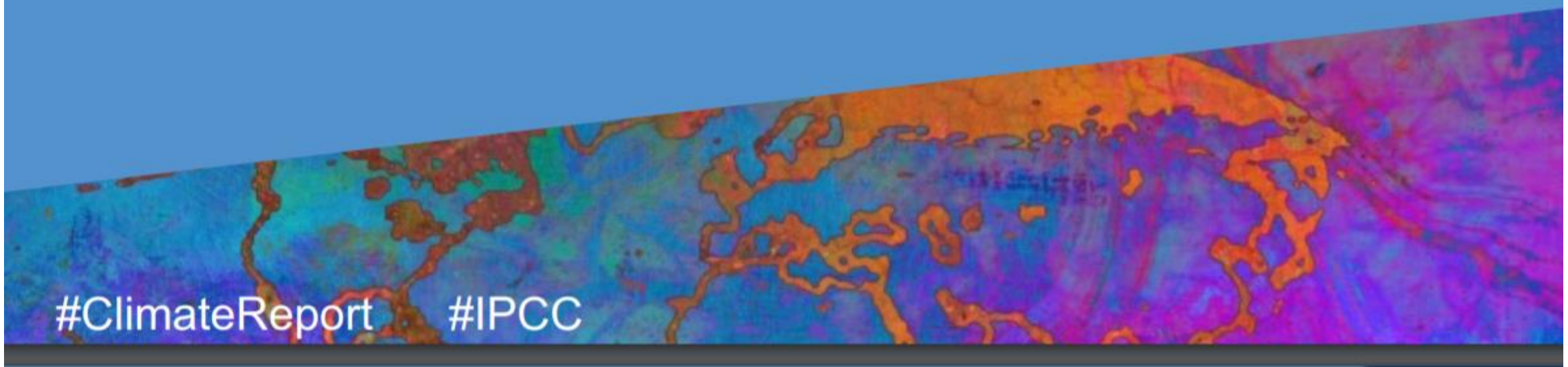
SIXTH ASSESSMENT REPORT
Working Group I – The Physical Science Basis

ipcc
INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

# Outreach Presentation

## 9th August 2021



[Credit: NASA]

"Recent changes in the climate are widespread, rapid, and intensifying, and unprecedented in thousands of years.

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[Credit: Peter John Maridable | Unsplash]

"Unless there are immediate, rapid, and large-scale reductions in greenhouse gas emissions, limiting warming to 1.5°C will be beyond reach.

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[Credit: Yoda Adaman | Unsplash]

"It is indisputable that human activities are causing climate change, making extreme climate events, including heat waves, heavy rainfall, and droughts, more frequent and severe.

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[Credit: Hong Nguyen | Unsplash]

"Climate change is already affecting every region on Earth, in multiple ways.

The changes we experience will increase with further warming.

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[Credit: Jenn Caselle | UCSB]

"There's no going back from some changes in the climate system…

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[Credit: Andy Mahoney | NSIDC]

"...However, some changes could be slowed and others could be stopped by limiting warming.

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[Credit: Bhari Gearheard | NSIDC]

"There's no going back from some changes in the climate system. However, some changes could be slowed and others could be stopped by limiting warming.

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[Credit: Evgeny Nelmin | Unsplash]

“

To limit global warming, strong, rapid, and sustained reductions in $CO_2$, methane, and other greenhouse gases are necessary.

This would not only reduce the consequences of climate change but also improve air quality.

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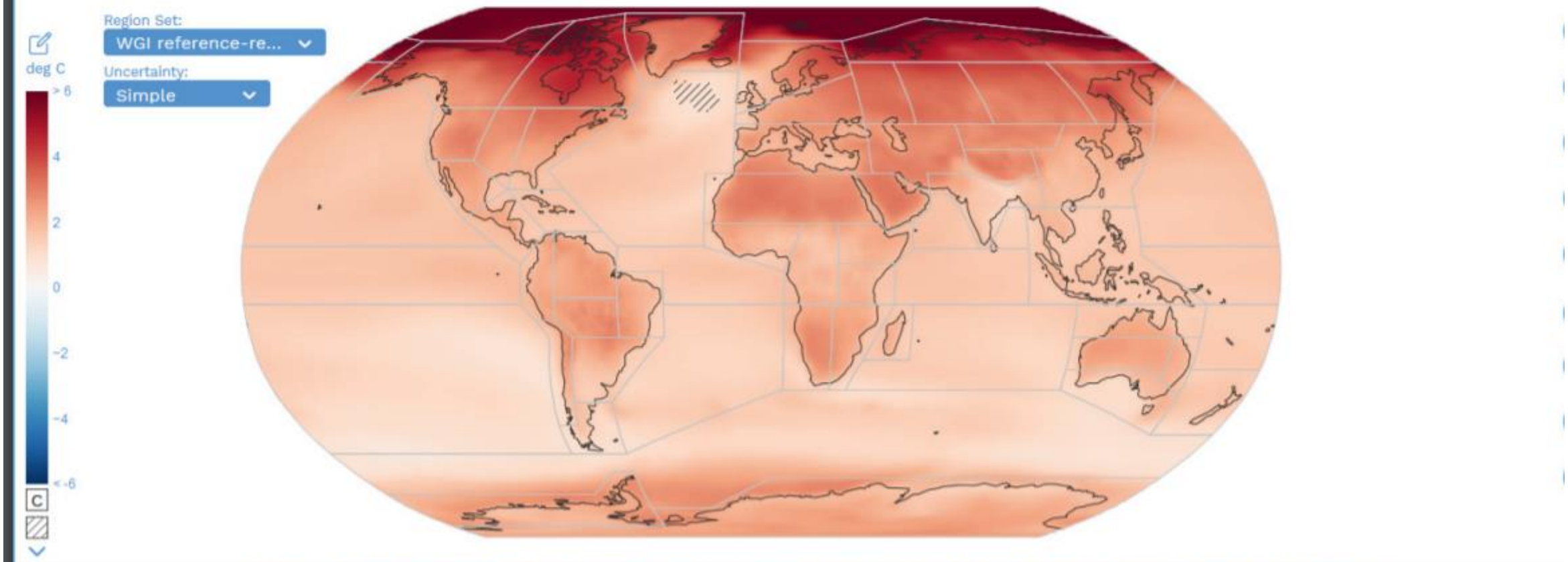
# Interactive Atlas

interactive-atlas.ipcc.ch

DATASET | VARIABLE | VALUE & PERIOD | SEASON

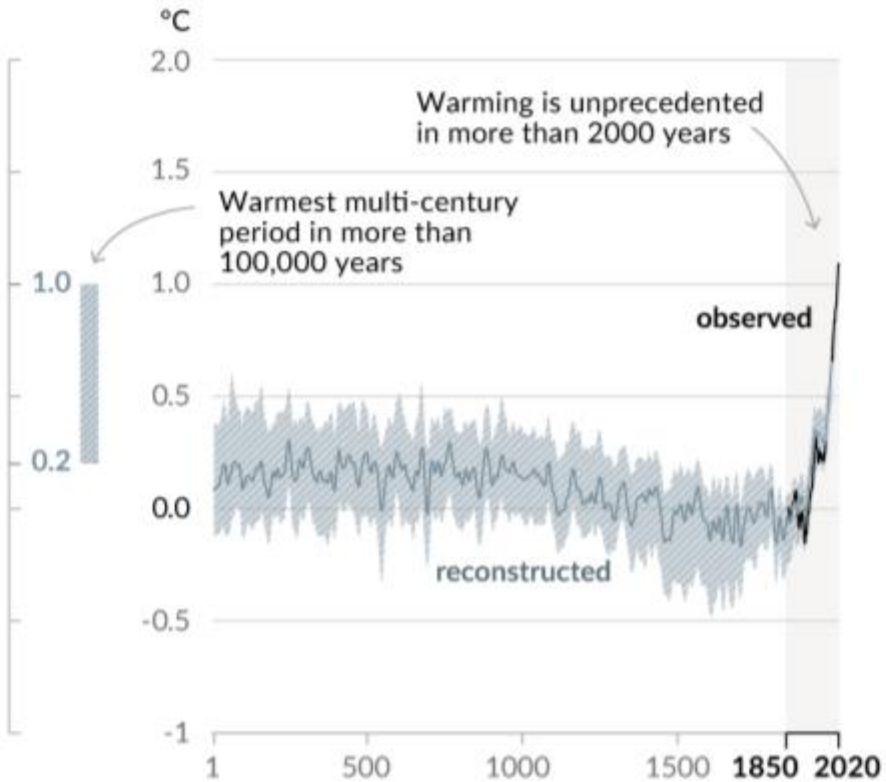



CMIP6 - Mean temperature (T) Change deg C - Warming 2°C SSP5 8.5 (rel. to 1850-1900) - Annual (34 models)

# Human influence has warmed the climate at a rate that is unprecedented in at least the last 2000 years

*Figure SPM.1*

a) Change in global surface temperature (decadal average) as reconstructed (1-2000) and **observed** (1850-2020)



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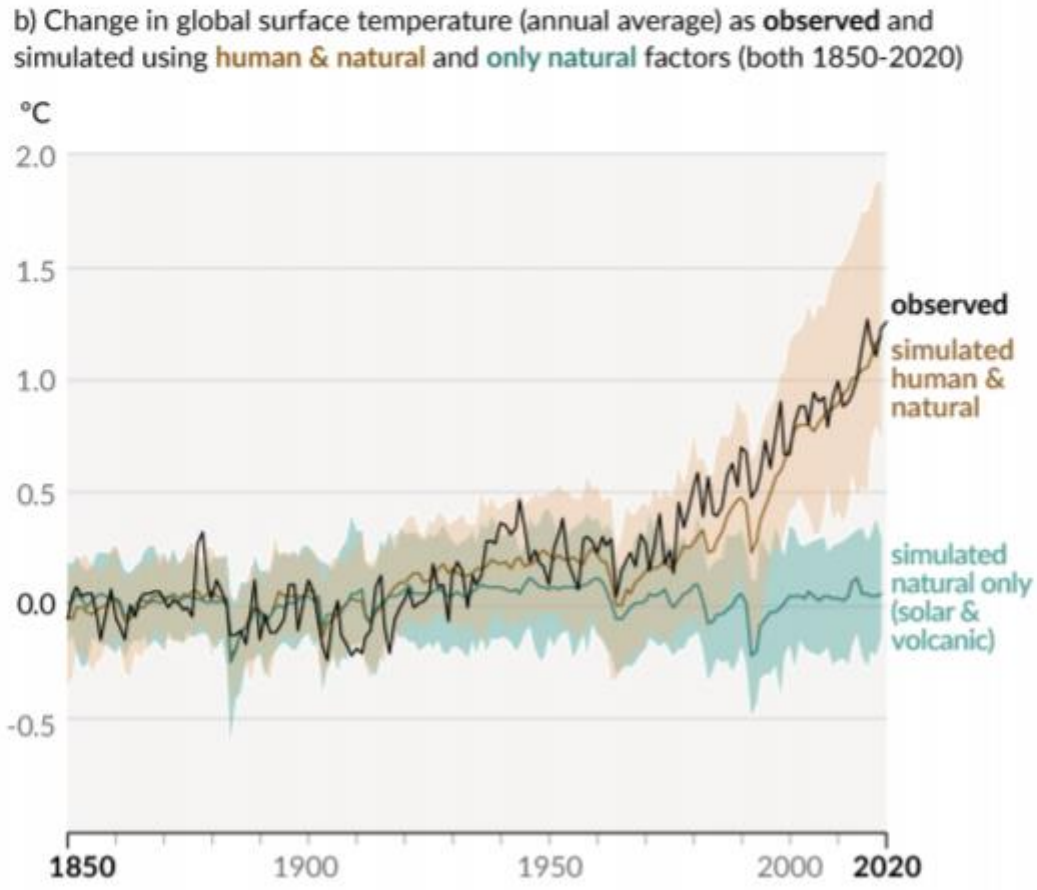
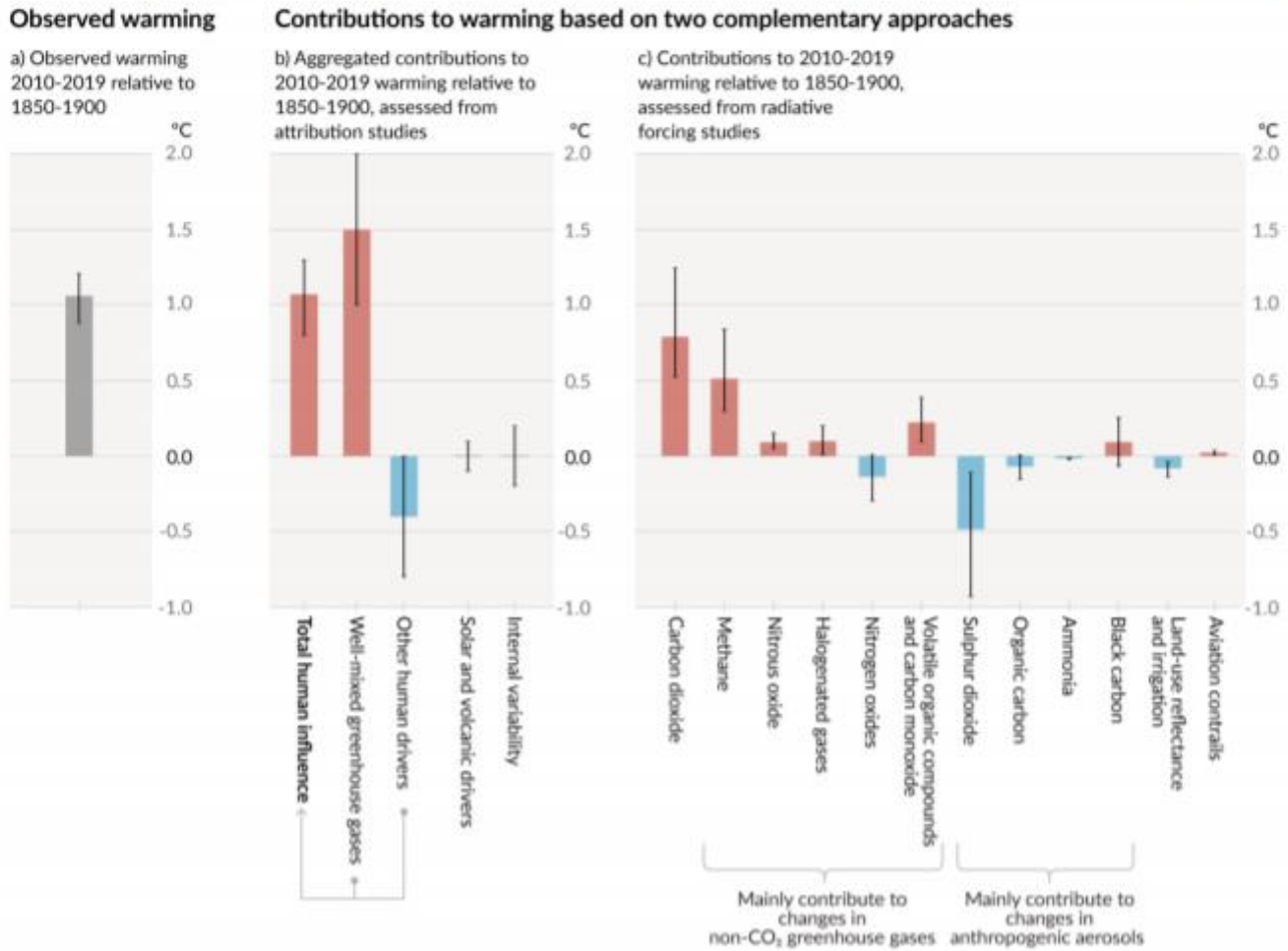


# Observed warming is driven by emissions from human activities, with greenhouse gas warming partly masked by aerosol cooling

*Figure SPM.2*



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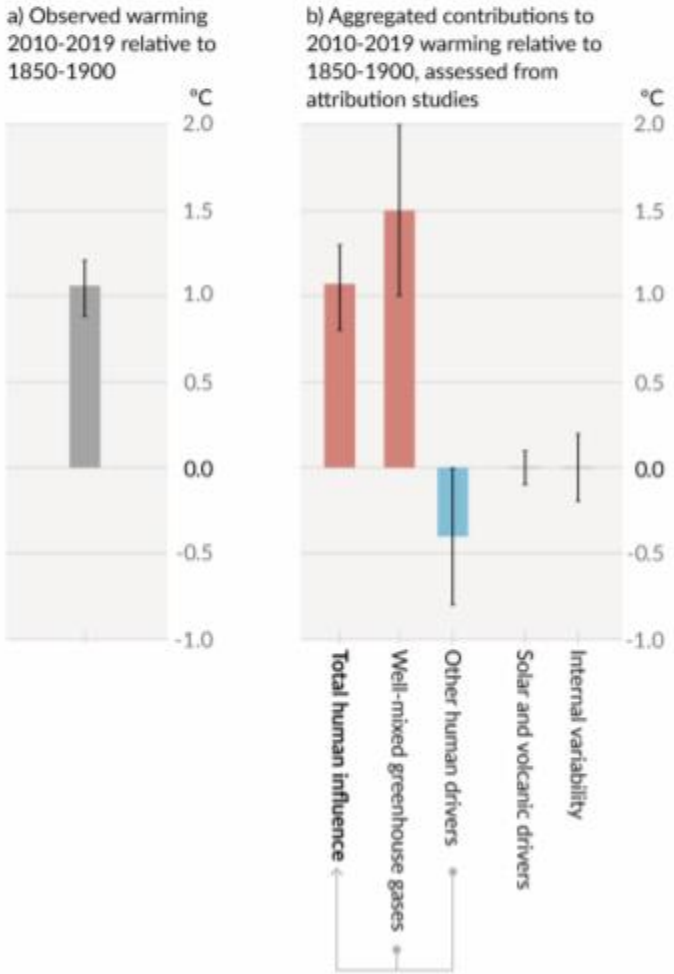

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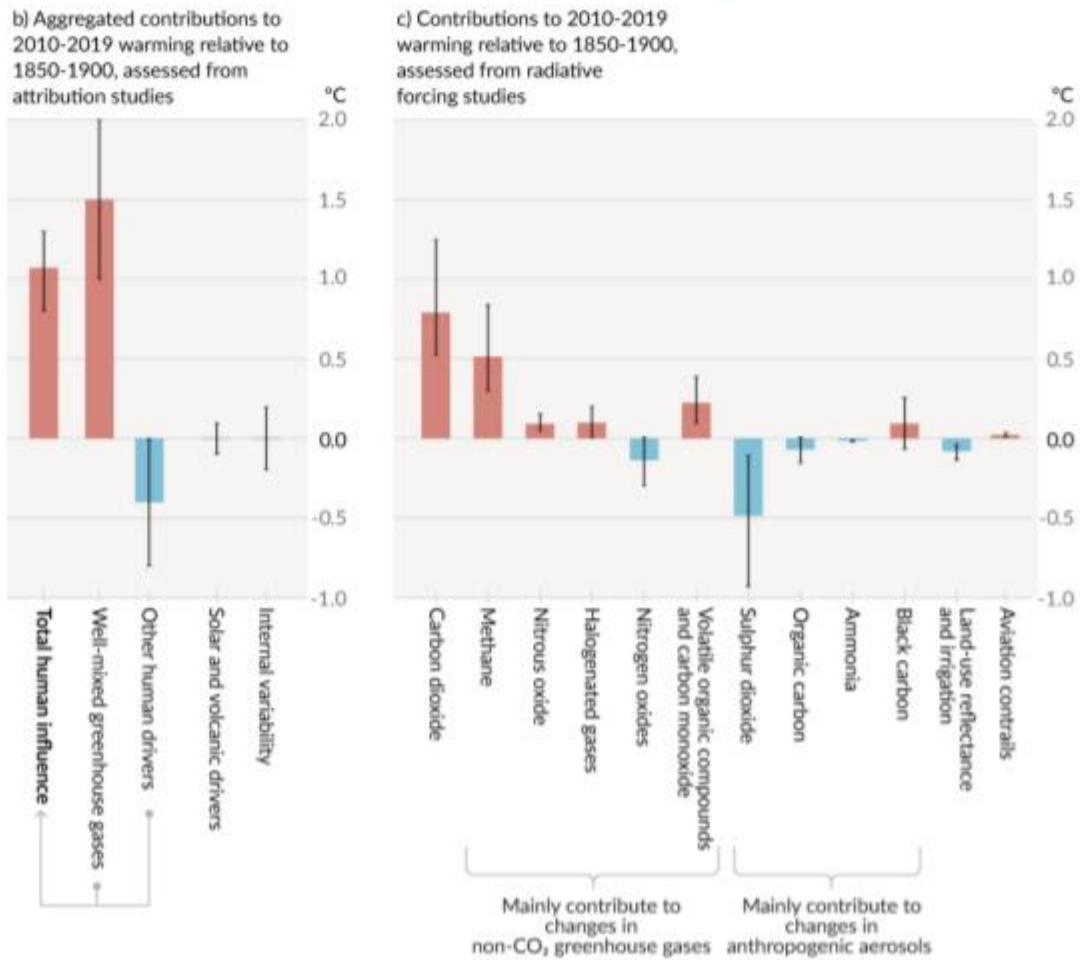

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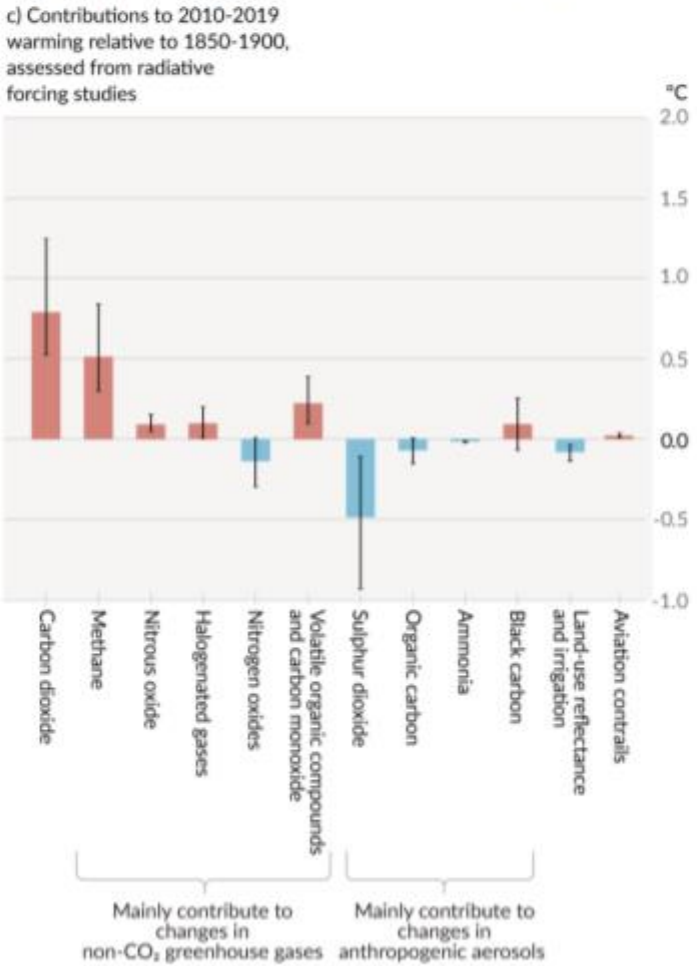

# Climate change is already affecting every inhabited region across the globe, with human influence contributing to many observed changes in weather and climate extremes

*Figure SPM.3*

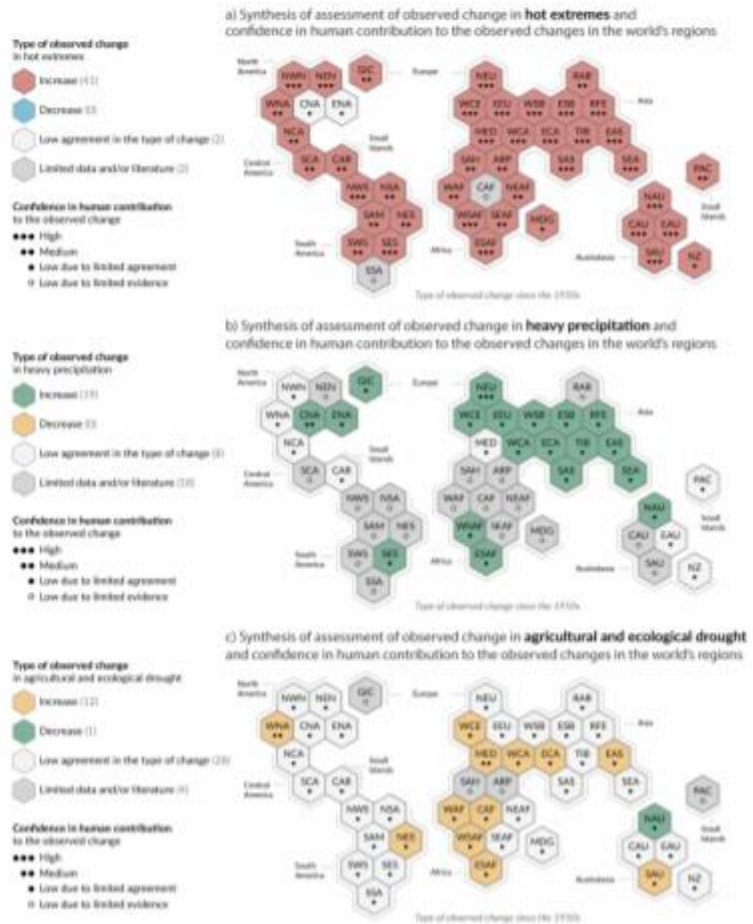

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*Figure SPM.3*

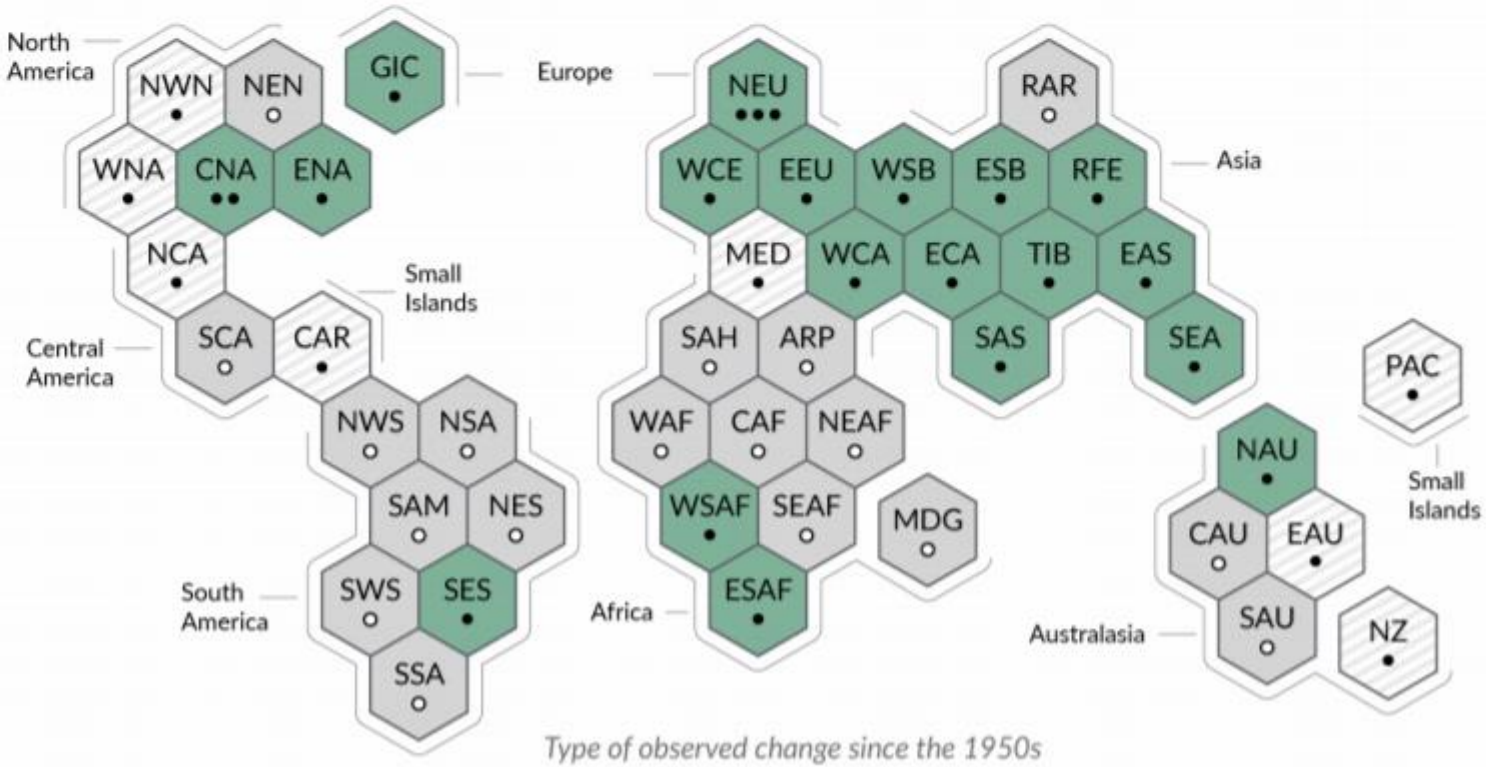
b) Synthesis of assessment of observed change in **heavy precipitation** and confidence in human contribution to the observed changes in the world's regions

**Type of observed change**
in heavy precipitation

- Increase (19)
- Decrease (0)
- Low agreement in the type of change (8)
- Limited data and/or literature (18)

**Confidence in human contribution**
to the observed change

- ●●● High
- ●● Medium
- ● Low due to limited agreement
- ○ Low due to limited evidence




*Type of observed change since the 1950s*

# Climate change is already affecting every inhabited region across the globe, with human influence contributing to many observed changes in weather and climate extremes

*Figure SPM.3*

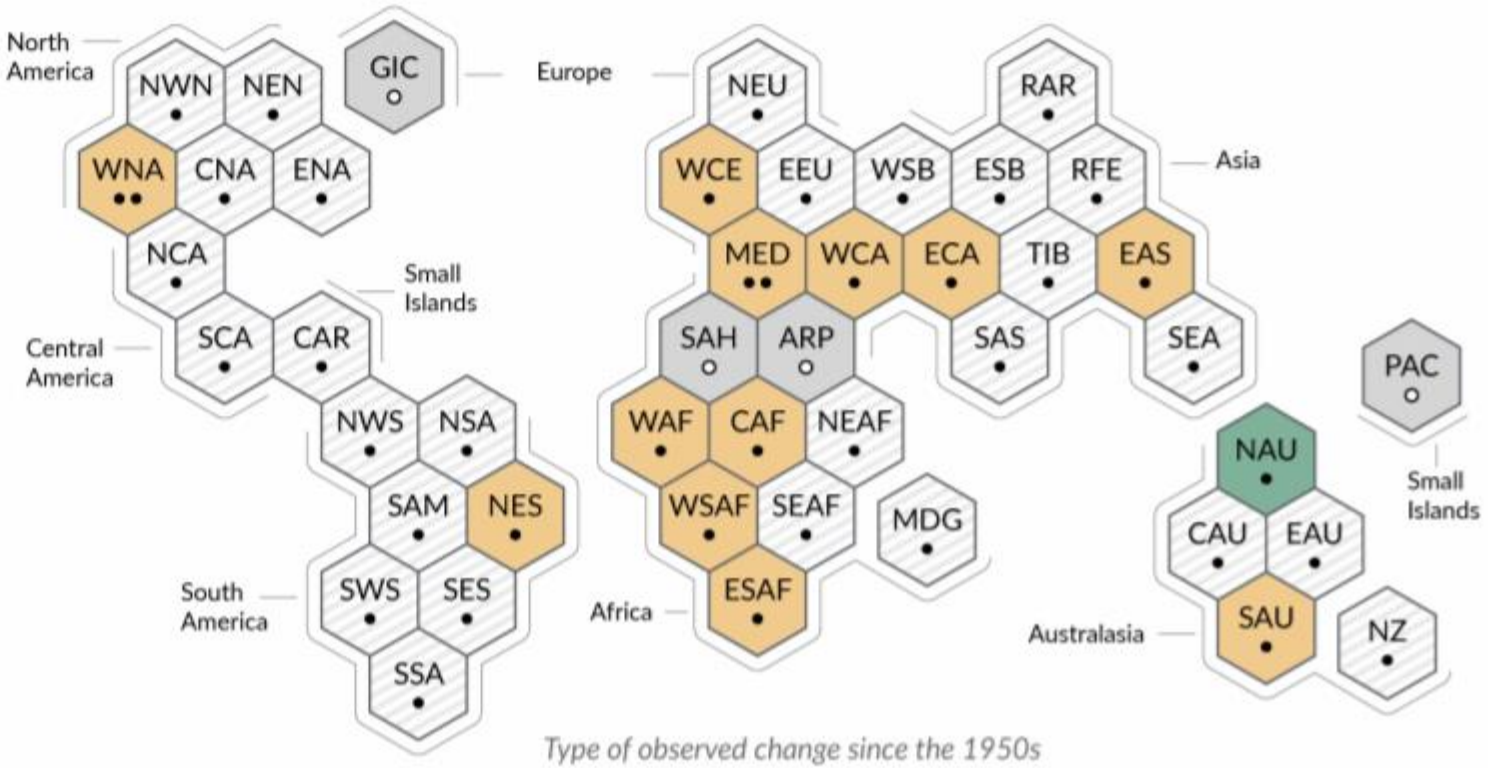
c) Synthesis of assessment of observed change in **agricultural and ecological drought** and confidence in human contribution to the observed changes in the world's regions

**Type of observed change**
in agricultural and ecological drought

- Increase (12)
- Decrease (1)
- Low agreement in the type of change (28)
- Limited data and/or literature (4)

**Confidence in human contribution**
to the observed change

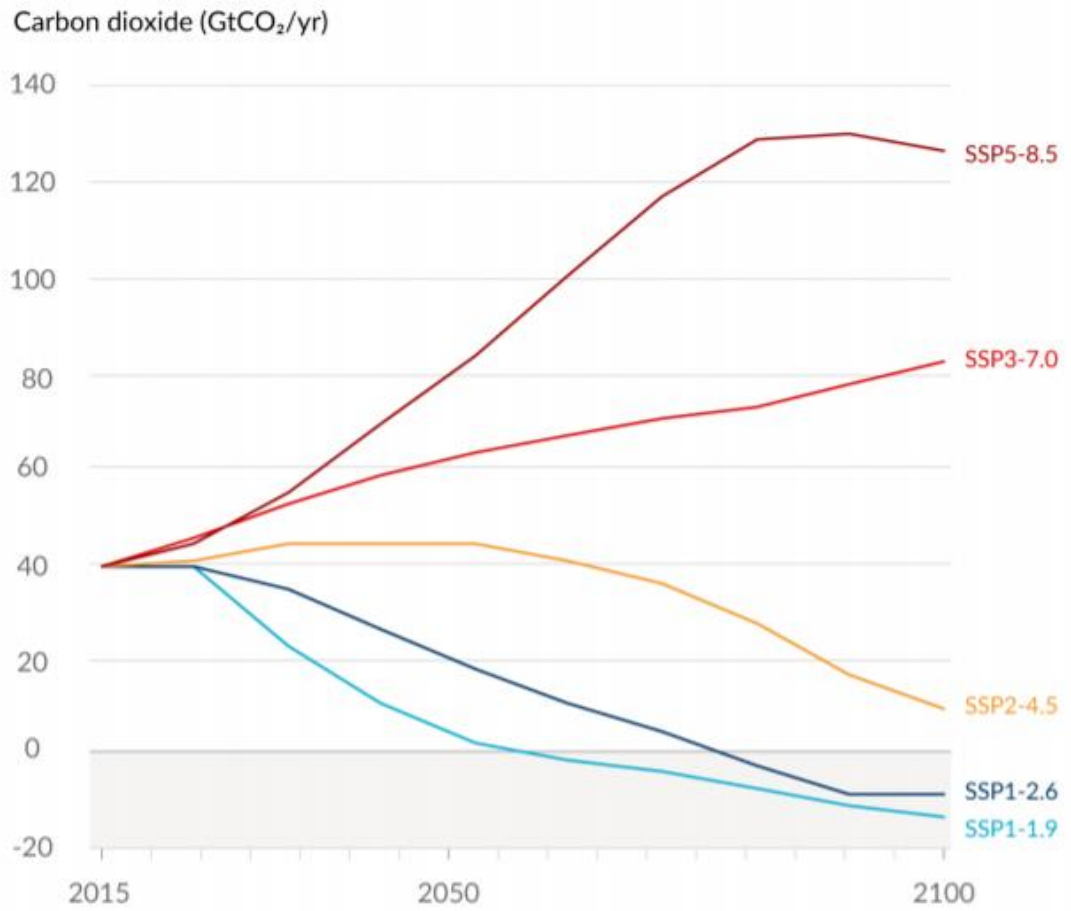
- ●●● High
- ●● Medium
- ● Low due to limited agreement
- ○ Low due to limited evidence




*Type of observed change since the 1950s*

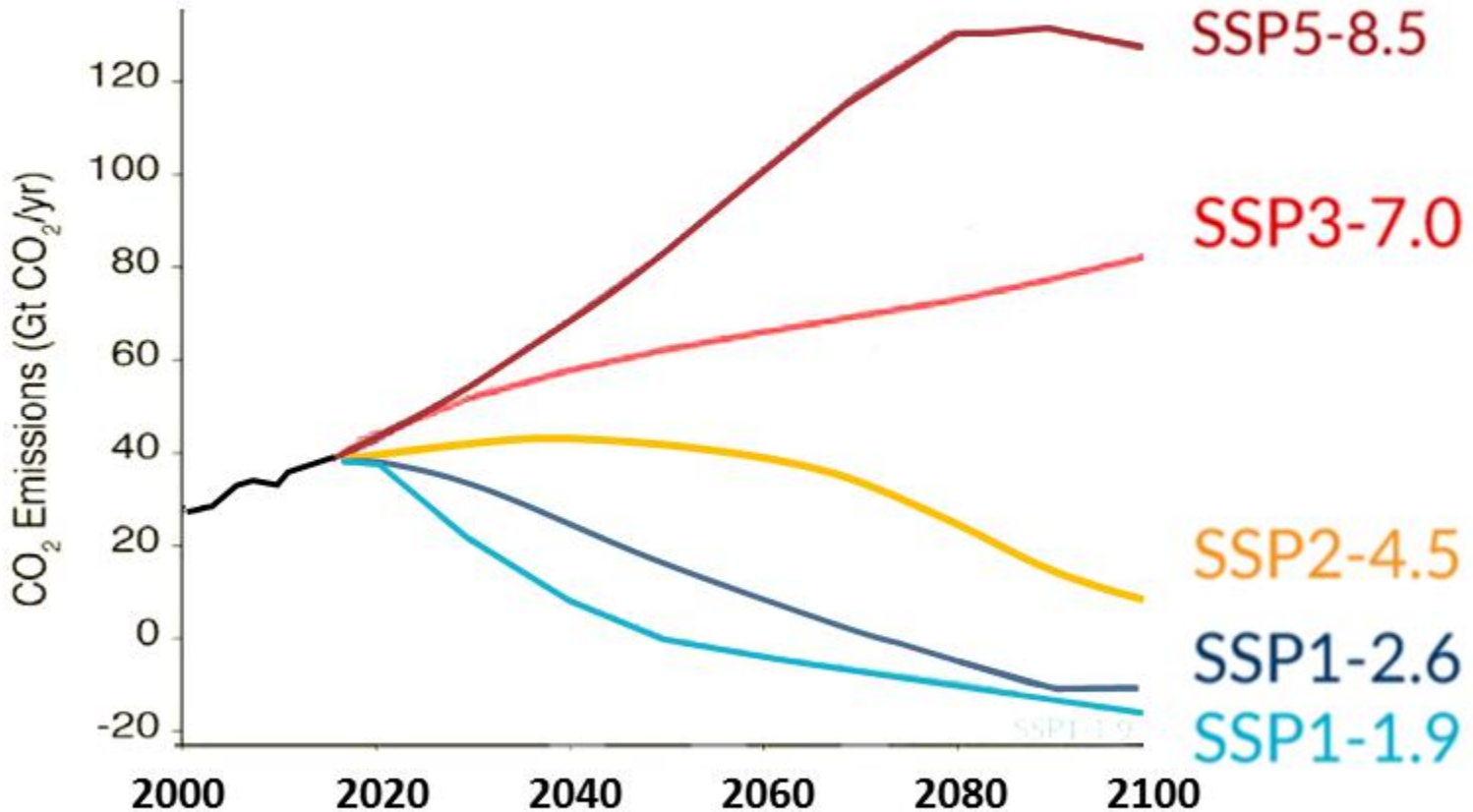
# Future emissions cause future additional warming, with total warming dominated by past and future $CO_2$ emissions

*Figure SPM.4*




**IPCC AR6 has delayed global emissions decline from 2020 to 2024, contrary to all previous published SSP and RCP scenarios, in the case of the IPCC going back to the 2014 AR5 scenarios.**
**This is badly policy misleading.**
Peter Carter

# Future emissions cause future additional warming, with total warming dominated by past and future $CO_2$ emissions




**The true SSP CO2 emissions scenario from IPCC AR6 WG1 Cross-Chapter Box 1.4, Figure 2: Comparison between the Shared Socio-economic Pathways (SSP) scenarios**

# Future emissions cause future additional warming, with total warming dominated by past and future $CO_2$ emissions

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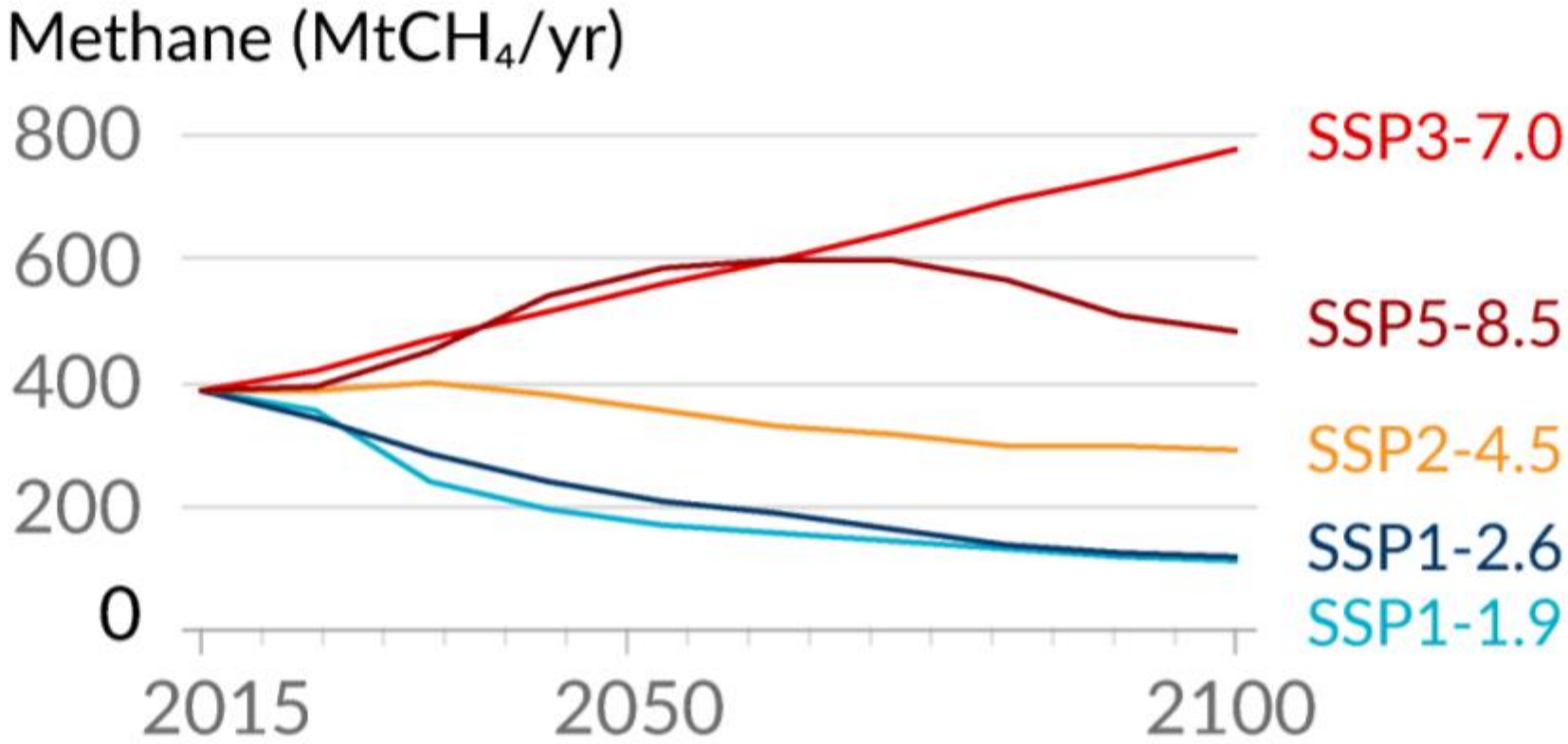

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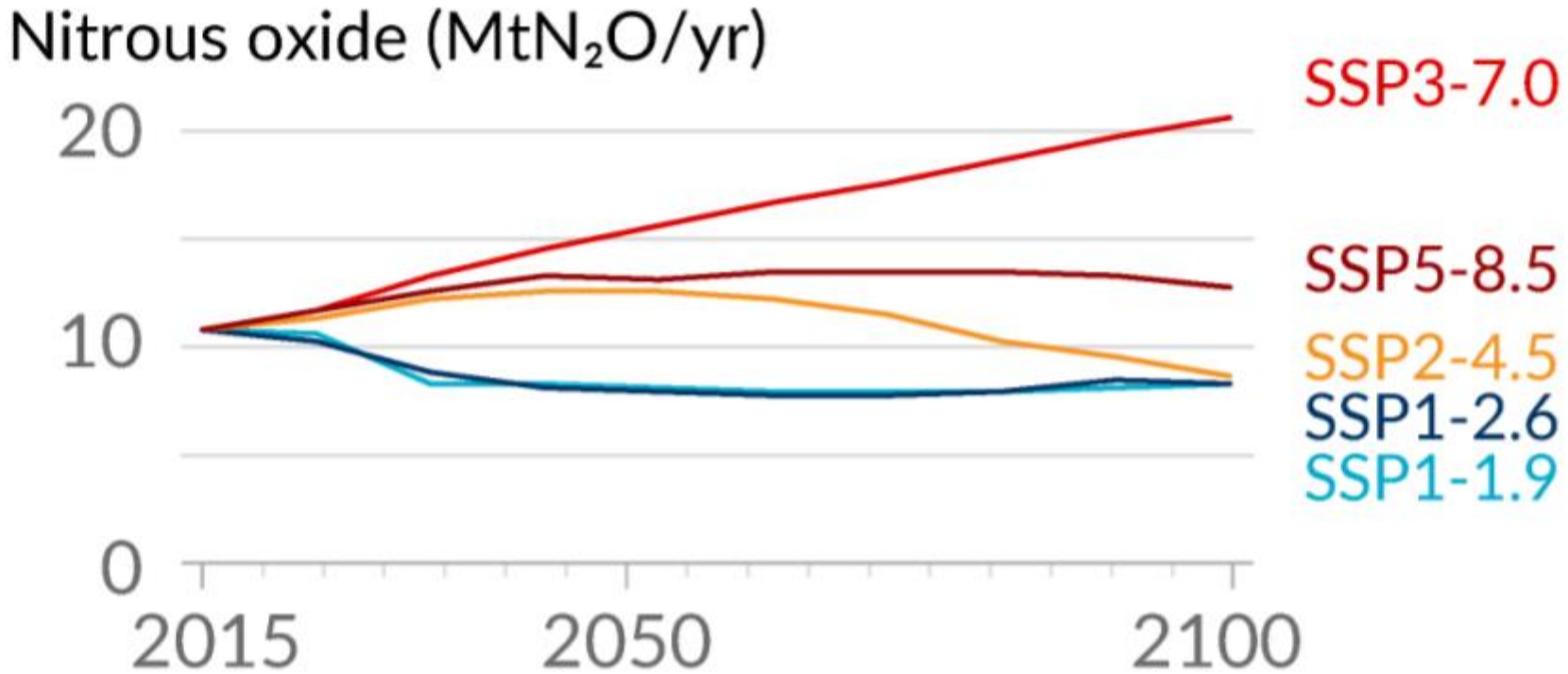

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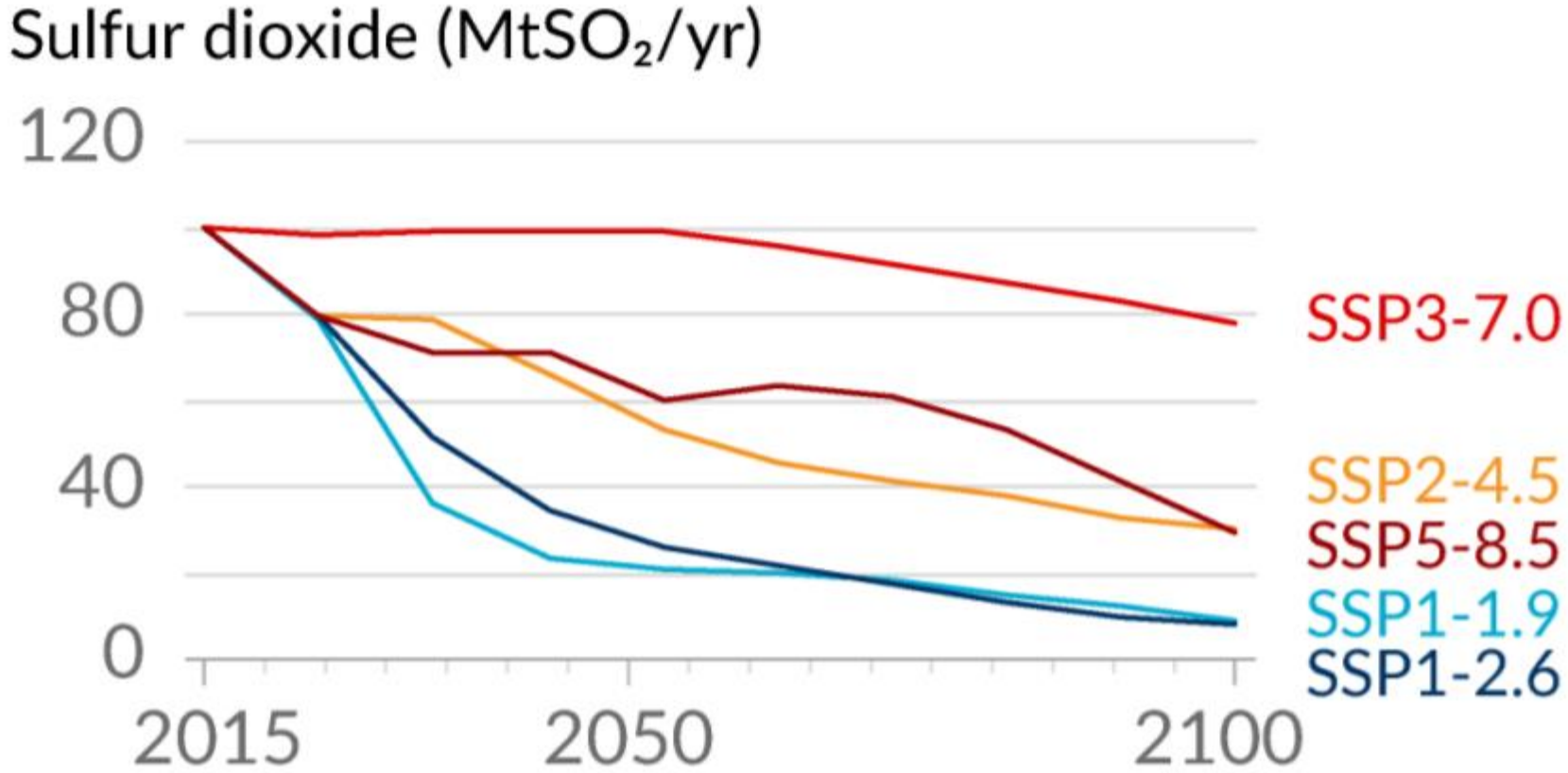
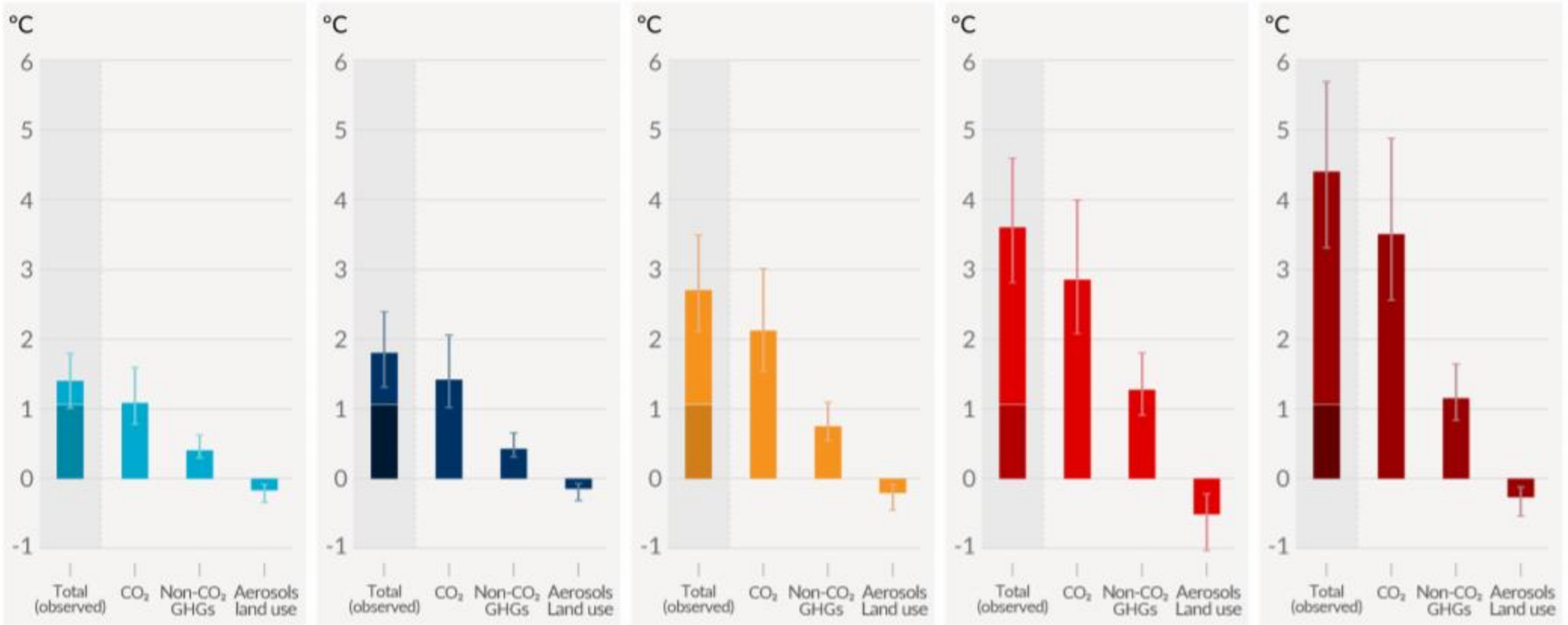


# Future emissions cause future additional warming, with total warming dominated by past and future $CO_2$ emissions

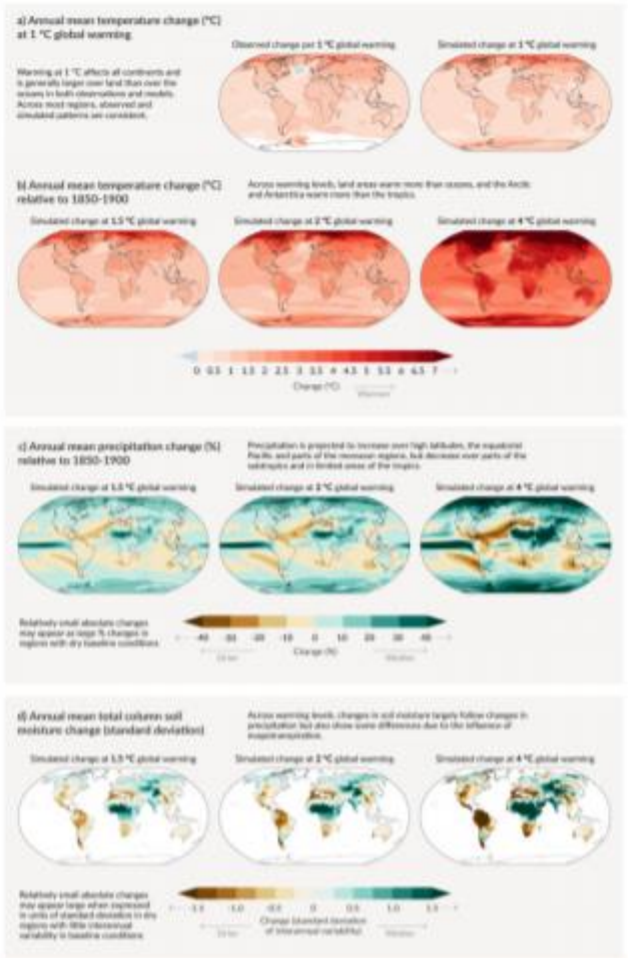
*Figure SPM.4*

Change in global surface temperature in 2081-2100 relative to 1850-1900 (°C)



# With every increment of global warming, changes get larger in regional mean temperature, precipitation and soil moisture

*Figure SPM.5*



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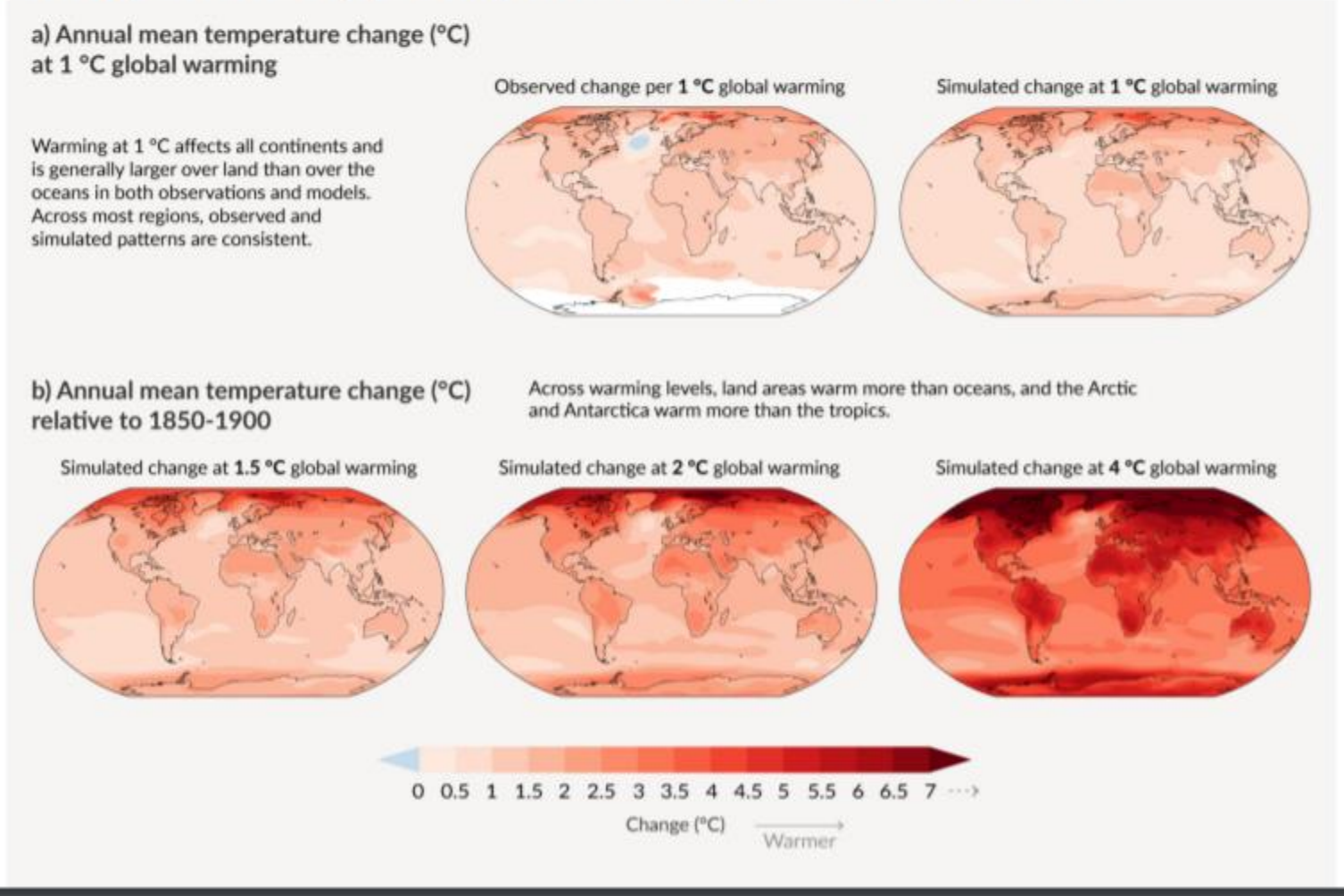

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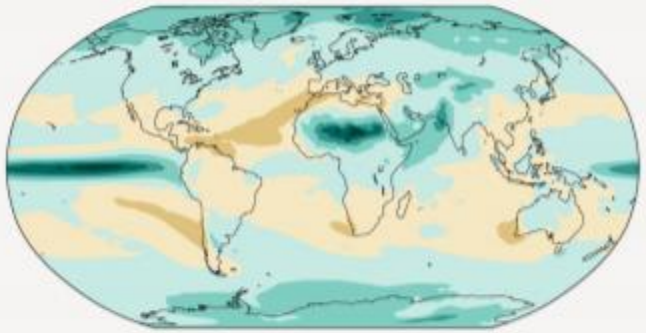
*Figure SPM.5*

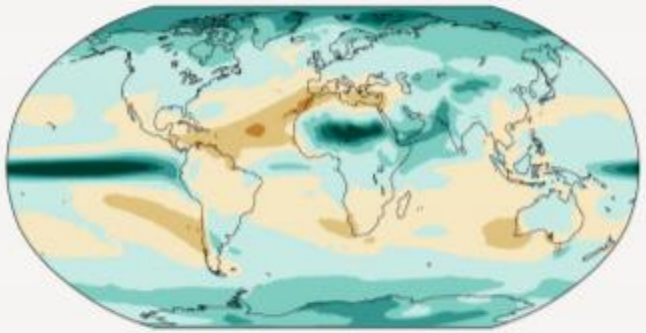
## c) Annual mean precipitation change (%) relative to 1850-1900

Precipitation is projected to increase over high latitudes, the equatorial Pacific and parts of the monsoon regions, but decrease over parts of the subtropics and in limited areas of the tropics.

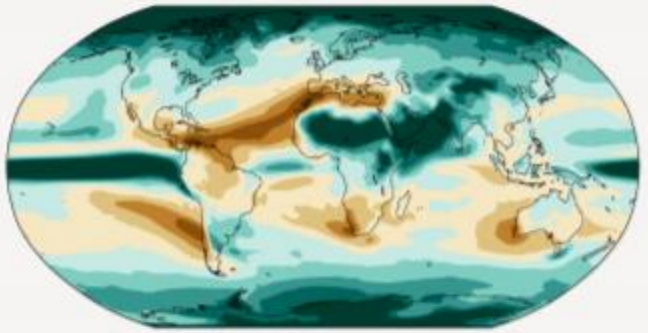
Simulated change at **1.5 °C** global warming



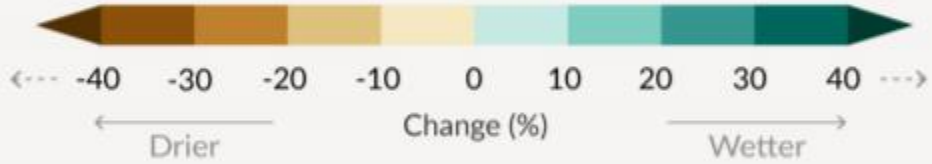
Simulated change at **2 °C** global warming



Simulated change at **4 °C** global warming



Relatively small absolute changes may appear as large % changes in regions with dry baseline conditions



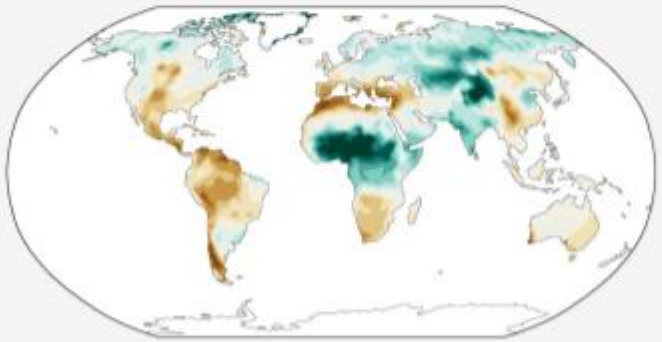
# With every increment of global warming, changes get larger in regional mean temperature, precipitation and soil moisture

*Figure SPM.5*

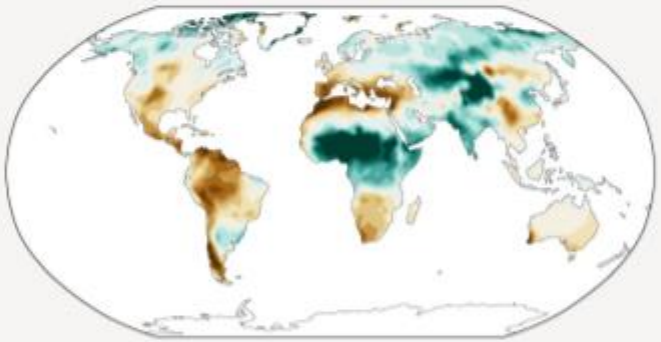
**d) Annual mean total column soil moisture change (standard deviation)**

Across warming levels, changes in soil moisture largely follow changes in precipitation but also show some differences due to the influence of evapotranspiration.

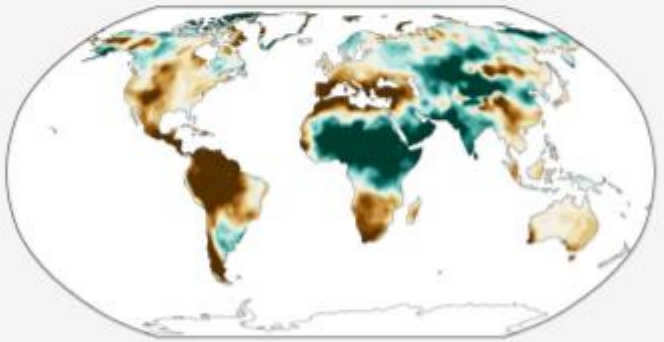
Simulated change at **1.5 °C** global warming



Simulated change at **2 °C** global warming



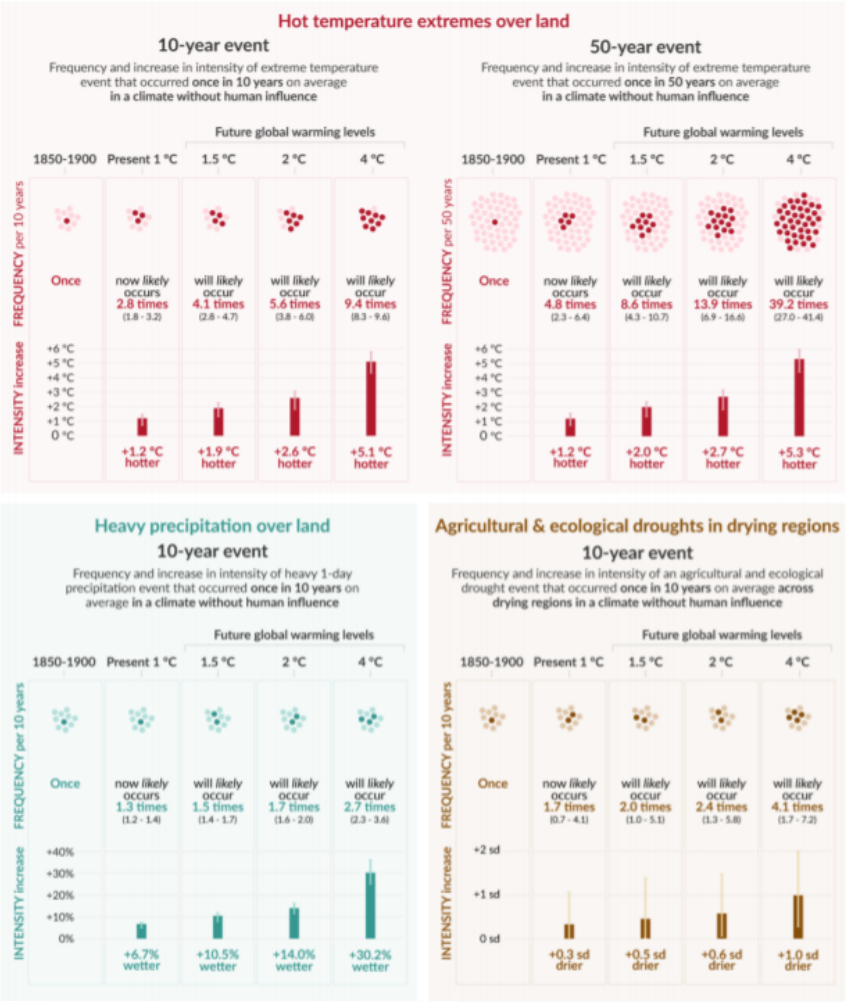
Simulated change at **4 °C** global warming



Relatively small absolute changes may appear large when expressed in units of standard deviation in dry regions with little interannual variability in baseline conditions

# Projected changes in extremes are larger in frequency and intensity with every additional increment of global warming

*Figure SPM.6*



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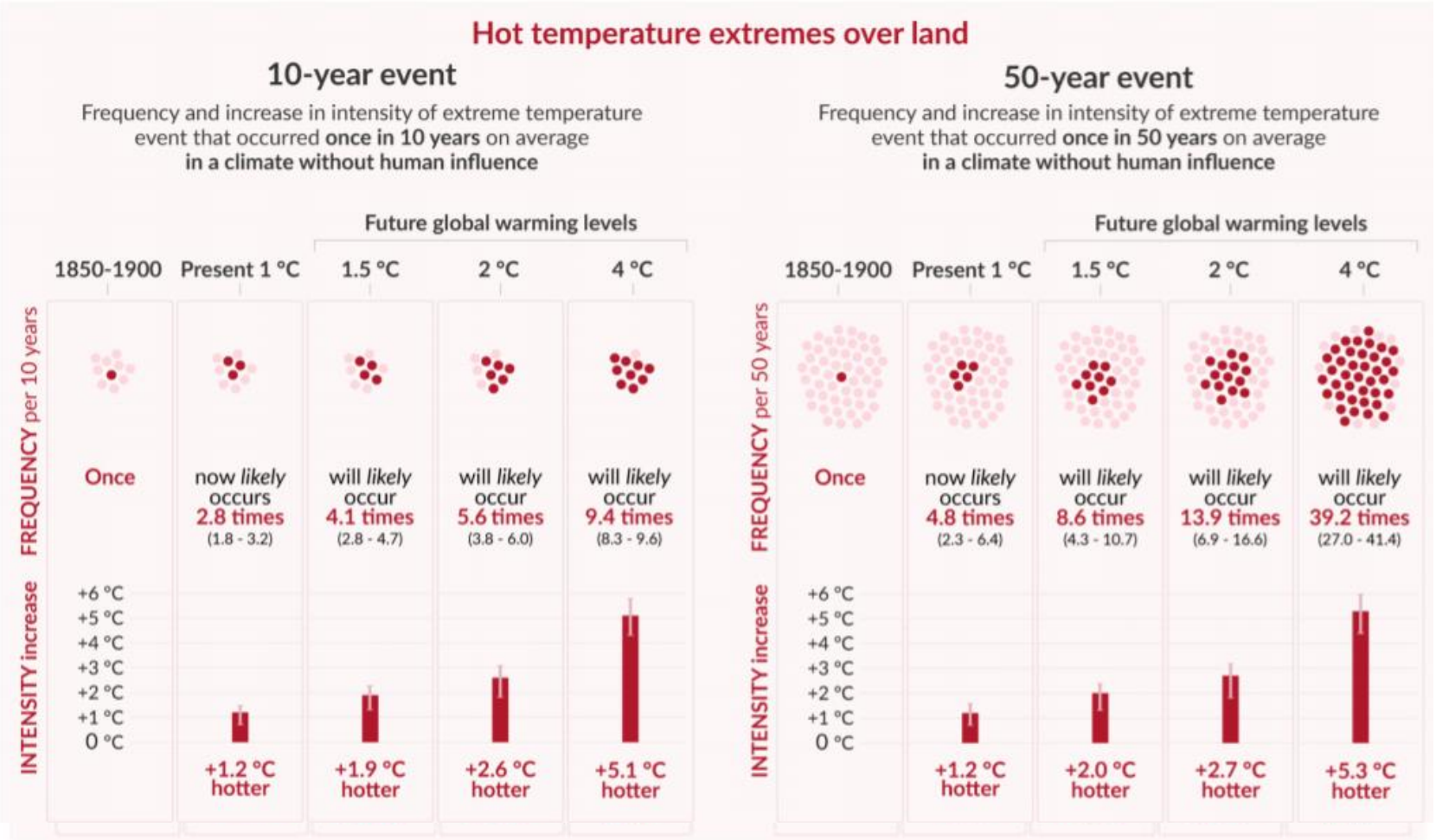

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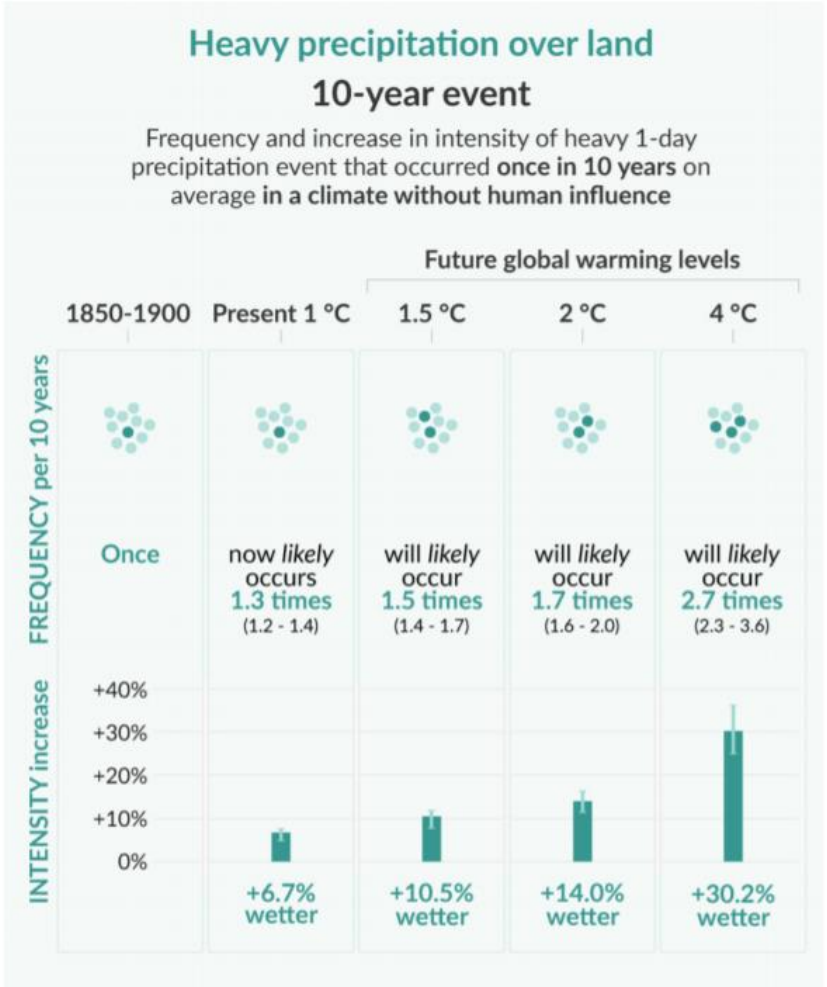

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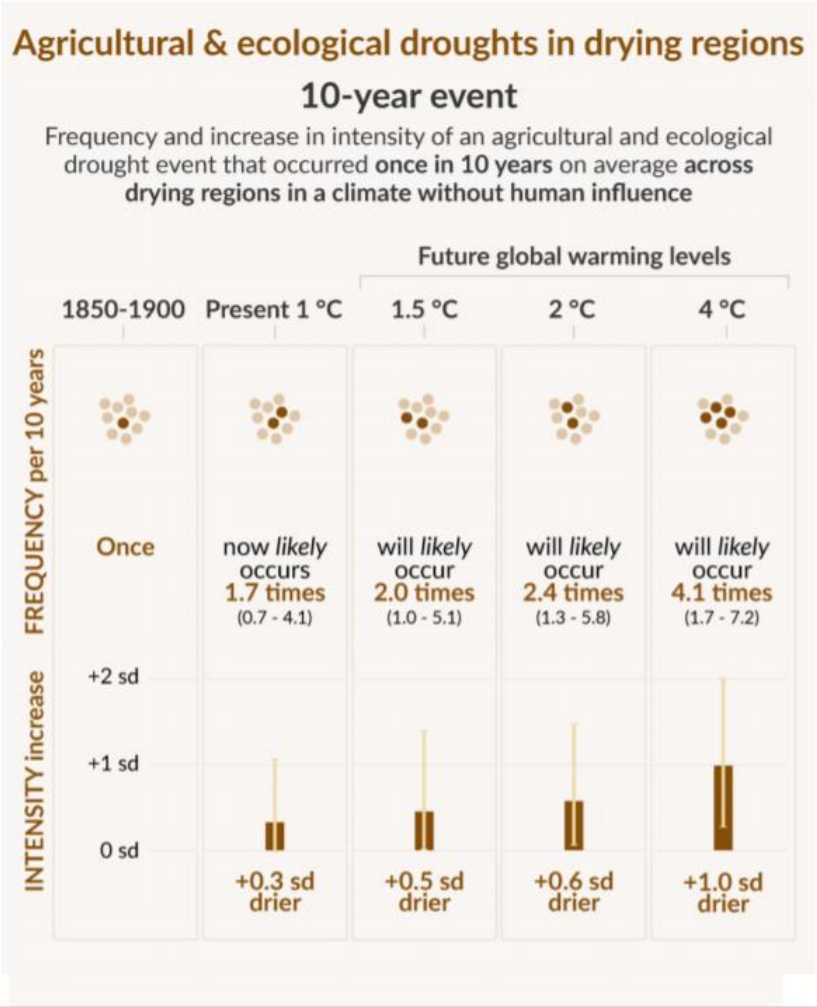
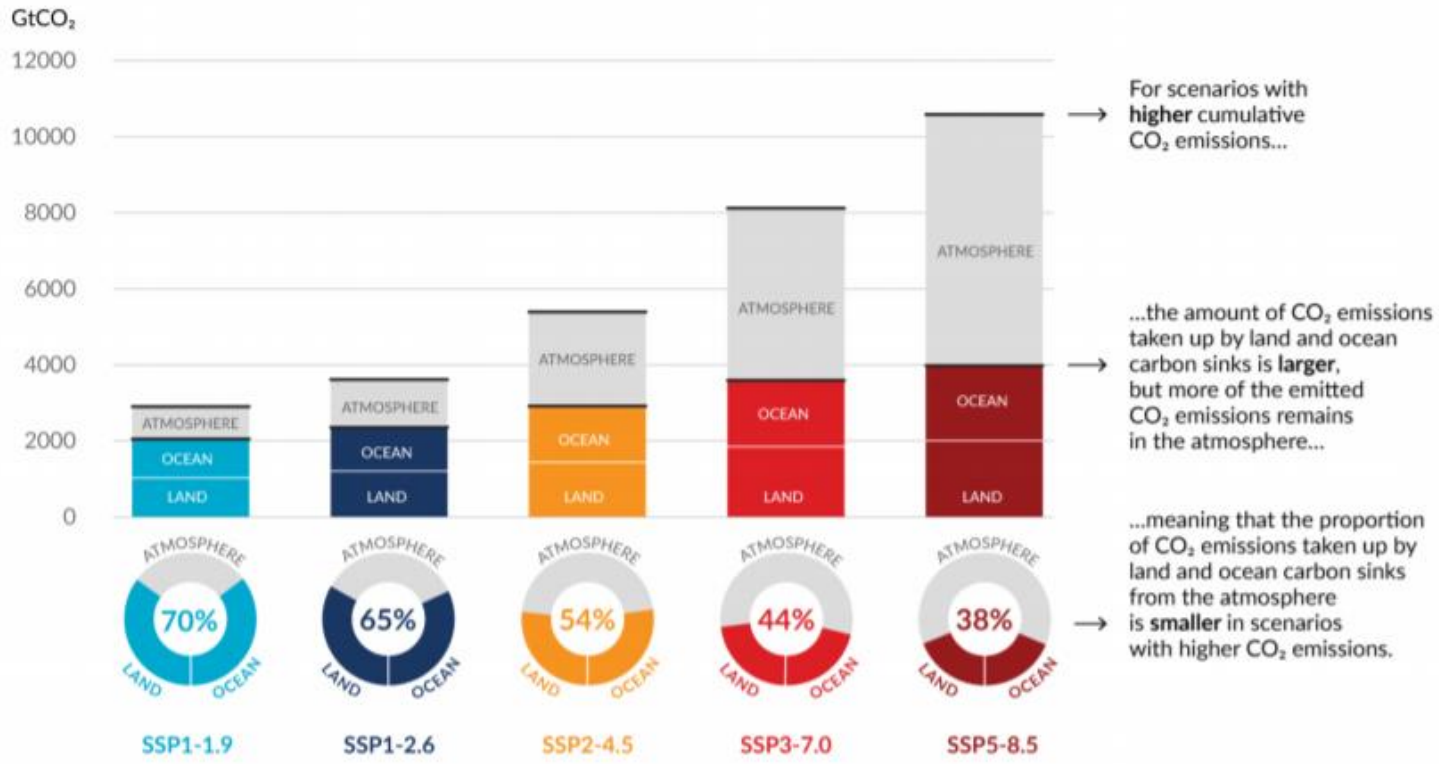


# The proportion of $CO_2$ emissions taken up by land and ocean carbon sinks is smaller in scenarios with higher cumulative $CO_2$ emissions

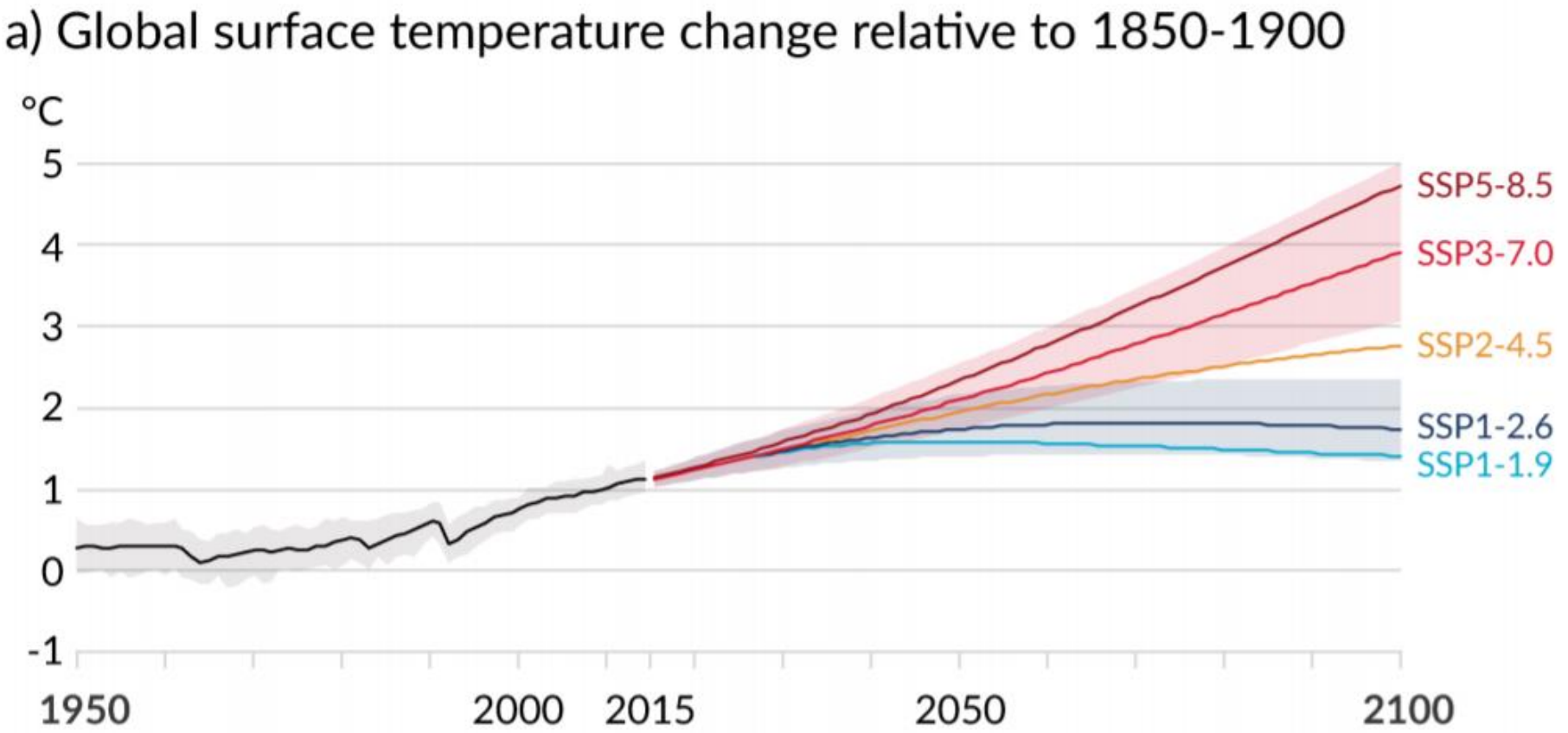
*Figure SPM.7*

Total cumulative $CO_2$ emissions **taken up by land and oceans** (colours) and remaining in the atmosphere (grey) under the five illustrative scenarios from 1850 to 2100



# Human activities affect all the major climate system components, with some responding over decades and others over centuries

*Figure SPM.8*



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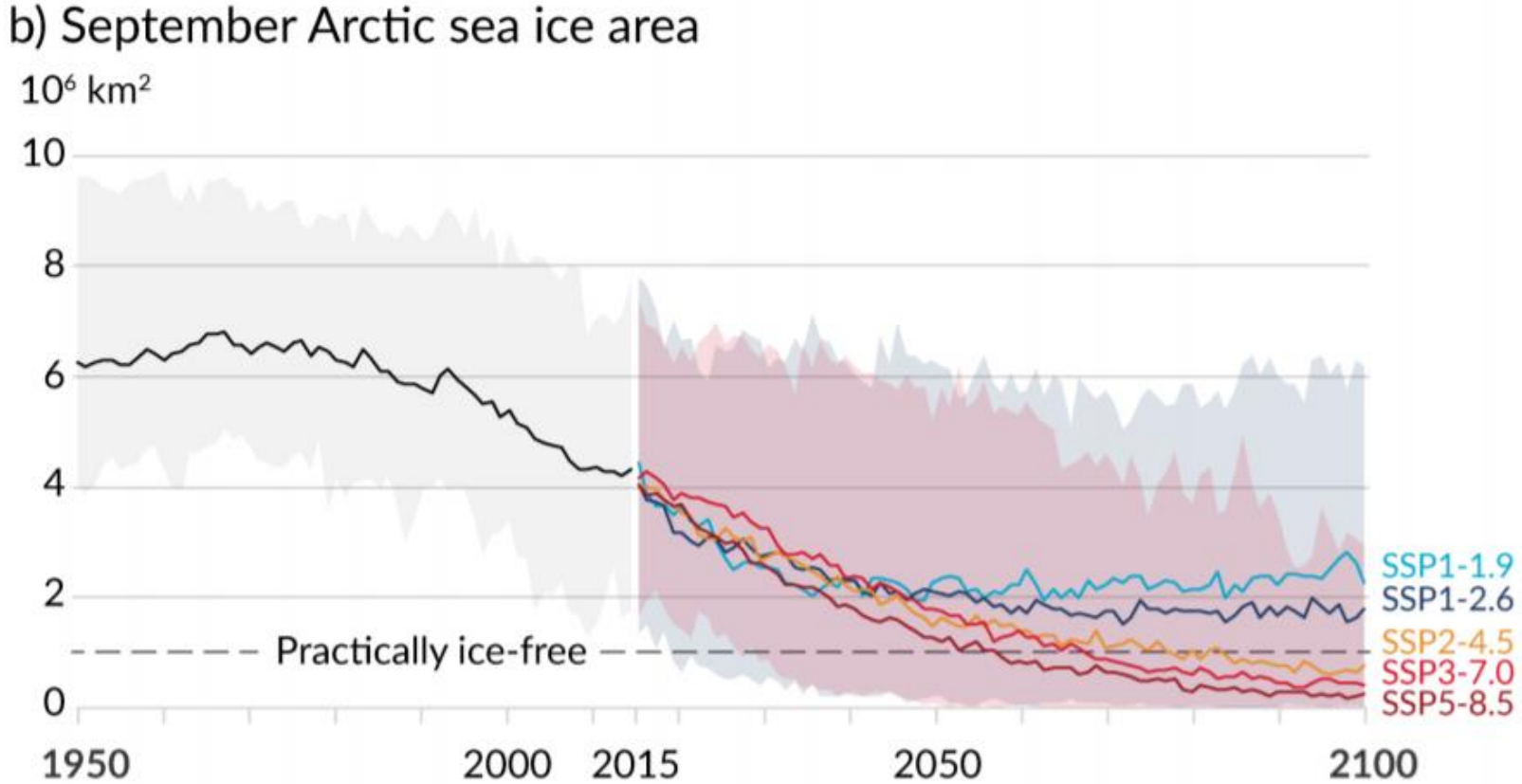

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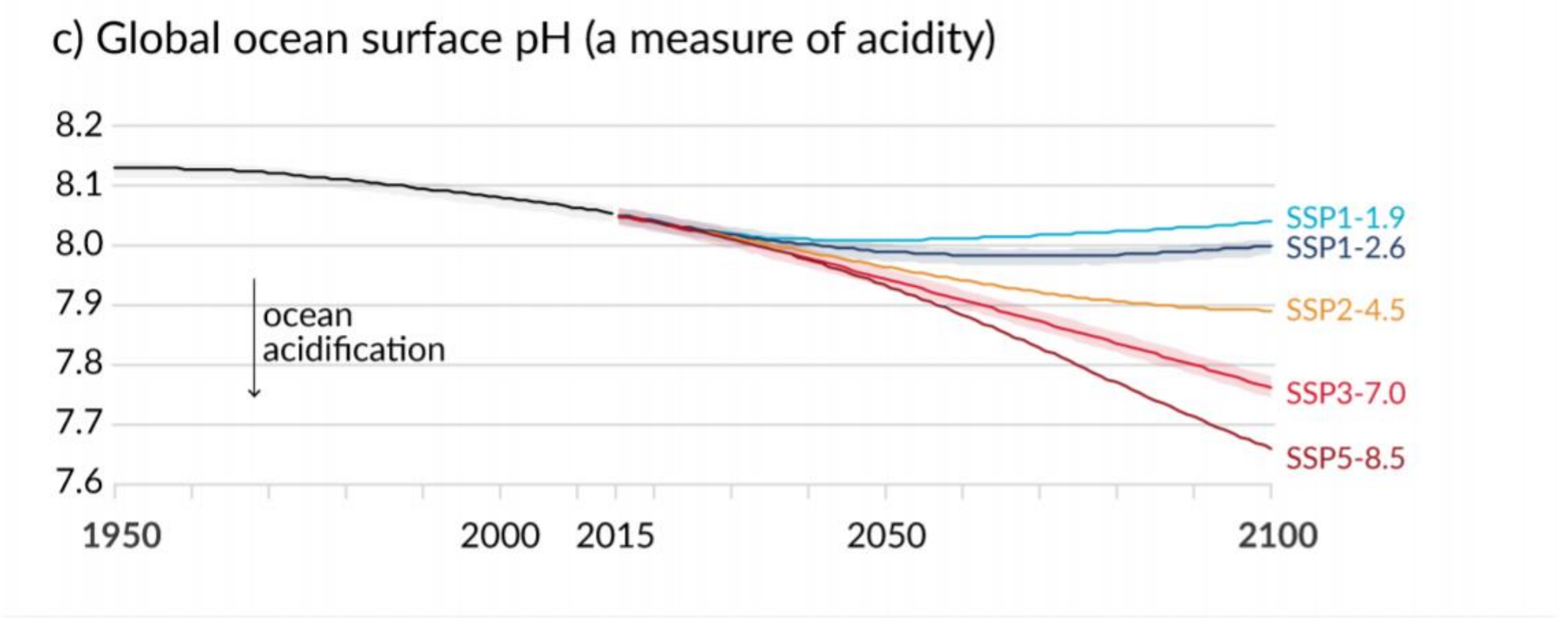

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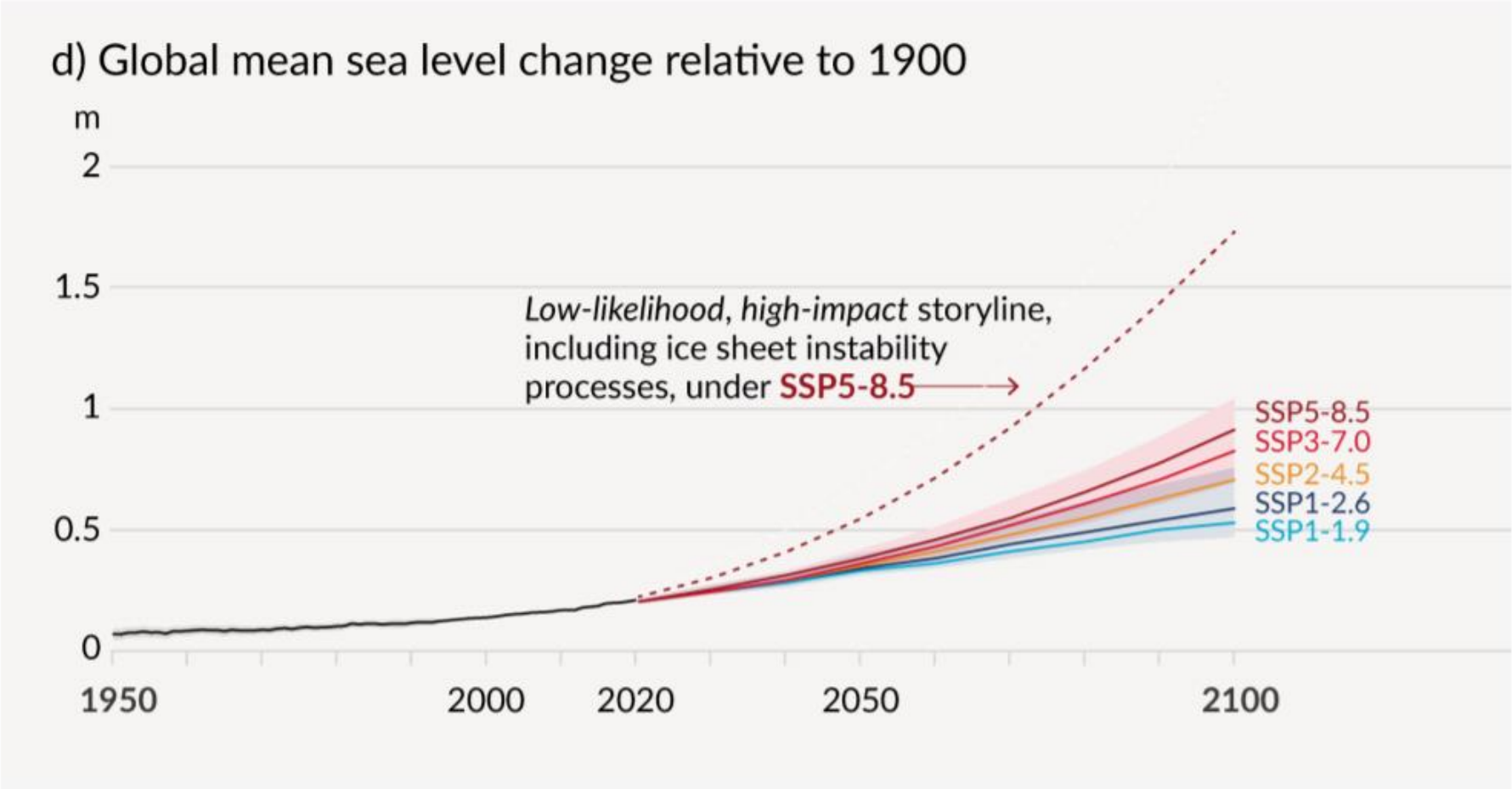

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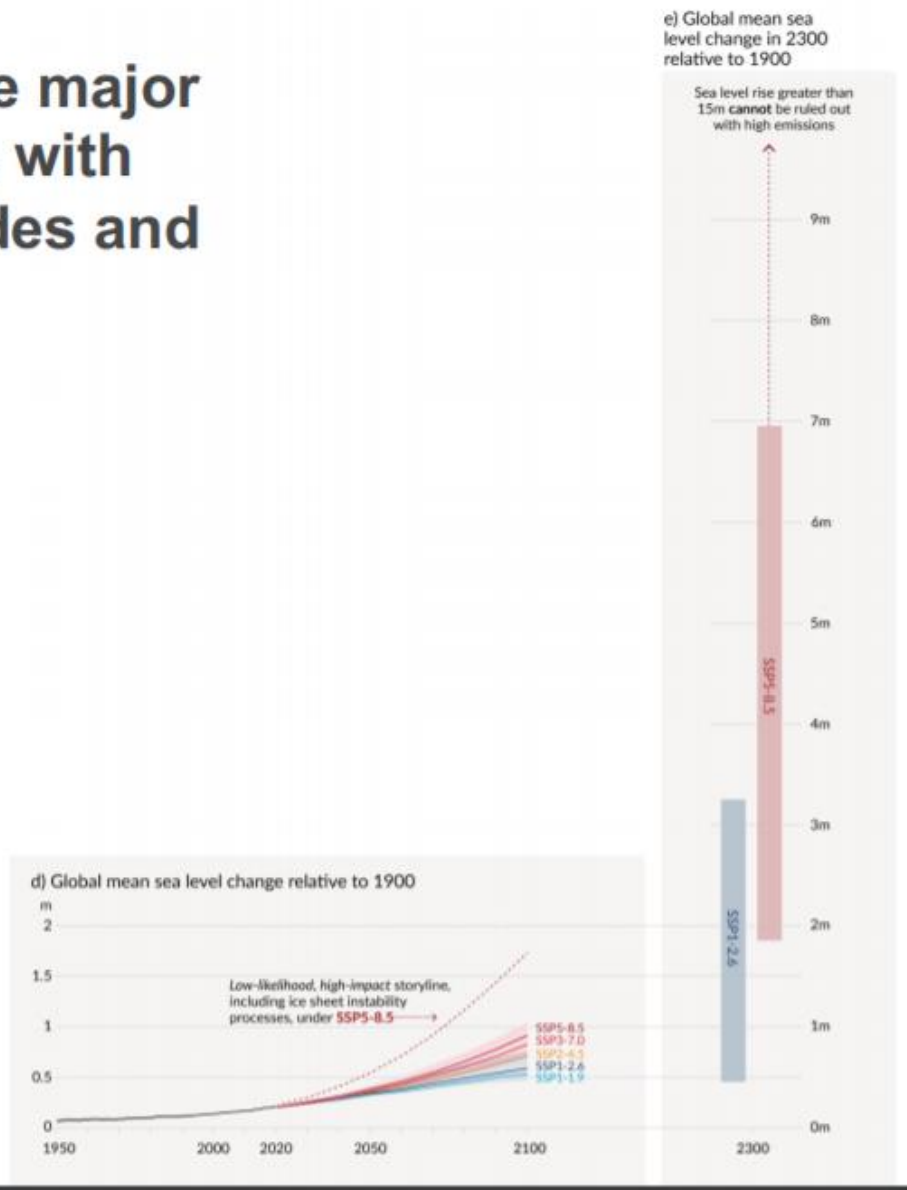
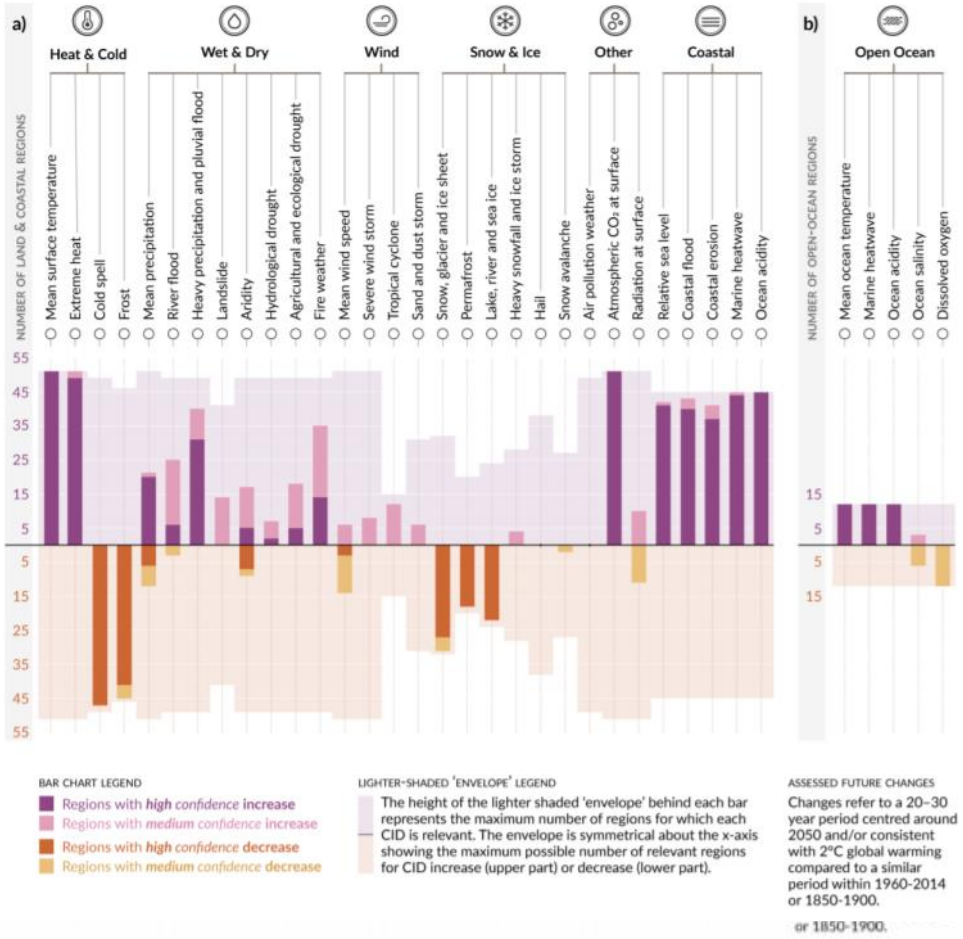


# Multiple climatic impact-drivers are projected to change in all regions of the world

*Figure SPM.9*

**Number of land & coastal regions** (a) and **open-ocean regions** (b) where each **climatic impact-driver** (CID) is projected to increase or decrease with ***high*** *confidence* (dark shade) or ***medium*** *confidence* (light shade)



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ASSESSED FUTURE CHANGES

Changes refer to a 20–30 year period centred around 2050 and/or consistent with 2°C global warming compared to a similar period within 1960-2014 or 1850-1900.

BAR CHART LEGEND

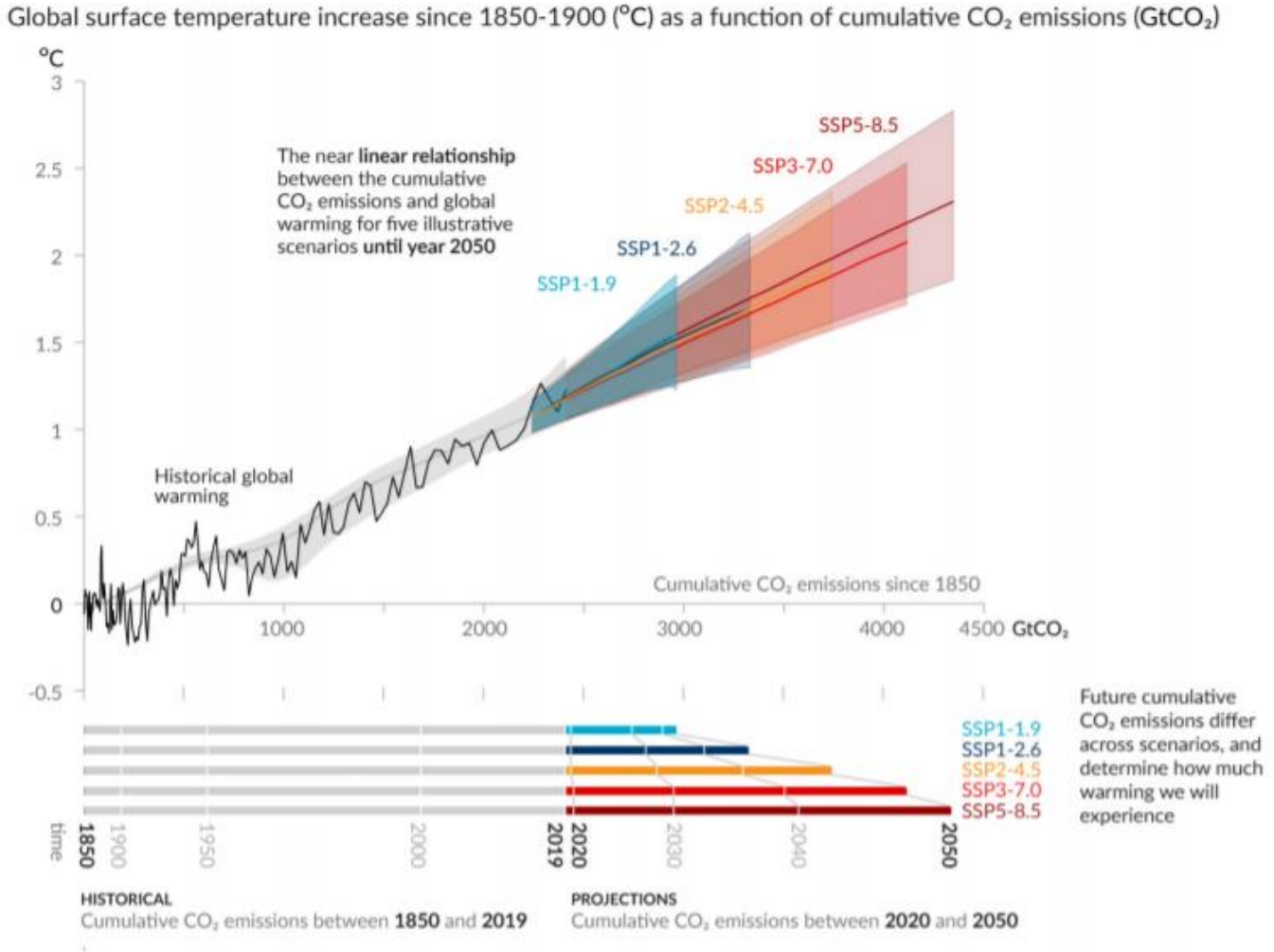
- Regions with ***high*** *confidence* **increase**
- Regions with ***medium*** *confidence* **increase**
- Regions with ***high*** *confidence* **decrease**
- Regions with ***medium*** *confidence* **decrease**

LIGHTER-SHADED 'ENVELOPE' LEGEND

The height of the lighter shaded 'envelope' behind each bar represents the maximum number of regions for which each CID is relevant. The envelope is symmetrical about the x-axis showing the maximum possible number of relevant regions for CID increase (upper part) or decrease (lower part).

# Every tonne of $CO_2$ emissions adds to global warming

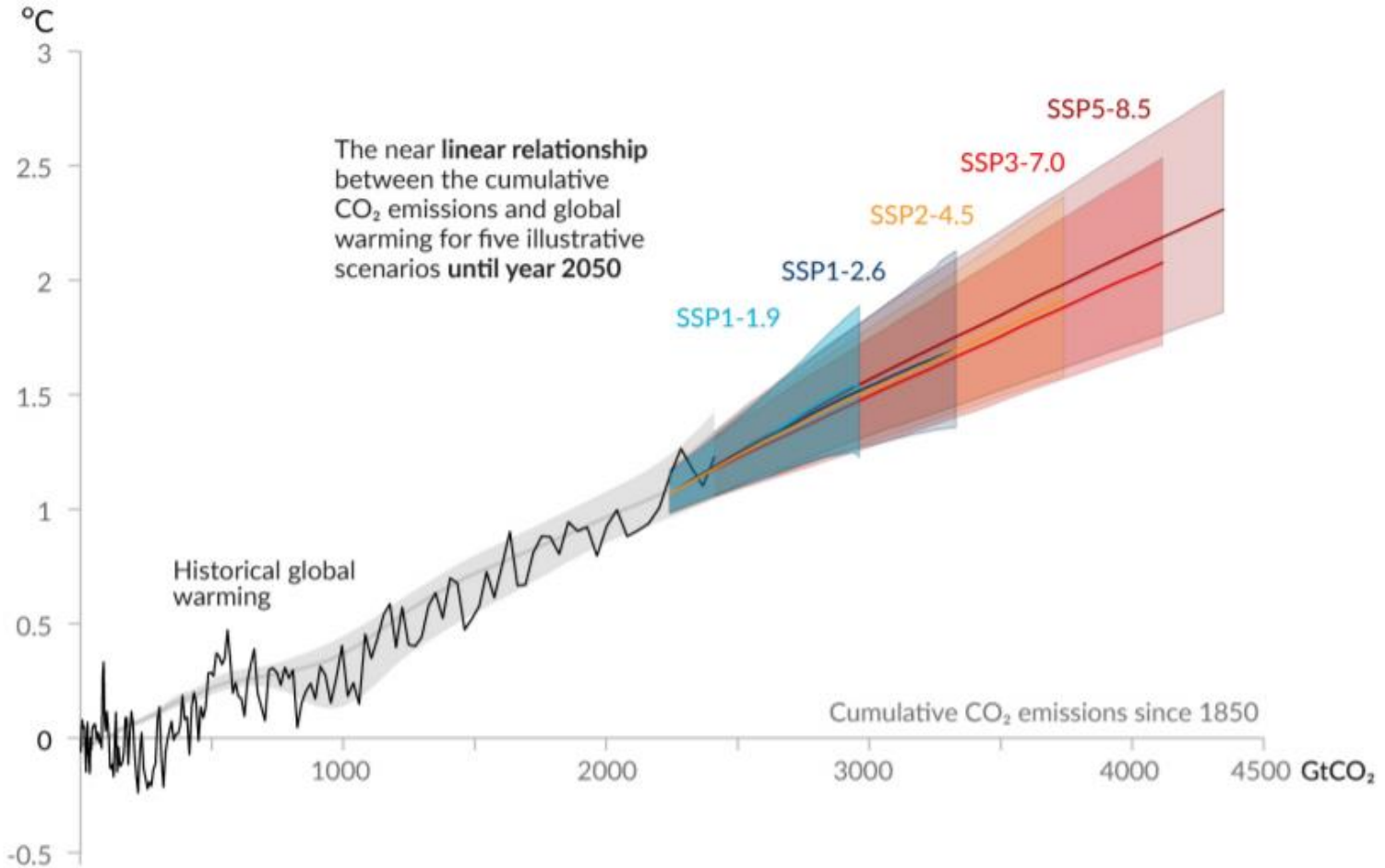
*Figure SPM.10*



# Every tonne of $CO_2$ emissions adds to global warming

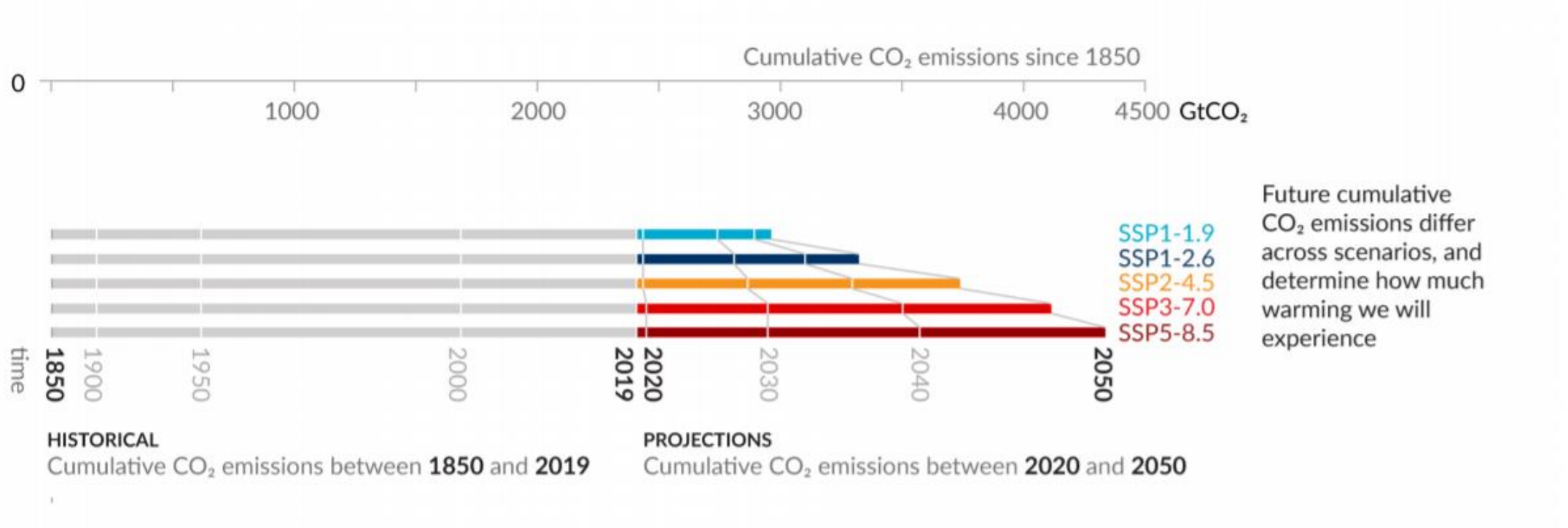
*Figure SPM.10*

Global surface temperature increase since 1850-1900 (°C) as a function of cumulative $CO_2$ emissions ($GtCO_2$)



# Every tonne of $CO_2$ emissions adds to global warming

*Figure SPM.10*



**SIXTH ASSESSMENT REPORT**
Working Group I – The Physical Science Basis

ipcc
INTERGOVERNMENTAL PANEL ON climate change

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# Thank you.

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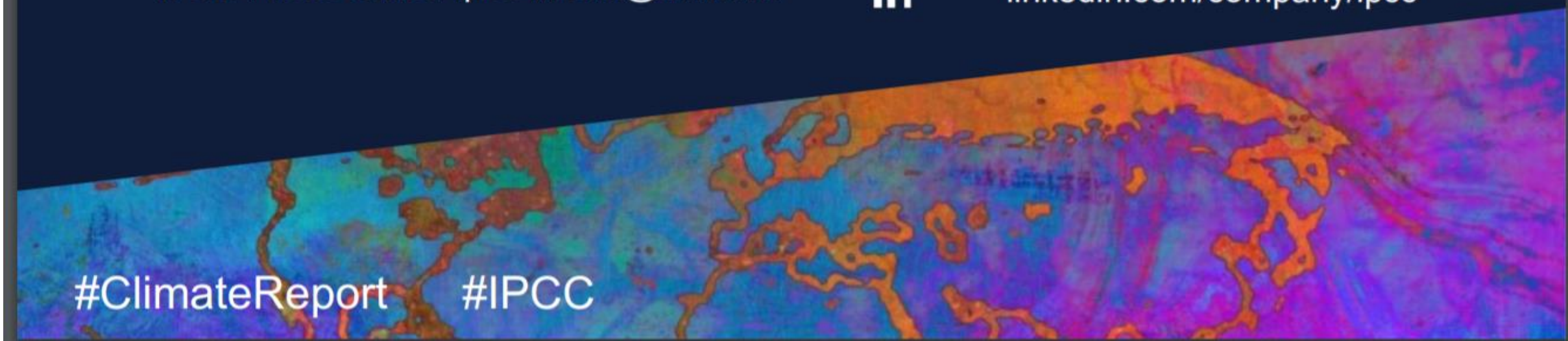

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