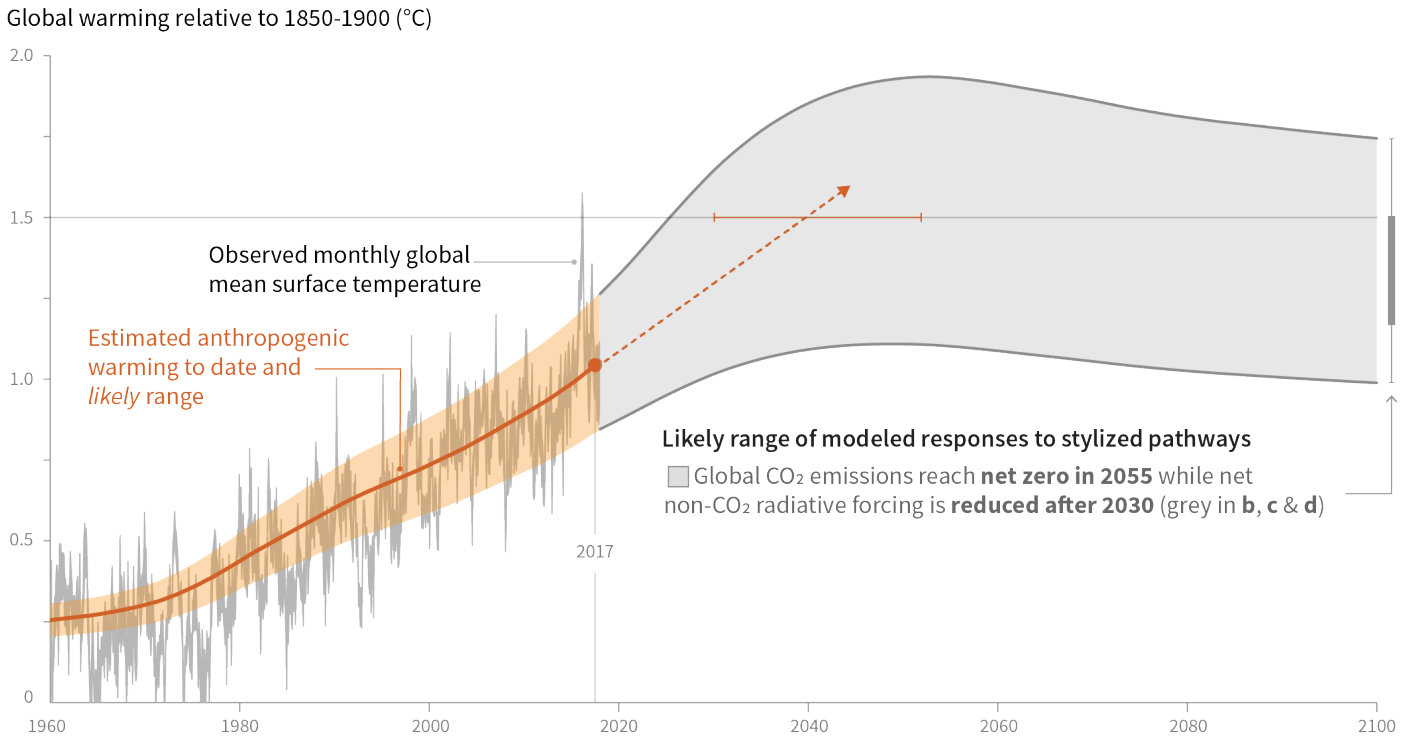

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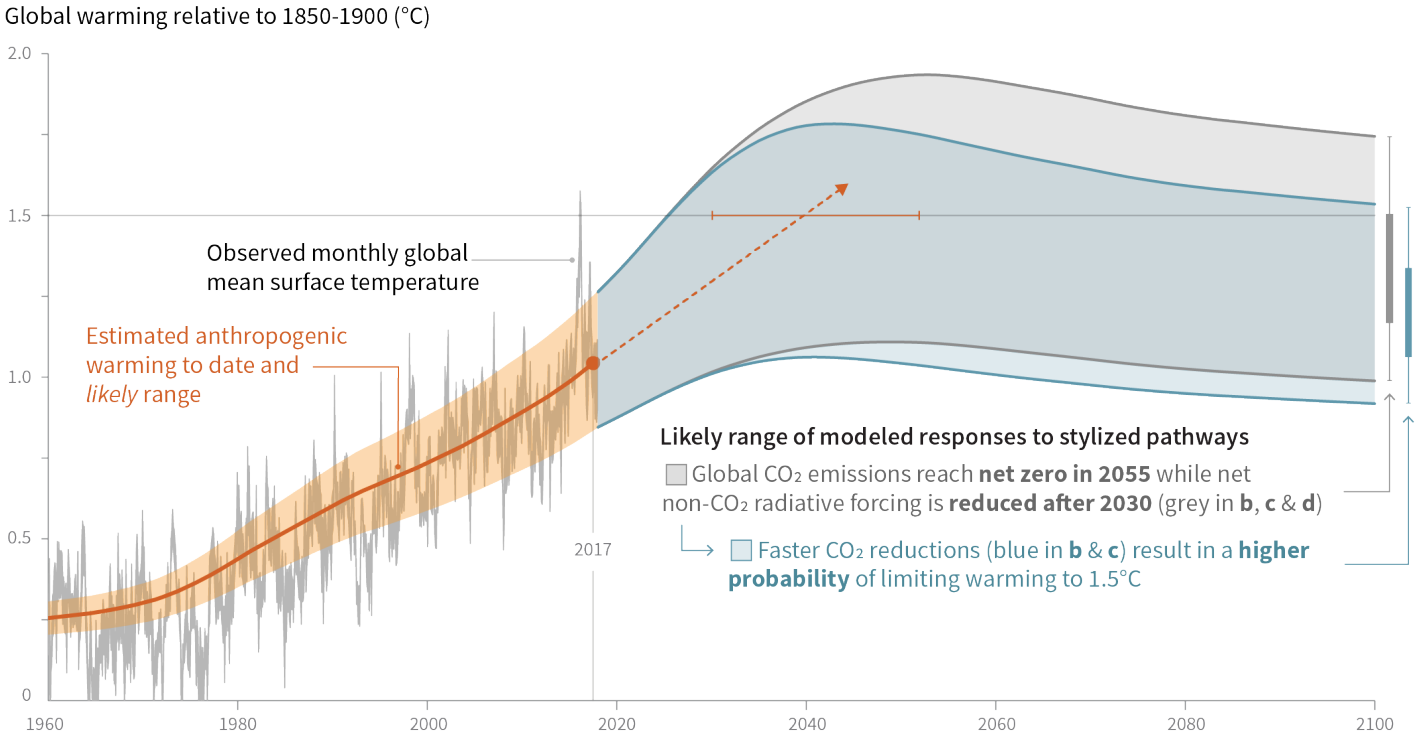

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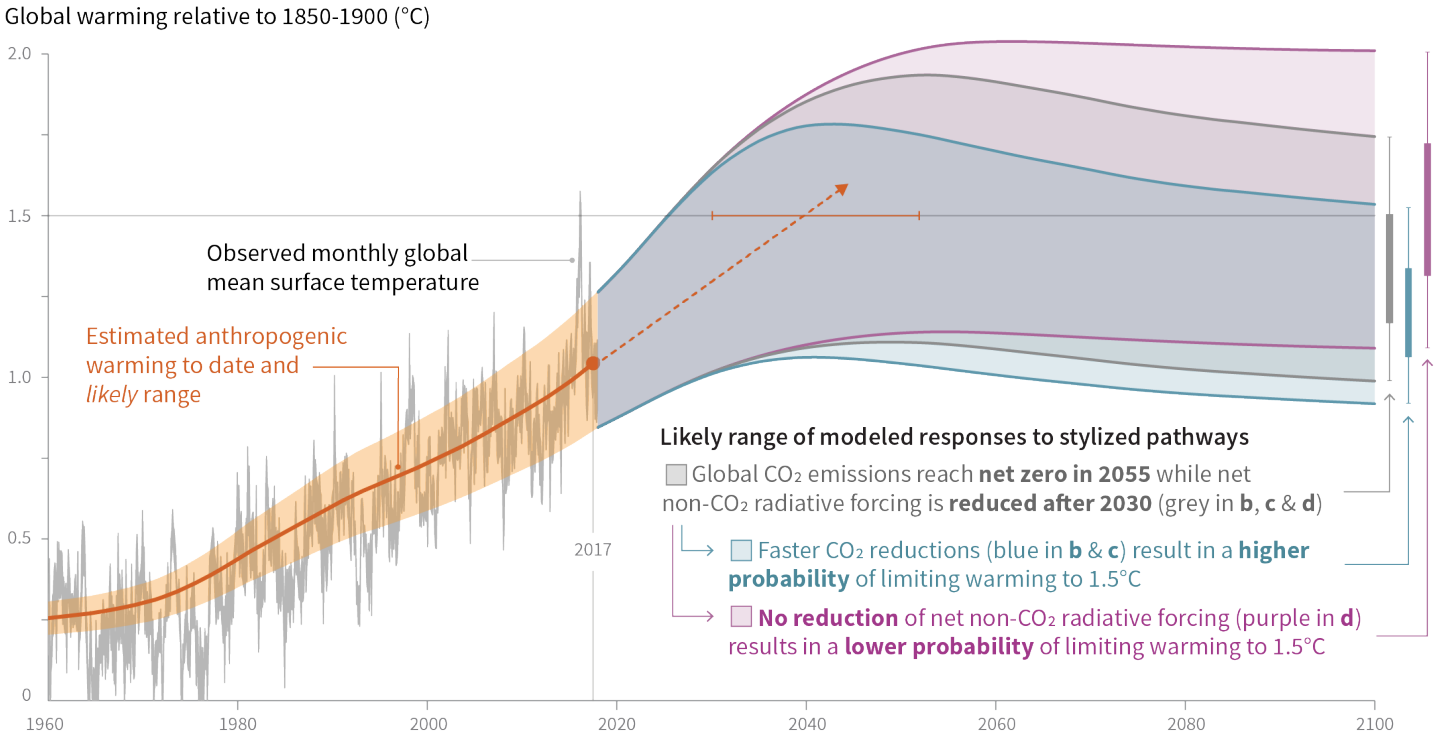

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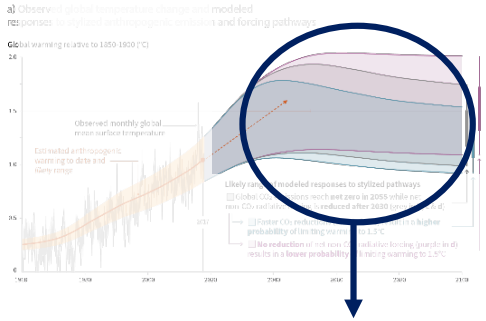
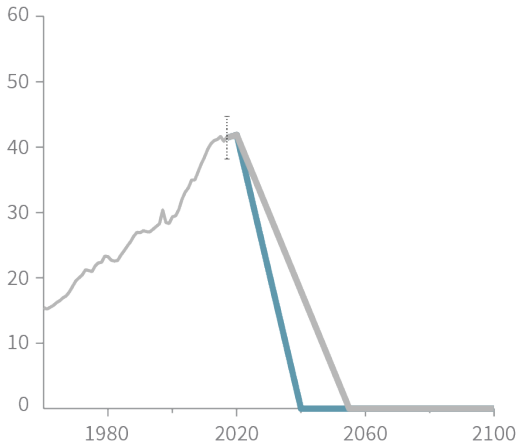


b) Stylized net global CO_2 emission pathways
Billion tonnes CO_2 per year ($GtCO_2$/yr)



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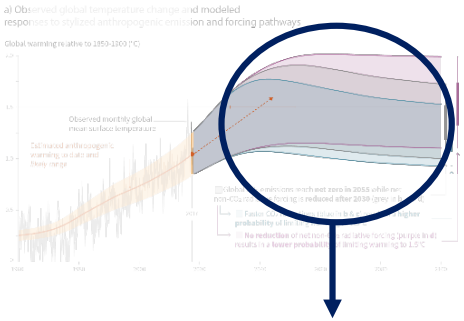

Faster immediate CO_2 emission reductions limit cumulative CO_2 emissions

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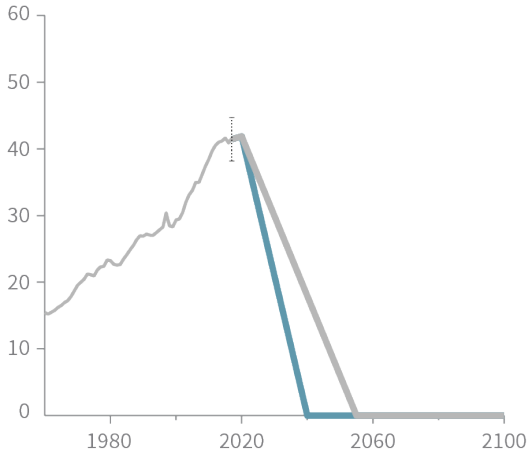
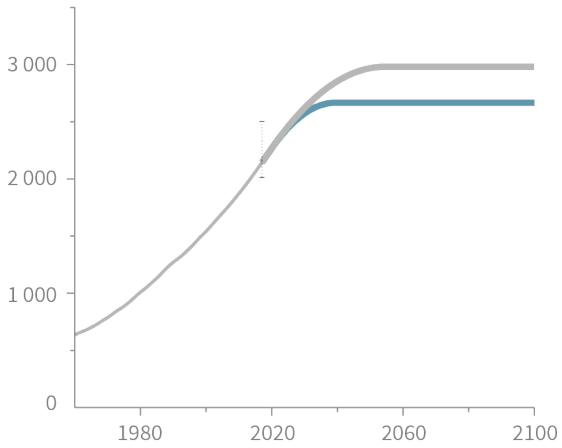


c) Cumulative net CO_2 emissions
Billion tonnes CO_2 ($GtCO_2$)



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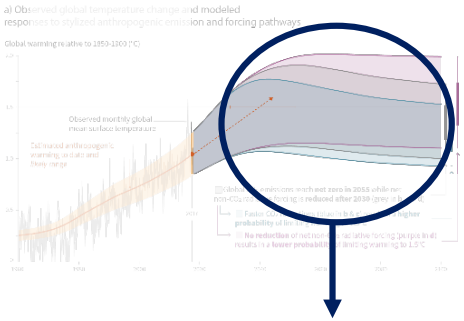
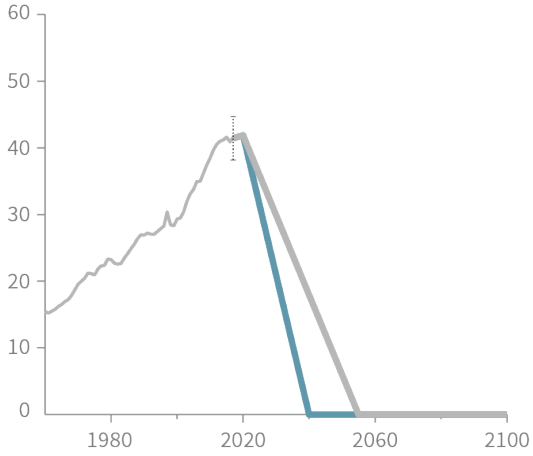


Maximum temperature rise is determined by cumulative net CO_2 emissions and net non-CO_2 radiative forcing due to methane, nitrous oxide, aerosols and other anthropogenic forcing agents.

b) Stylized net global CO_2 emission pathways
Billion tonnes CO_2 per year ($GtCO_2$/yr)



c) Cumulative net CO_2 emissions
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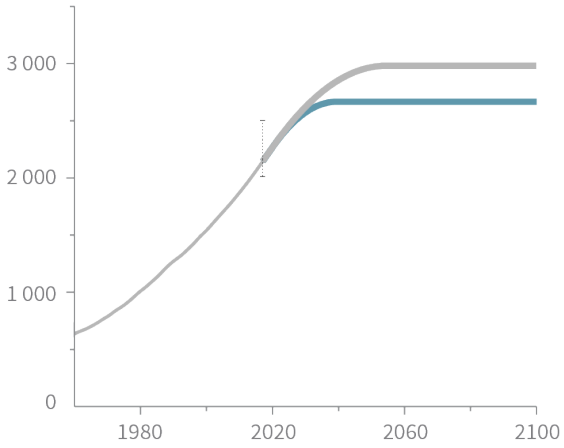
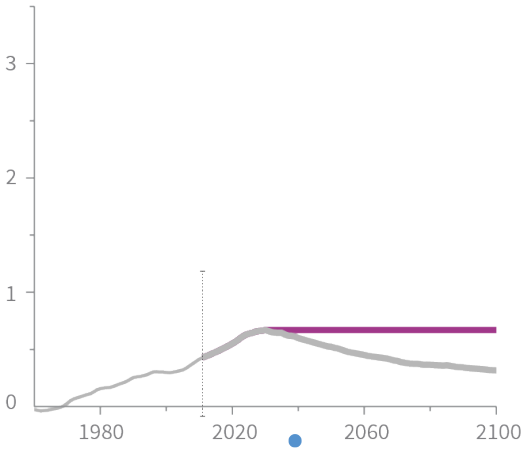
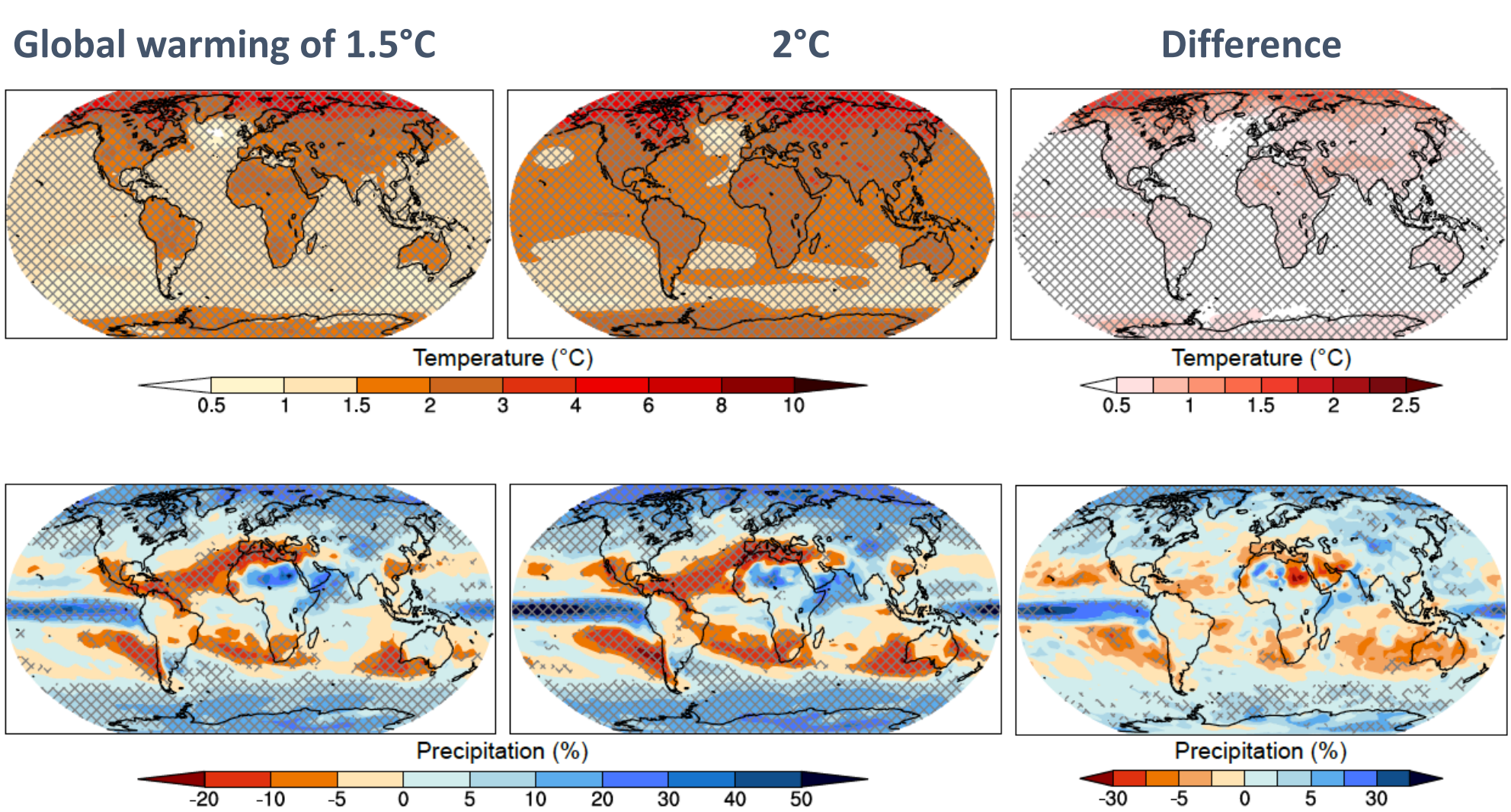


d) Non-CO_2 radiative forcing pathways
Watts per square metre (W/m^2)

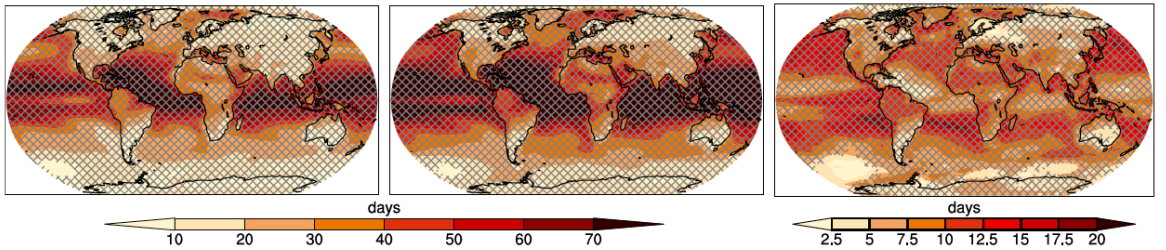
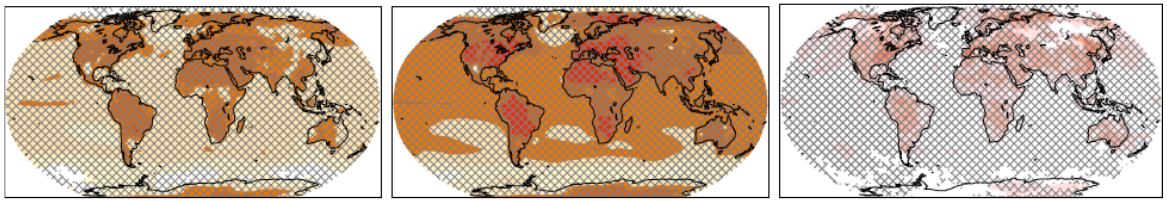
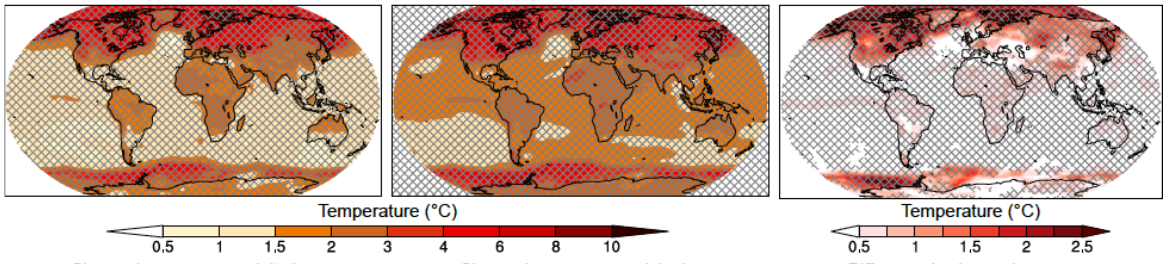
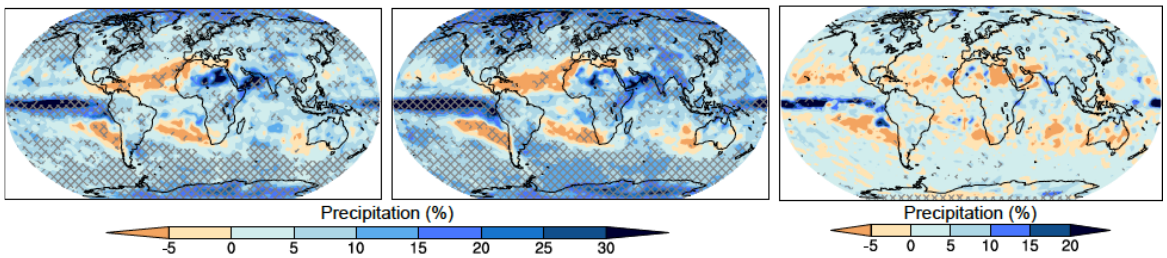


Spatial patterns of changes in mean temperature and precipitation



26 CMIP5 models; hatching : 66% model agreement

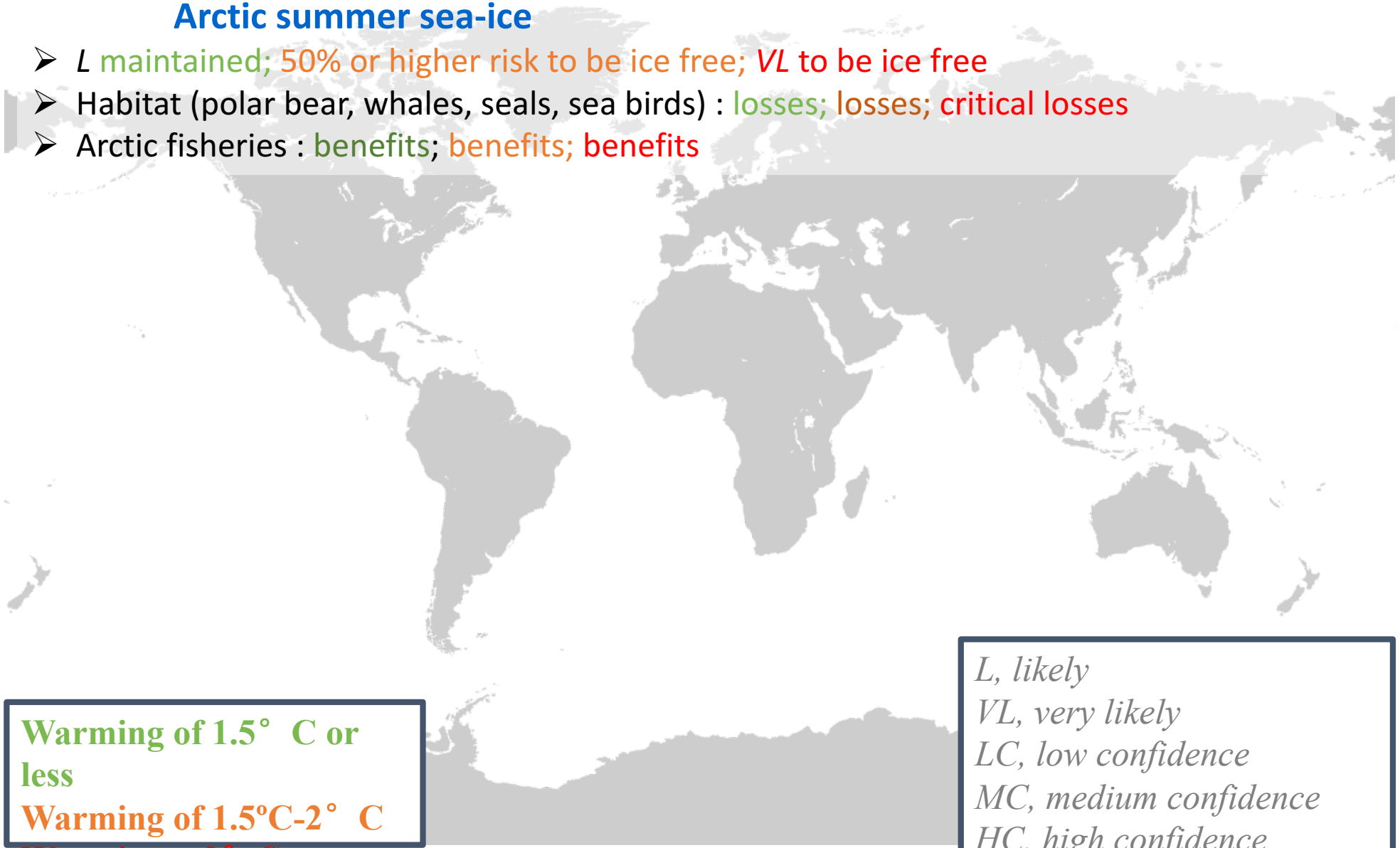
Spatial patterns of changes in extreme temperature and precipitation

	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 (%)			

Emergence and intensity of regional climate change hot spots

Arctic summer sea-ice

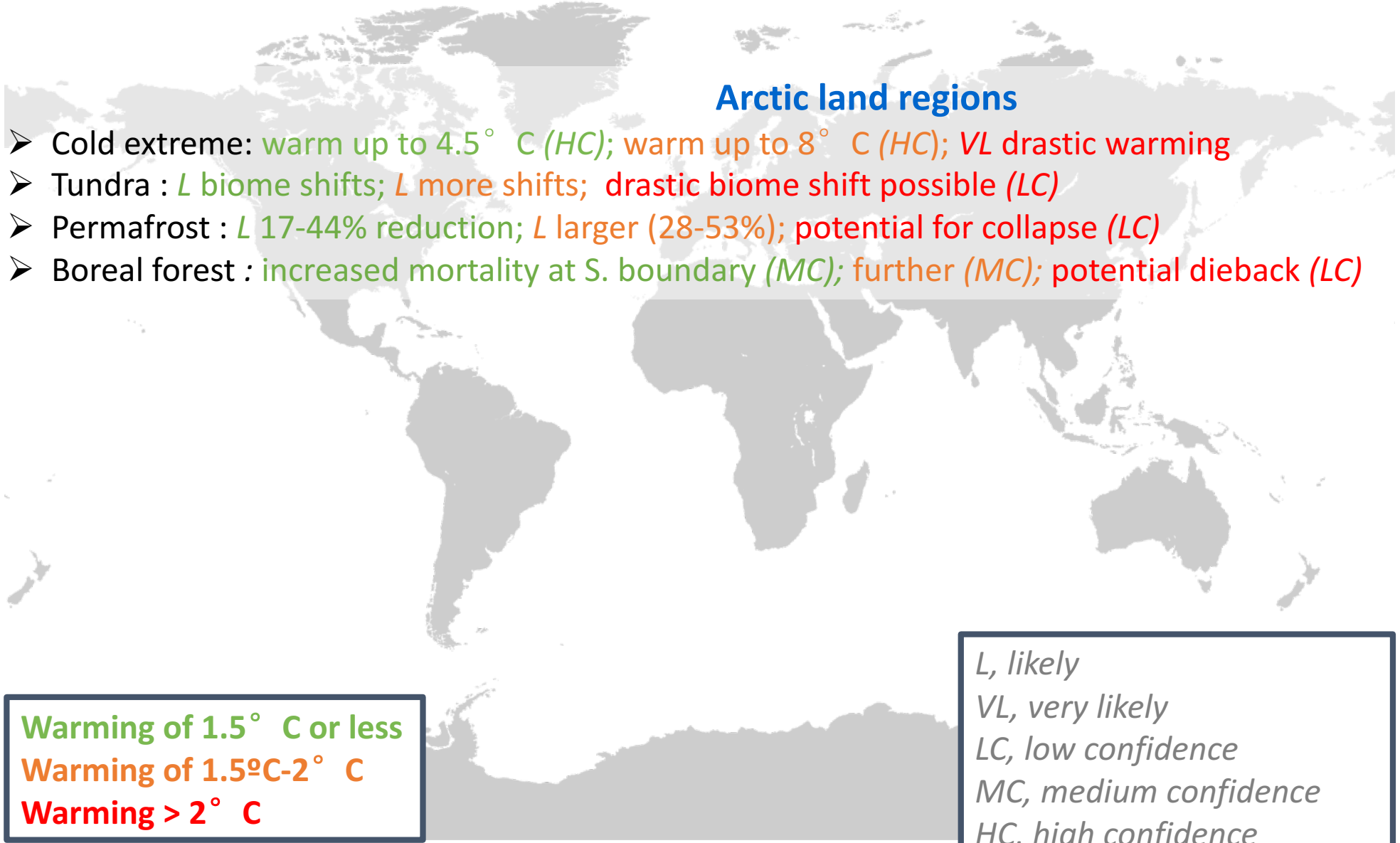
- *L* maintained; 50% or higher risk to be ice free; *VL* to be ice free
- Habitat (polar bear, whales, seals, sea birds) : losses; losses; critical losses
- Arctic fisheries : benefits; benefits; benefits



Warming of 1.5° C or less
Warming of 1.5°C-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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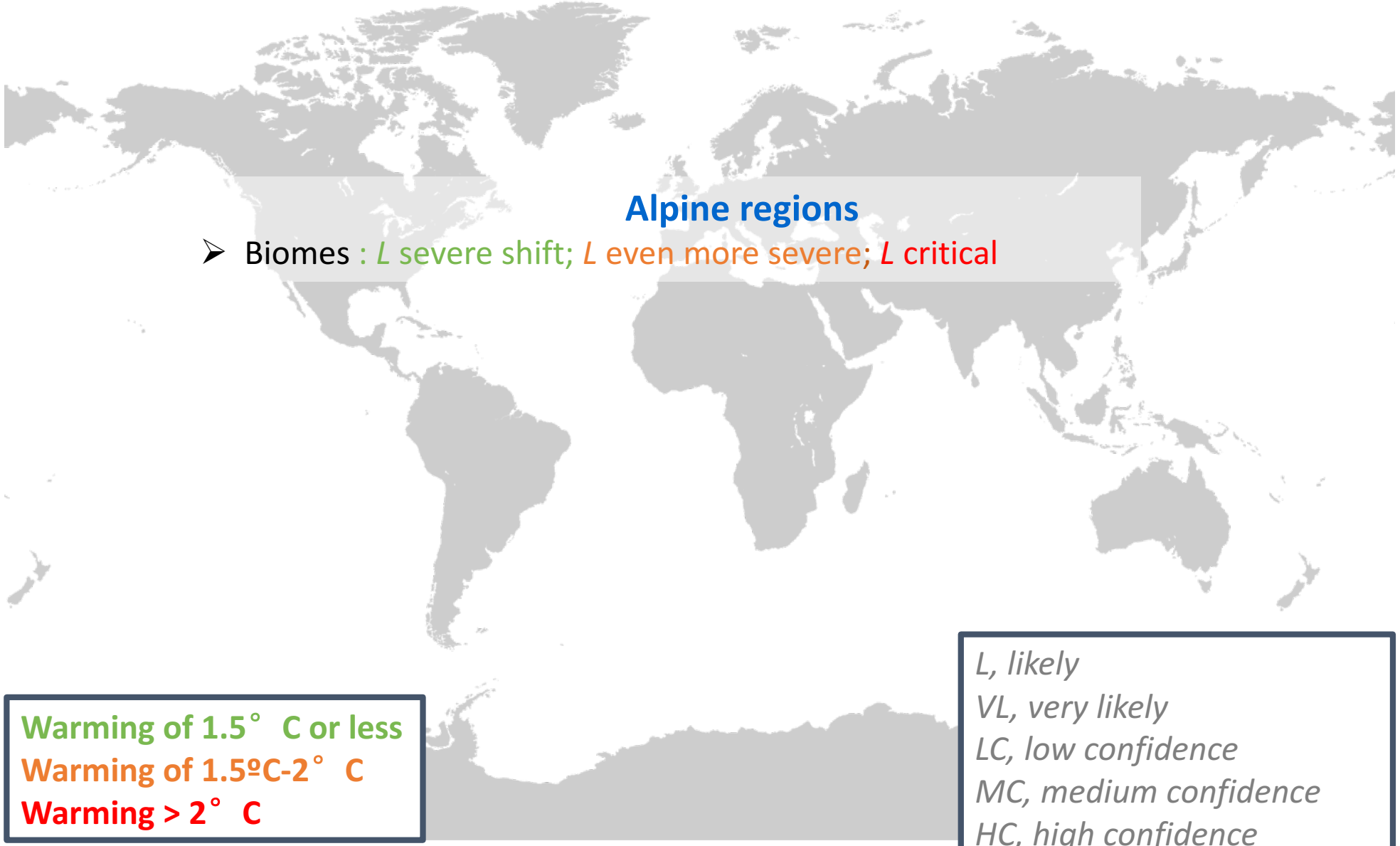

Alpine regions

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

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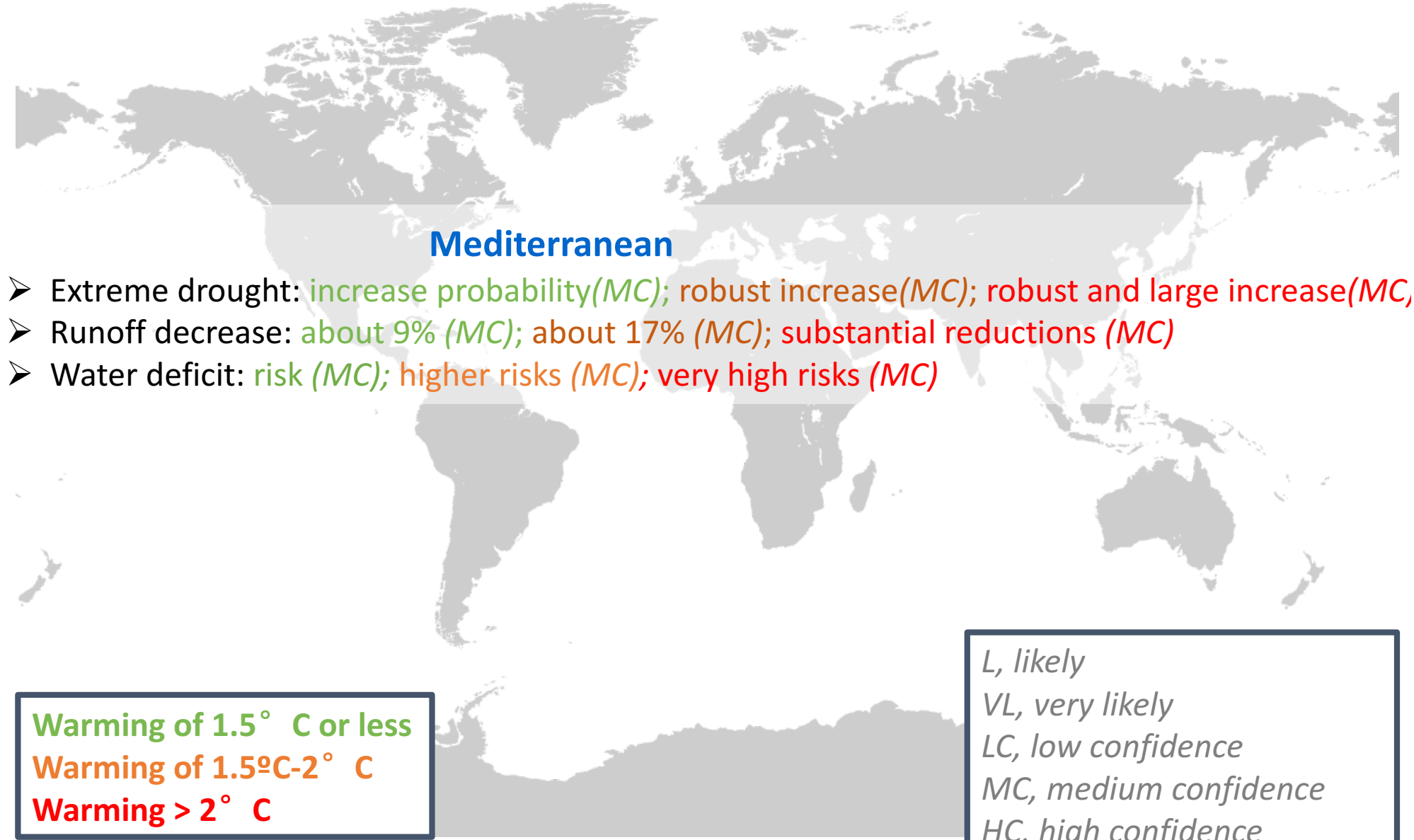

Mediterranean

- 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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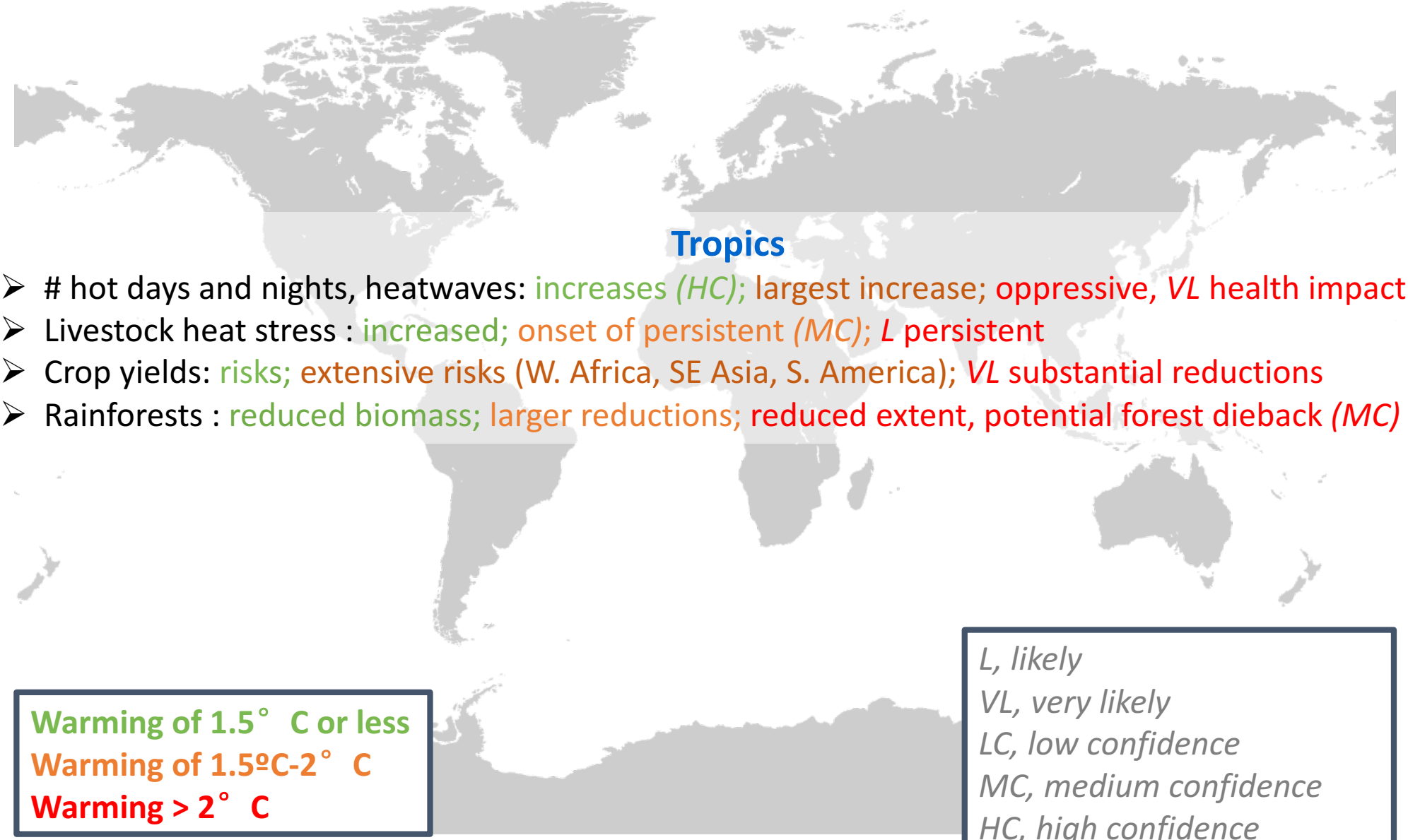

Tropics

- # 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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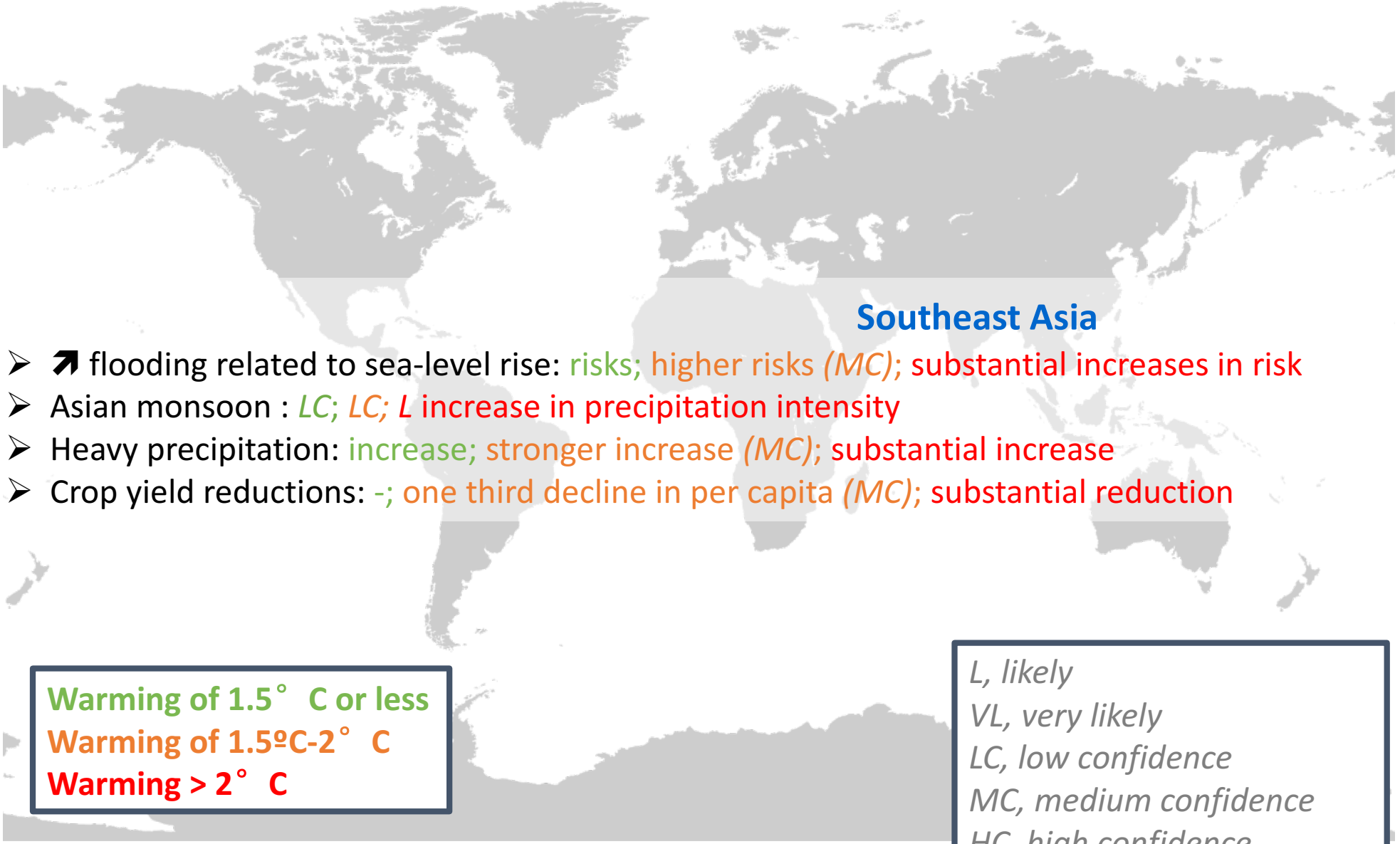

Southeast Asia

- ↗ 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

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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

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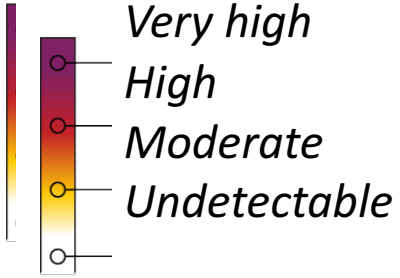
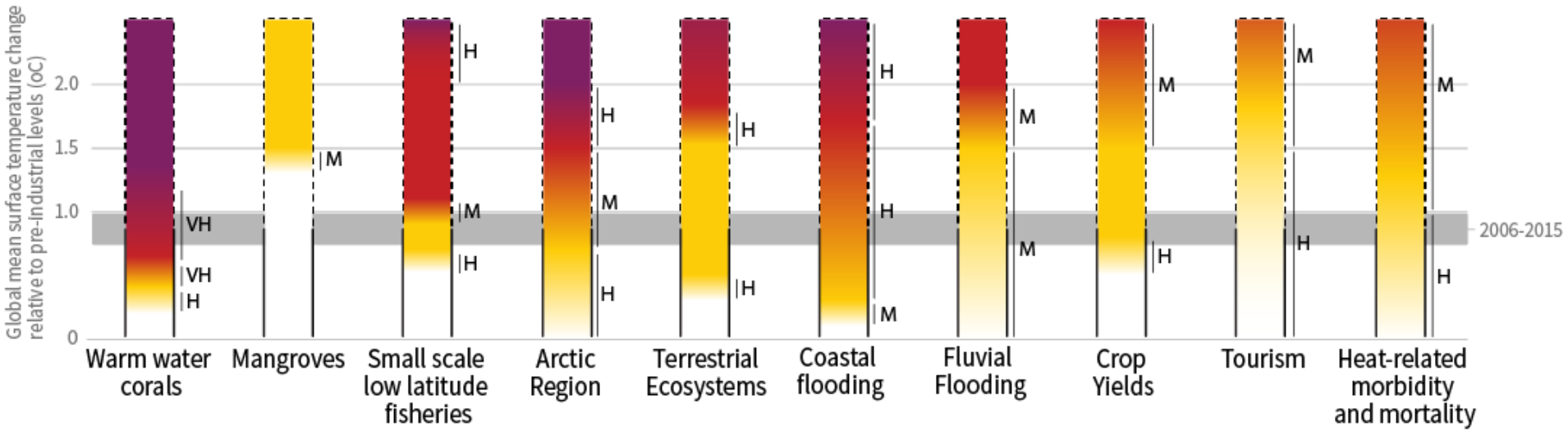
Small islands:

- 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?

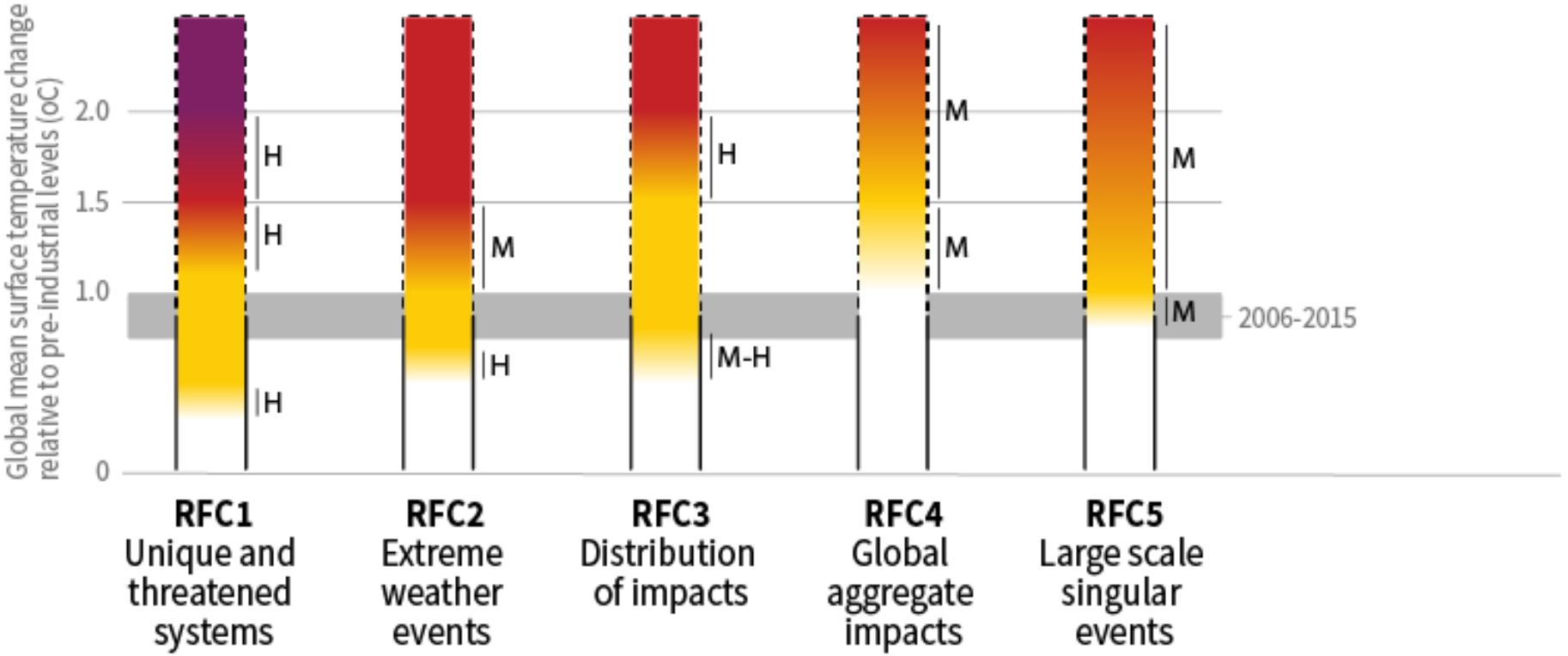


Impacts and risks for selected natural, managed and human systems



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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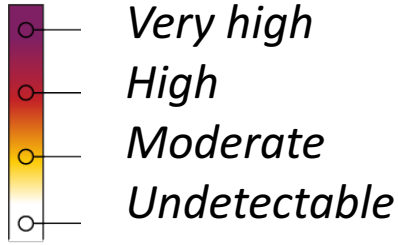
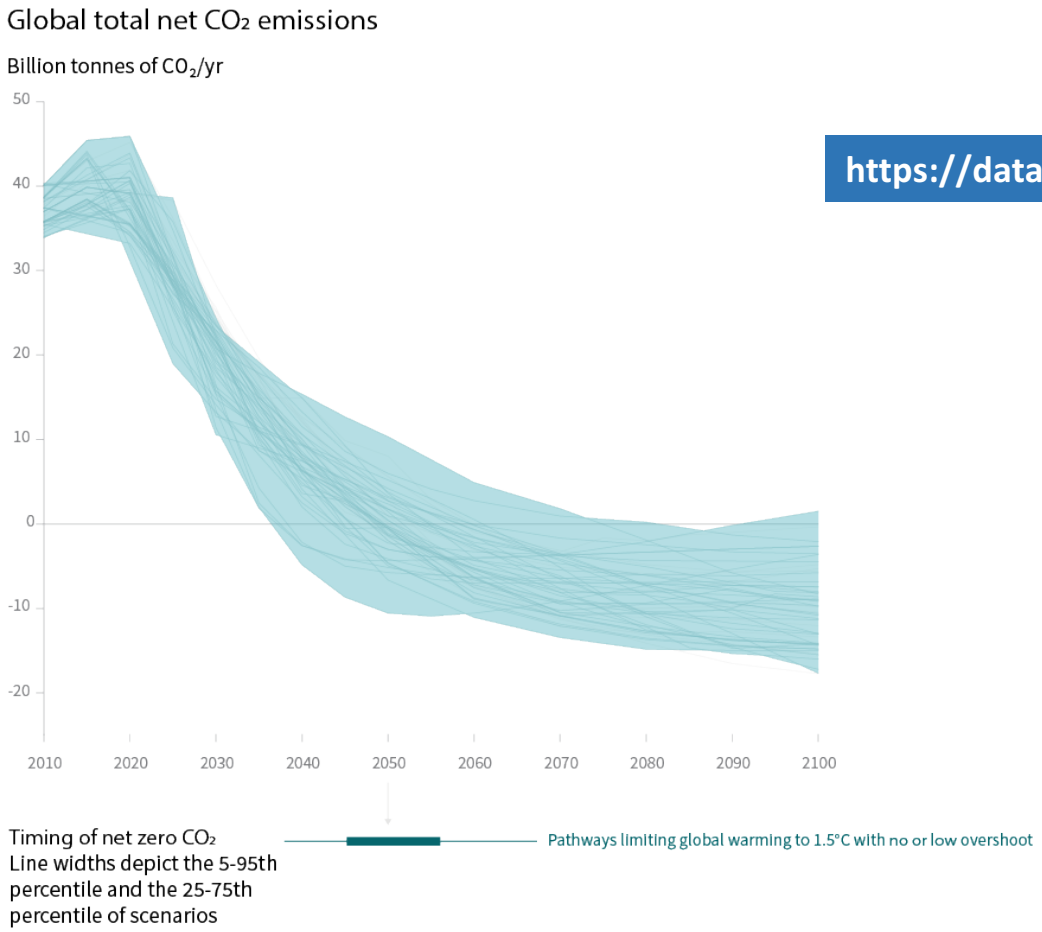


Jason Florio / Aurora Photos

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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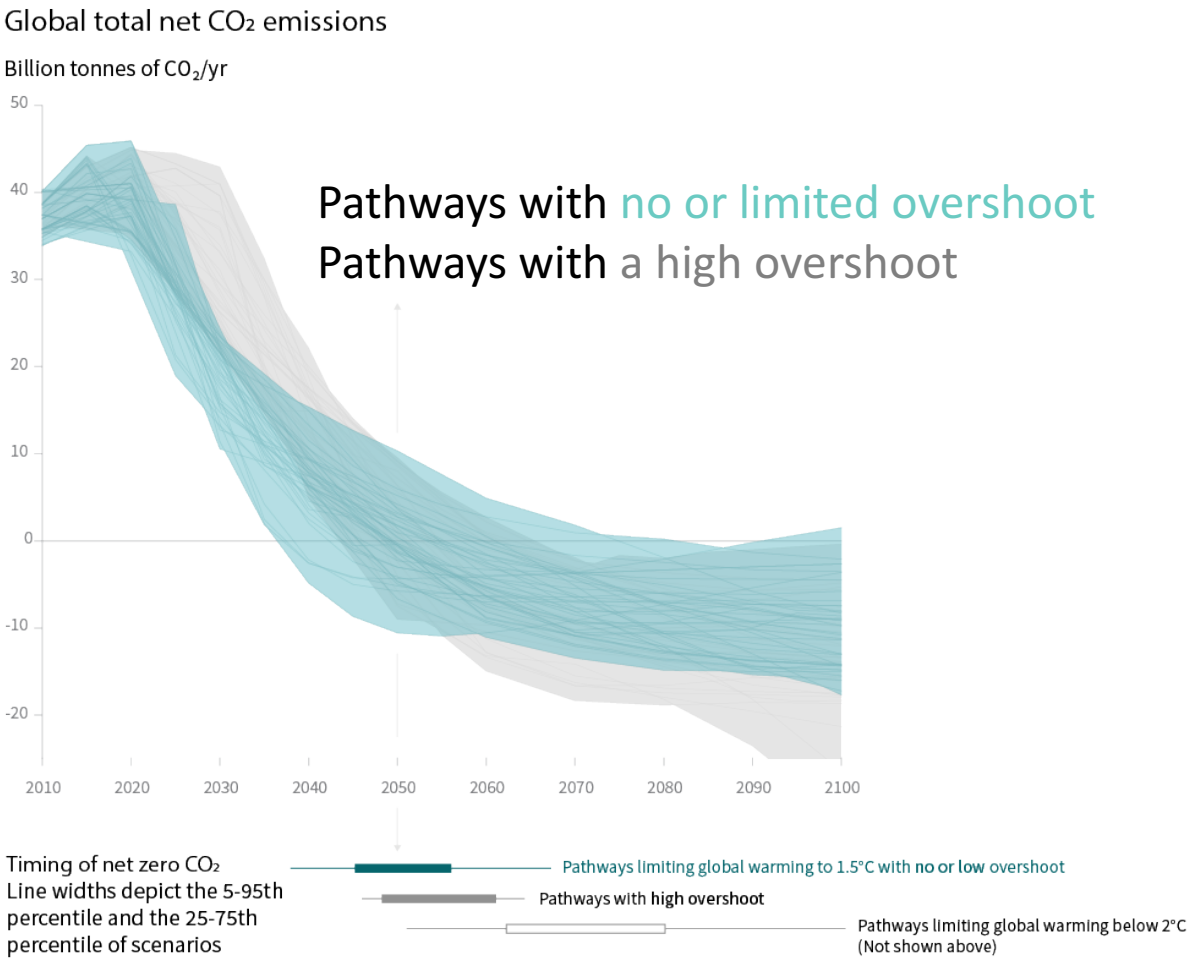

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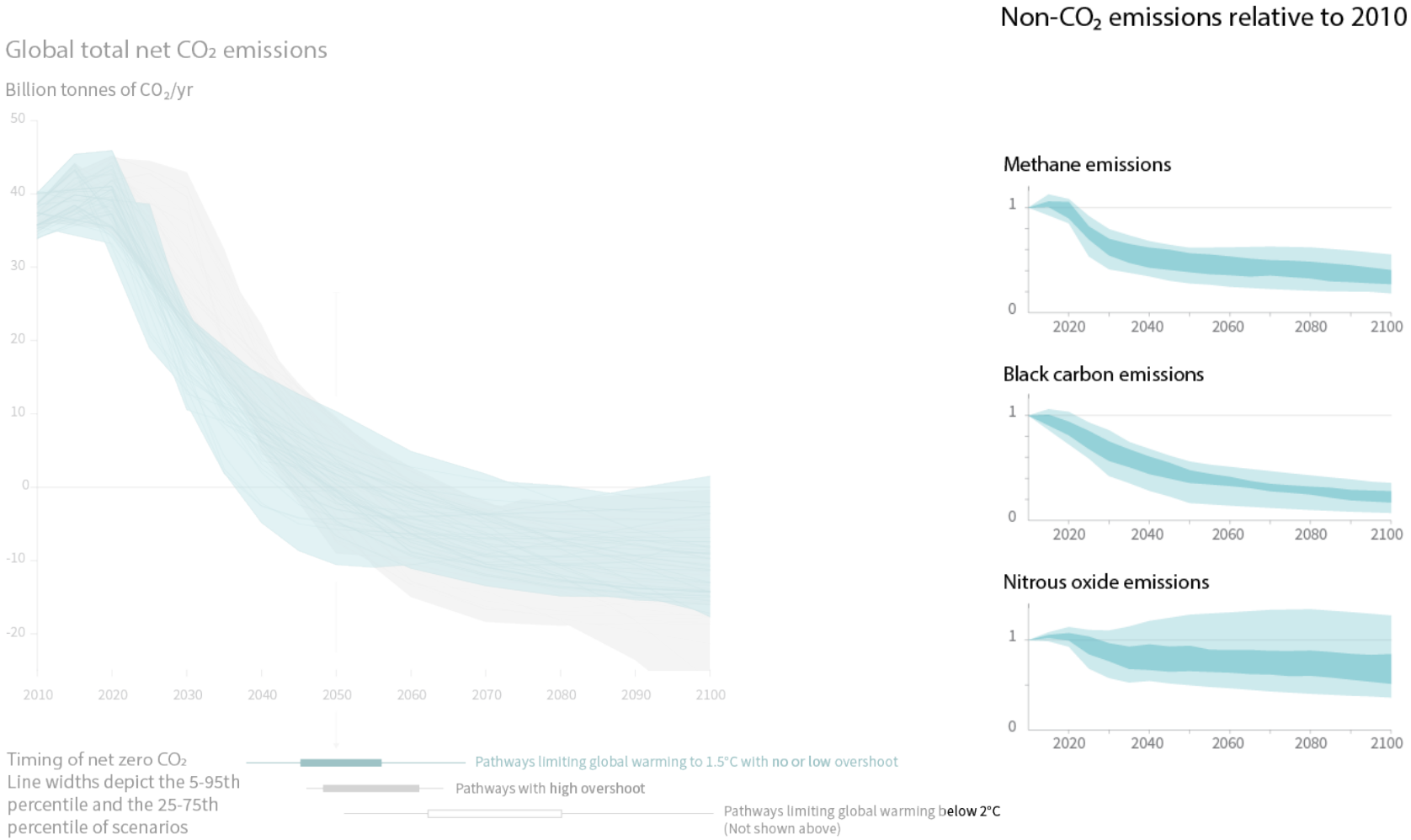

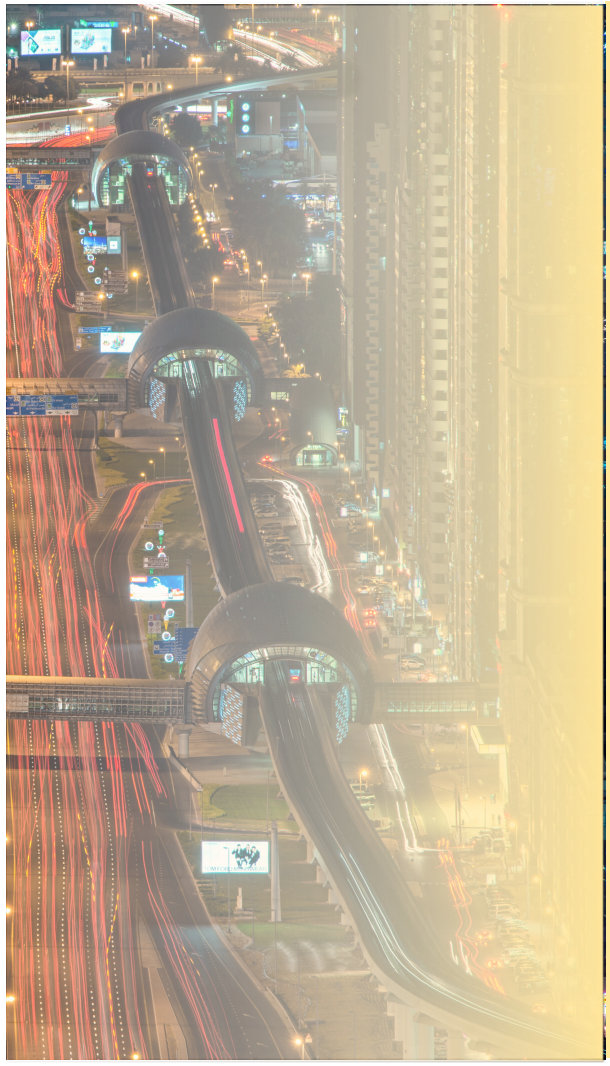

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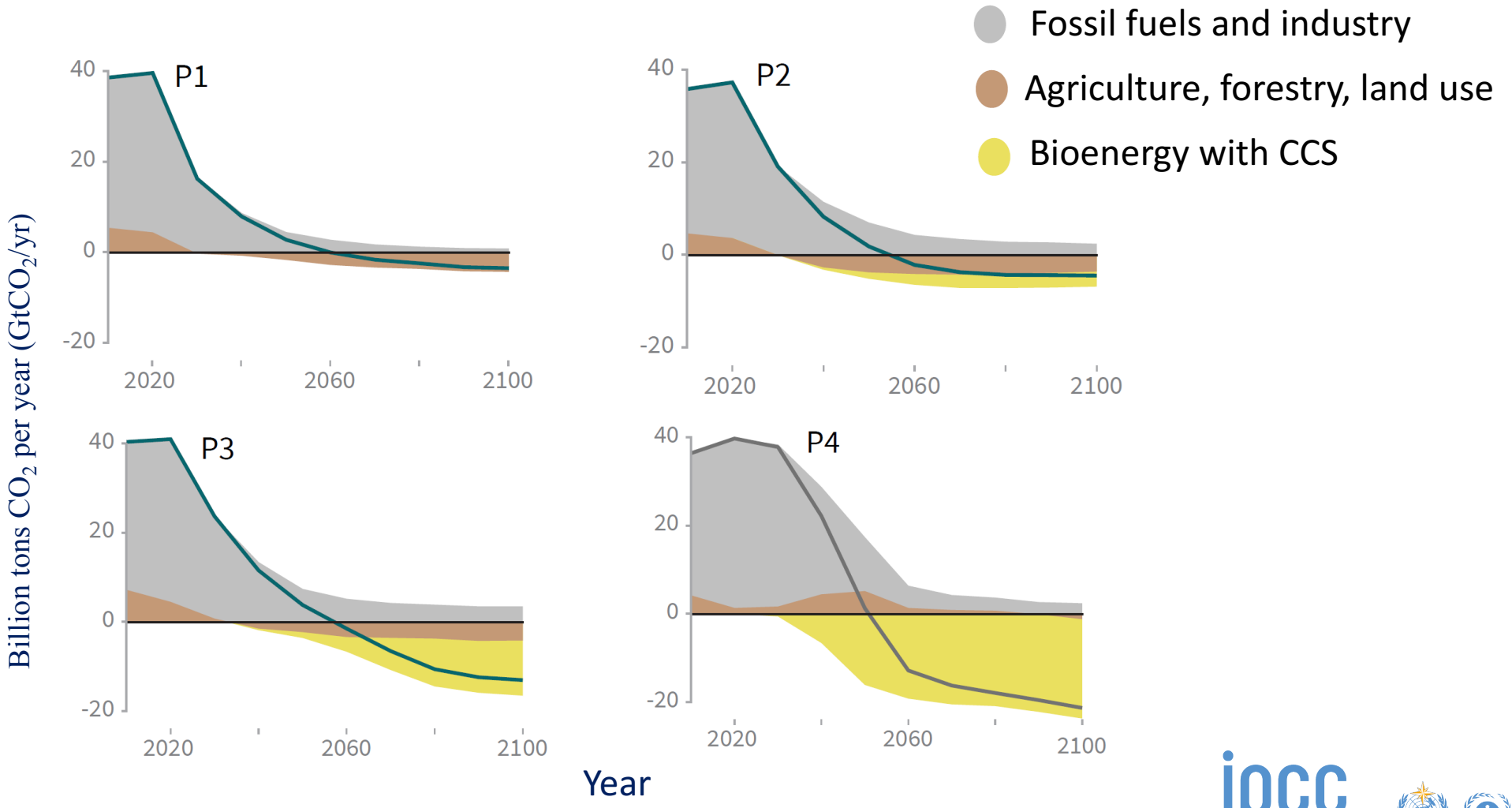
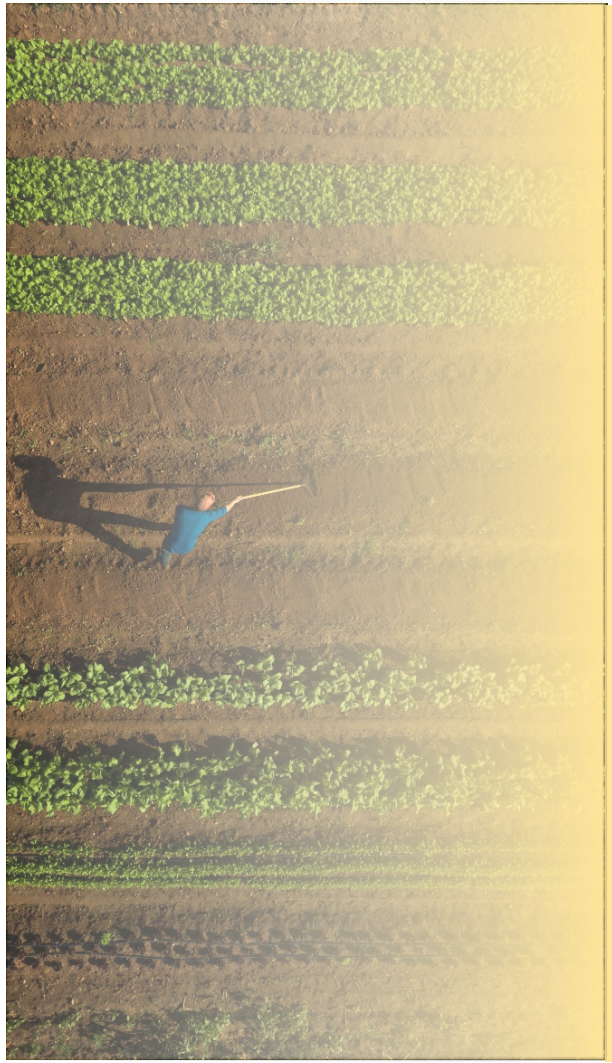
Limiting warming to 1.5°C

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

Four illustrative model pathways

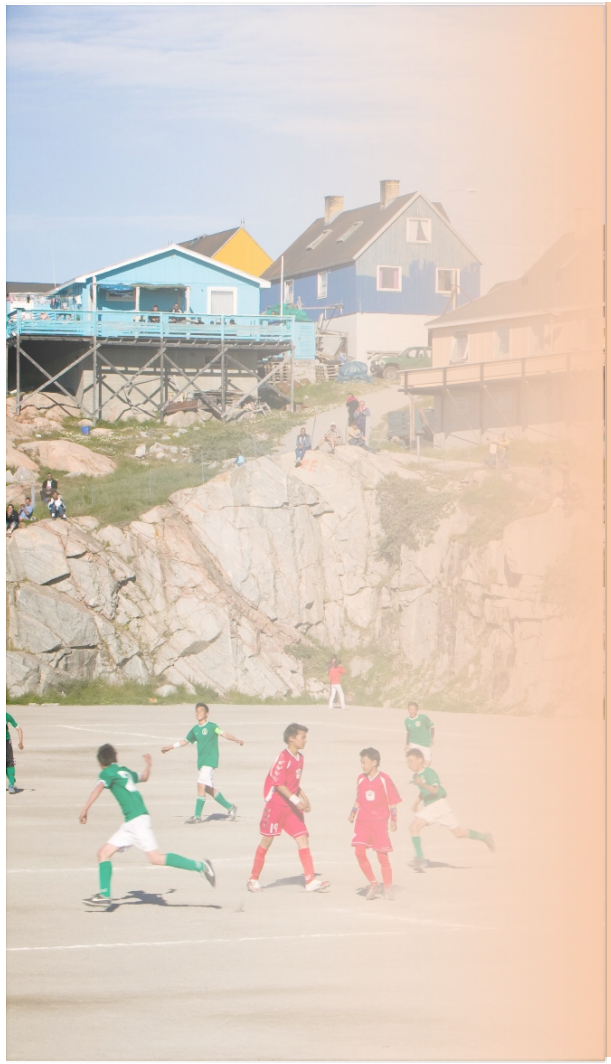




Peter Essick / Aurora Photos

Where are we?

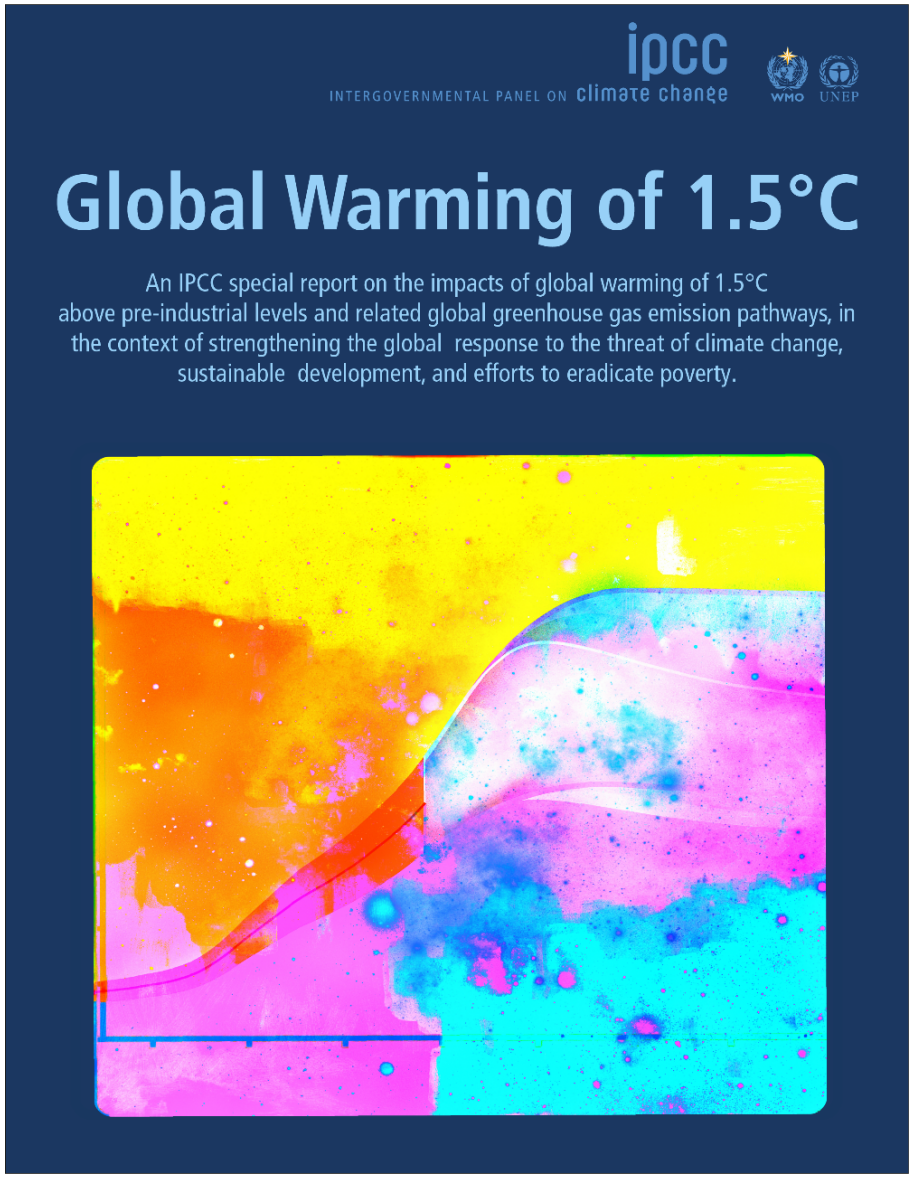
- National pledges are not enough to limit warming to 1.5°C
- Avoiding warming of more than 1.5°C would require carbon dioxide emissions to decline substantially before 2030



Ashley Cooper/ Aurora Photos

Climate change and sustainability

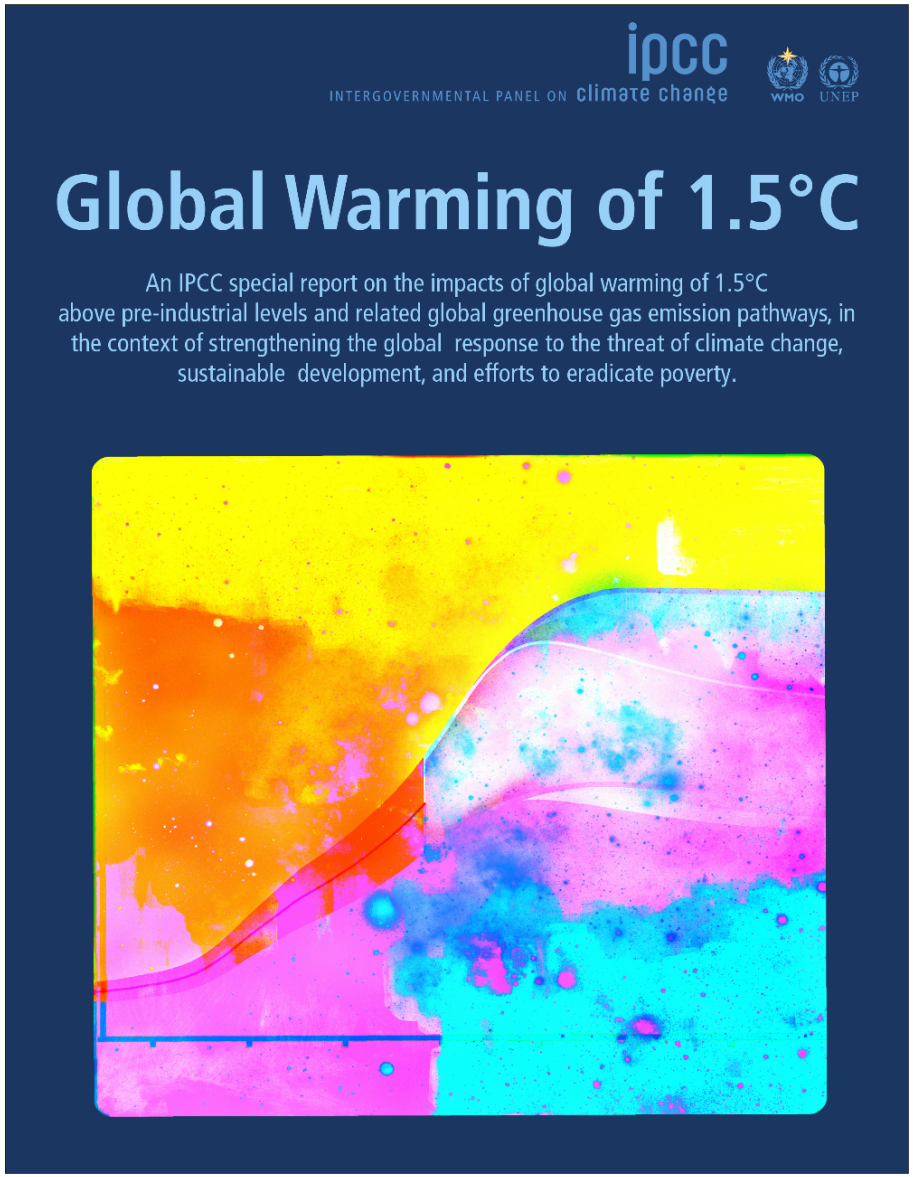
- Ethical and fair transitions
- Different pathways have different synergies and trade-offs with UN Sustainable Development Goals (SDGs)
- Careful mix of measures to adapt to climate change and reduce emissions can help achieve SDGs
- Low energy demand, low material consumption and low carbon food carry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



Every half a degree matters

Every year matters

Every choice matters



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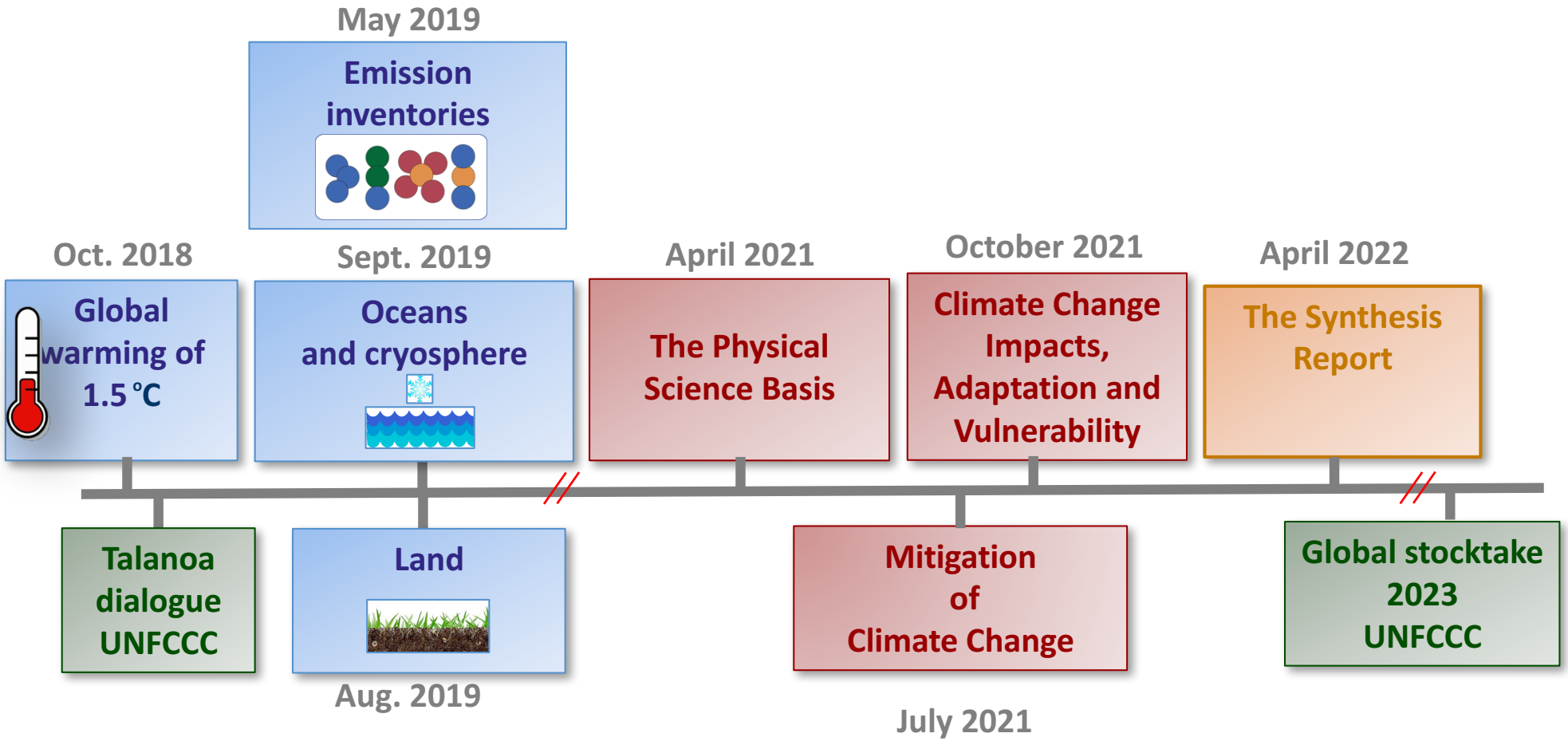
Summary for Policy Makers

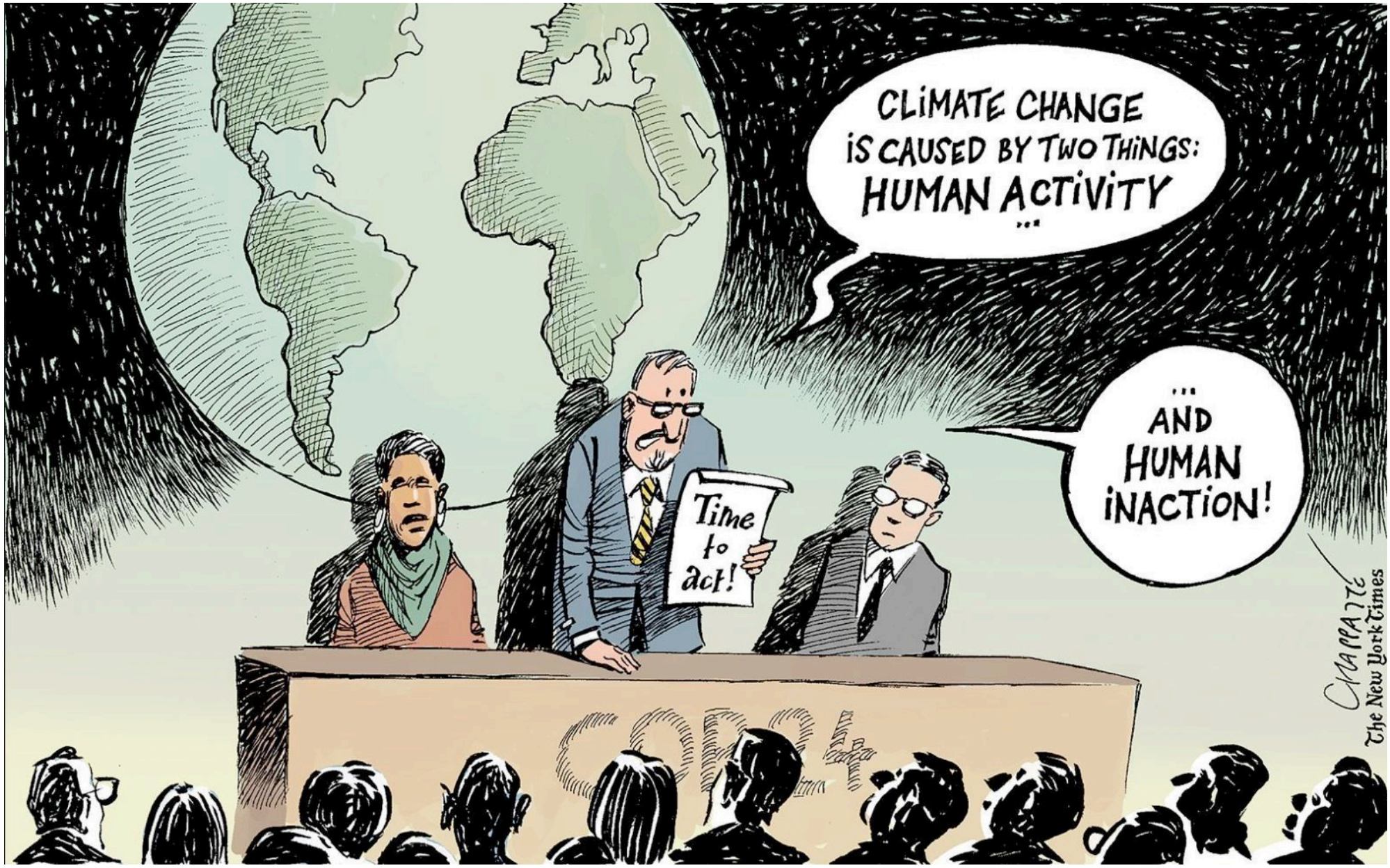
10 Frequently Asked Questions

5 Chapters

Glossary



The IPCC Sixth Assessment Cycle


CLIMATE CHANGE IS CAUSED BY TWO THINGS: HUMAN ACTIVITY ...
... AND HUMAN INACTION!
Time to act!
COP27
CAGLE
The New York Times

Thank you for your attention

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