

# Climate and deep decarbonisation risks in a post-COVID world

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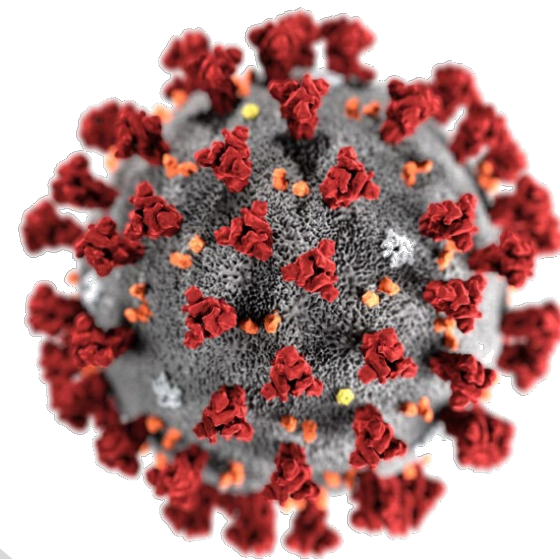
Dr. Joeri ROGELJ

2<sup>nd</sup> EU–JRC Summer School on Sustainable Finance  
September 1-3, 2020

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# Climate and deep decarbonisation risks in a post-COVID world

- State of knowledge
  - IPCC
  - Climate risks
  - Transition risks
- COVID impact
- Post-COVID outlook





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# What is the IPCC?

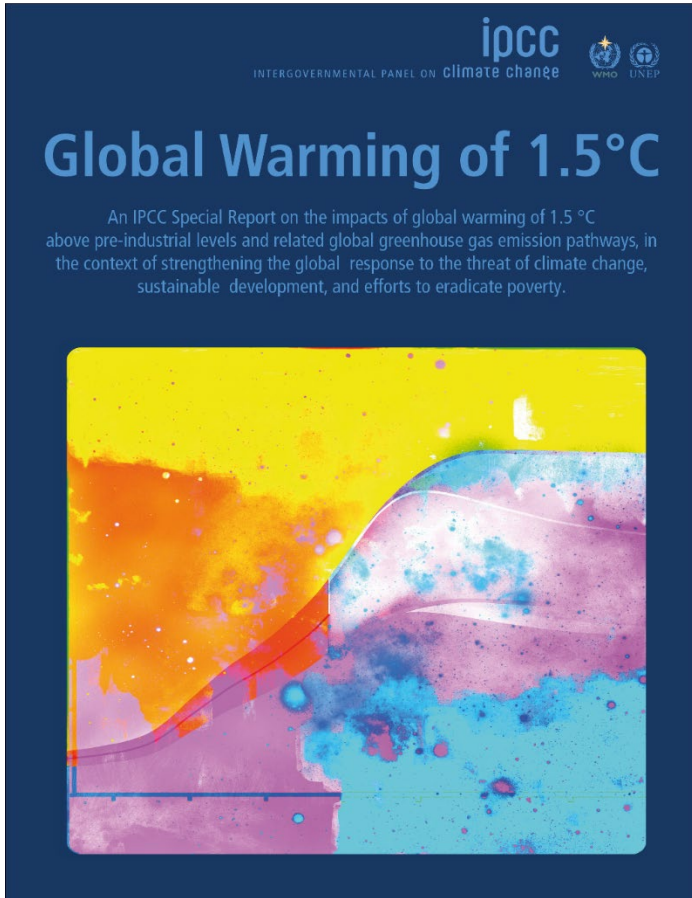
- Intergovernmental organization, est. in 1988 by WMO and UNEP
- Representatives of 195 member countries
- Provide the most comprehensive assessment of our current knowledge of climate science
- 3 Working Groups + 1 Task Force
  - WG1: Physical science basis
  - WG2: Impacts, adaptation & vulnerability
  - WG3: Mitigation of climate change
  - TF on national greenhouse gas inventories

# Key principles governing IPCC work

- Assessments – no new research
- Comprehensive, objective, open and transparent process
- Common understanding of scientific basis of risk of climate change
- Policy-neutral yet policy-relevant
- Report are prepared by leading scientific experts from all world regions







## The report in numbers

**133** Contributing authors

**6000** Studies

**91** Authors from **40** Countries

**1 113** Reviewers

**42 001** Comments

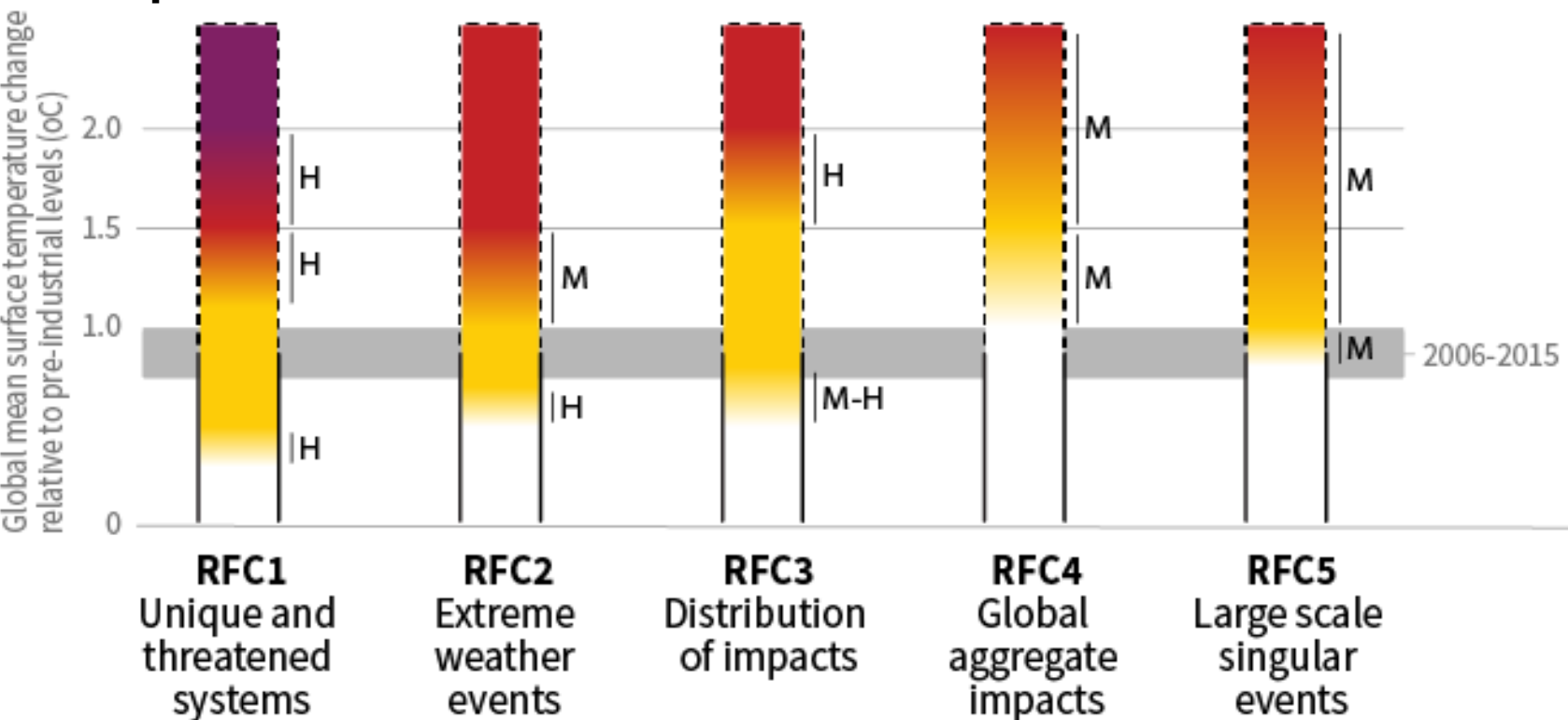


IPCC plenary room in Incheon, Korea  
Image: ENB



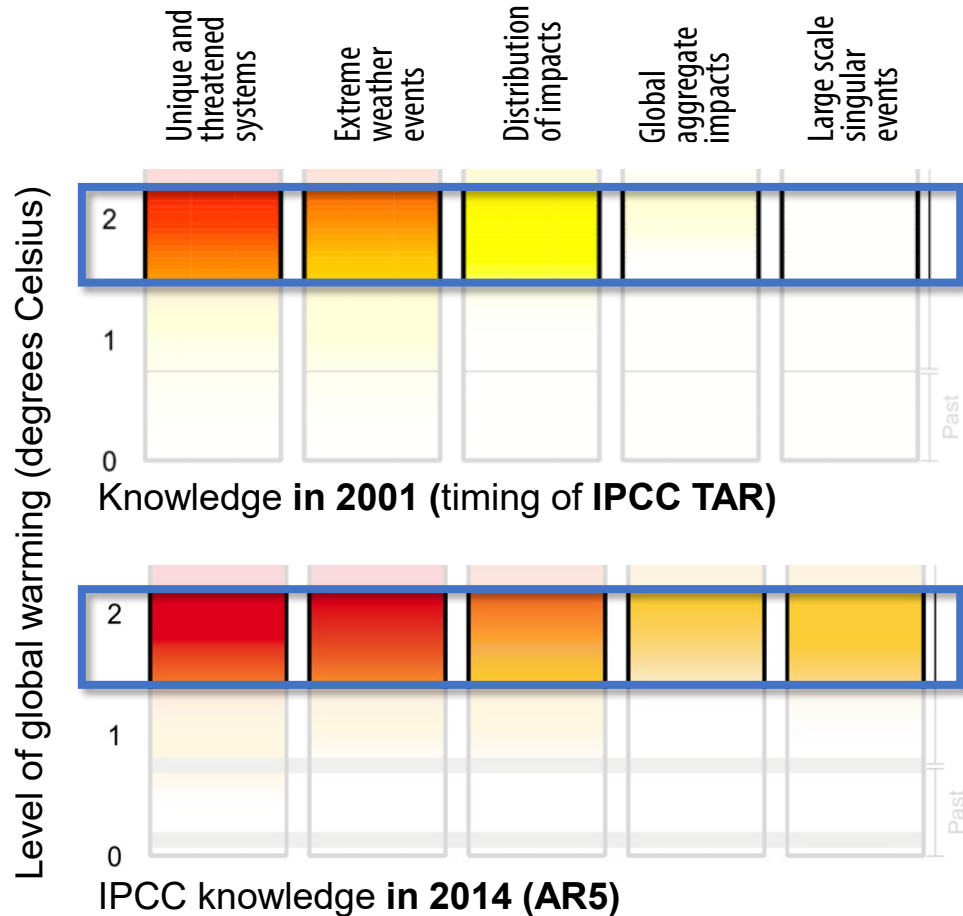
# Climate risks at 1.5°C and 2°C of global warming

Five impact areas or “Reasons for concern” (RFC)

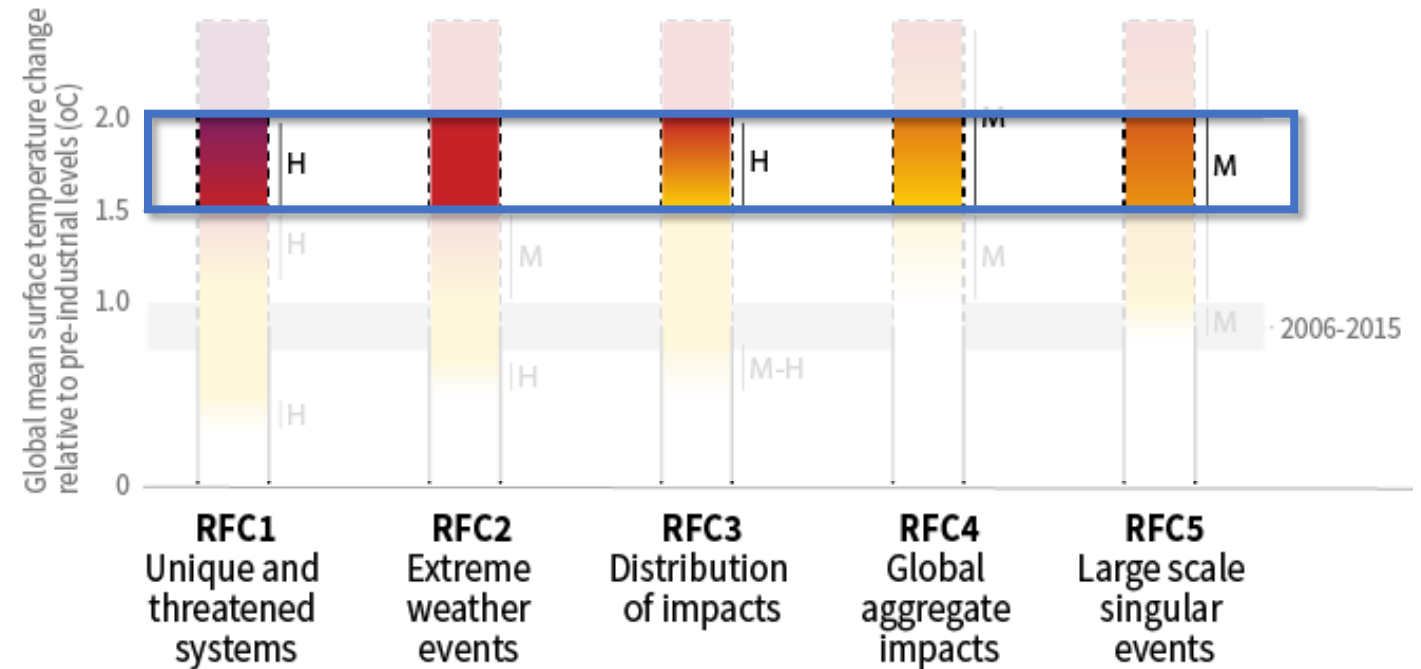


Risk colour scale: white=undetectable, yellow=moderate, red=high, purple=very high  
Confidence level for transition: L=Low, M=Medium, H=High and VH=Very high  
Joeri Rogelj – 2 September 2020 | Source: IPCC SR1.5 (2018)

# The more we learn, the worse the outlook



## IPCC knowledge in 2018 (IPCC SR1.5)



Risk colour scale: white=undetectable, yellow=moderate, red=high, purple=very high

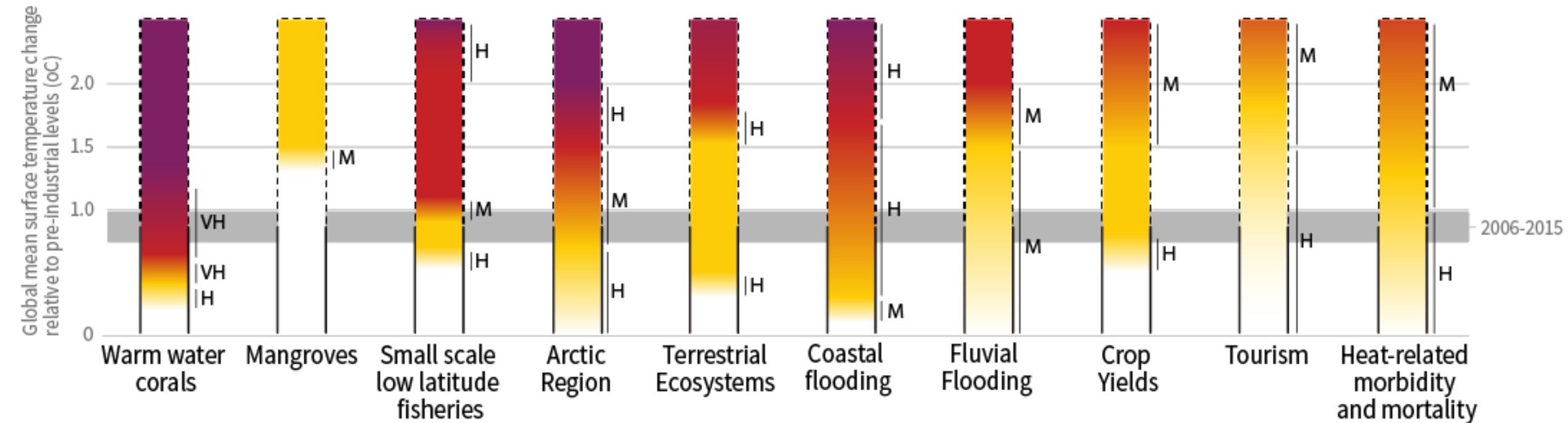
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Joeri Rogelj – 2 September 2020 | Source: Smith et al (PNAS, 2009), IPCC AR5 WG2 (2014), IPCC SR1.5 (2018)



# Climate risks at 1.5°C and 2°C of global warming

## Impacts and risks for selected natural, managed and human systems

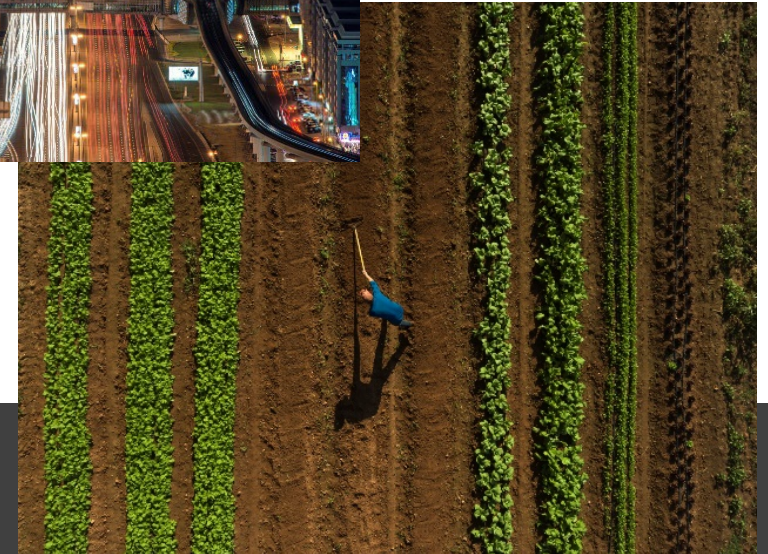
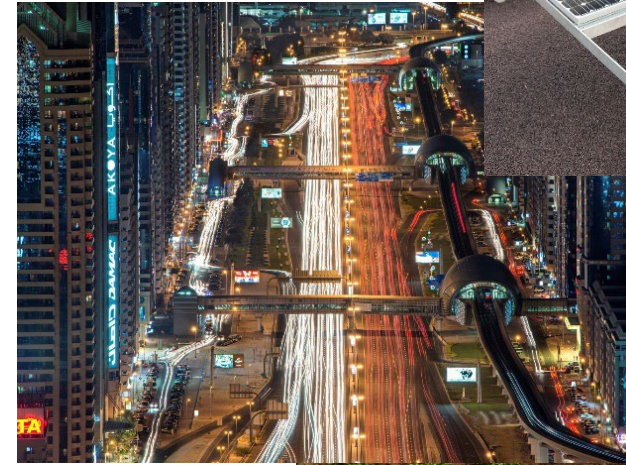
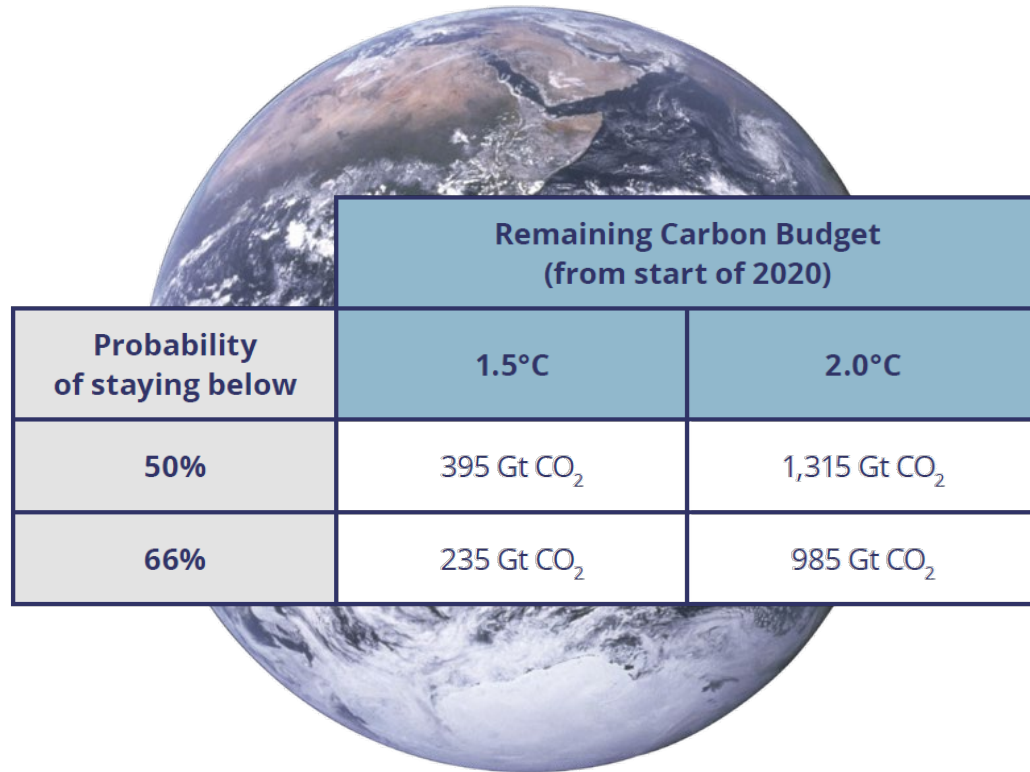


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Joeri Rogelj – 2 September 2020 | Source: IPCC SR1.5 (2018)

# Halting climate change needs zero emissions



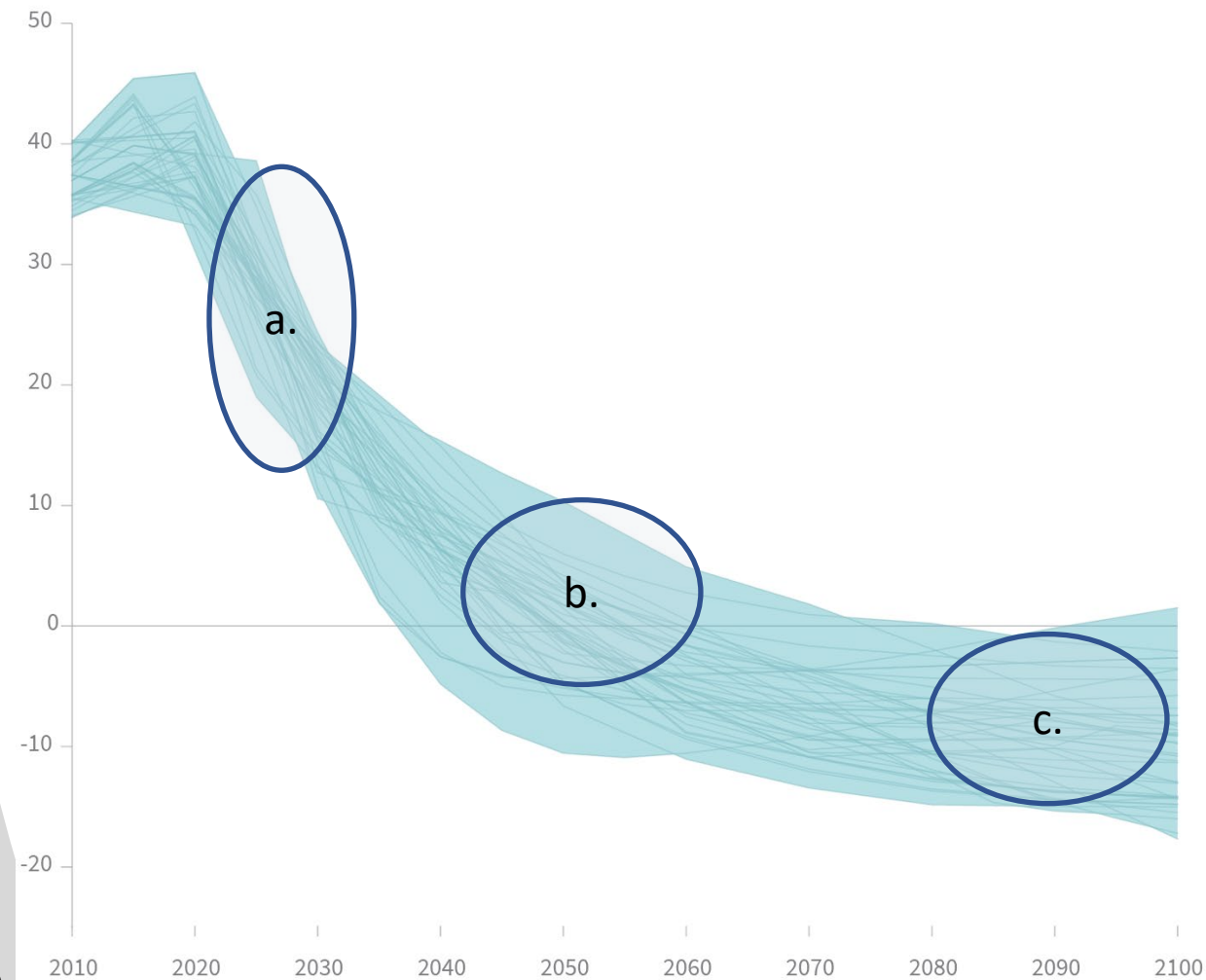
# Achieving 1.5°C compatible reductions?

## Global CO<sub>2</sub> characteristics

*Pathways limiting warming to 1.5°C  
with no or limited overshoot (less than 0.1°C):*

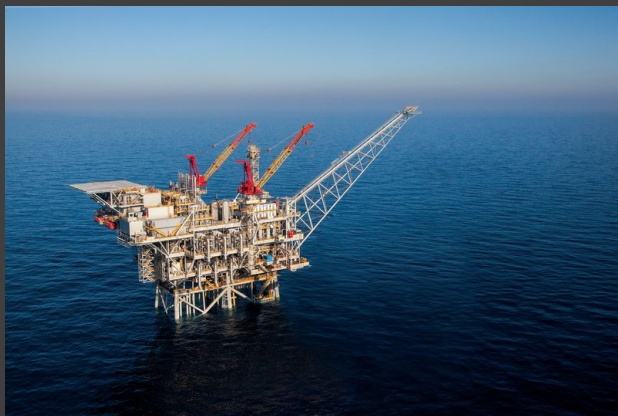
- a. Robust declining trend in next decade  
45% (range 40-60%) below 2010 levels by 2030
- b. Reach net-zero CO<sub>2</sub> around mid-century  
Net zero greenhouse gases ca. 2 decades later!
- c. Varying levels of net carbon-dioxide removal

Billion tonnes of CO<sub>2</sub>/yr

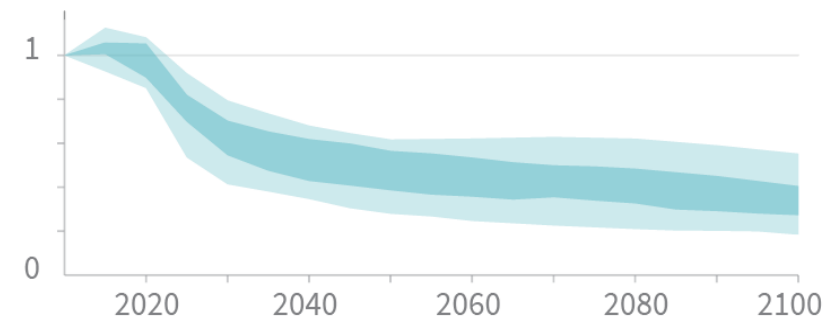




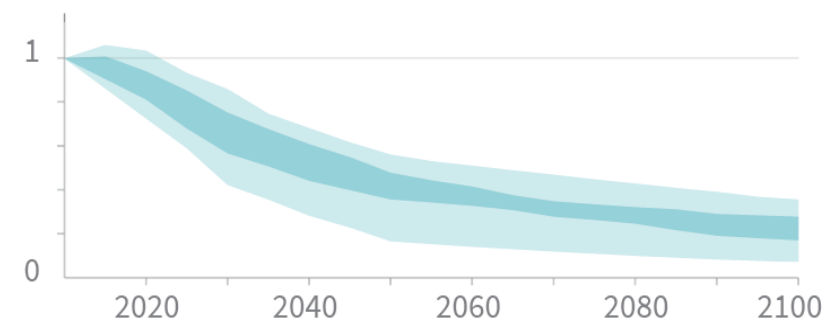
# Achieving 1.5°C compatible reductions?



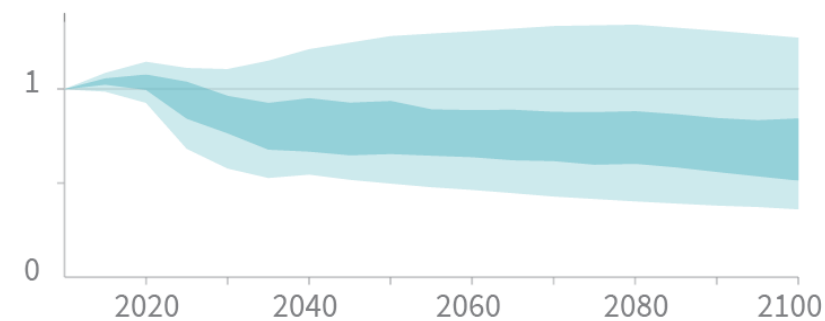
## Methane emissions



## Black carbon emissions



## Nitrous oxide emissions





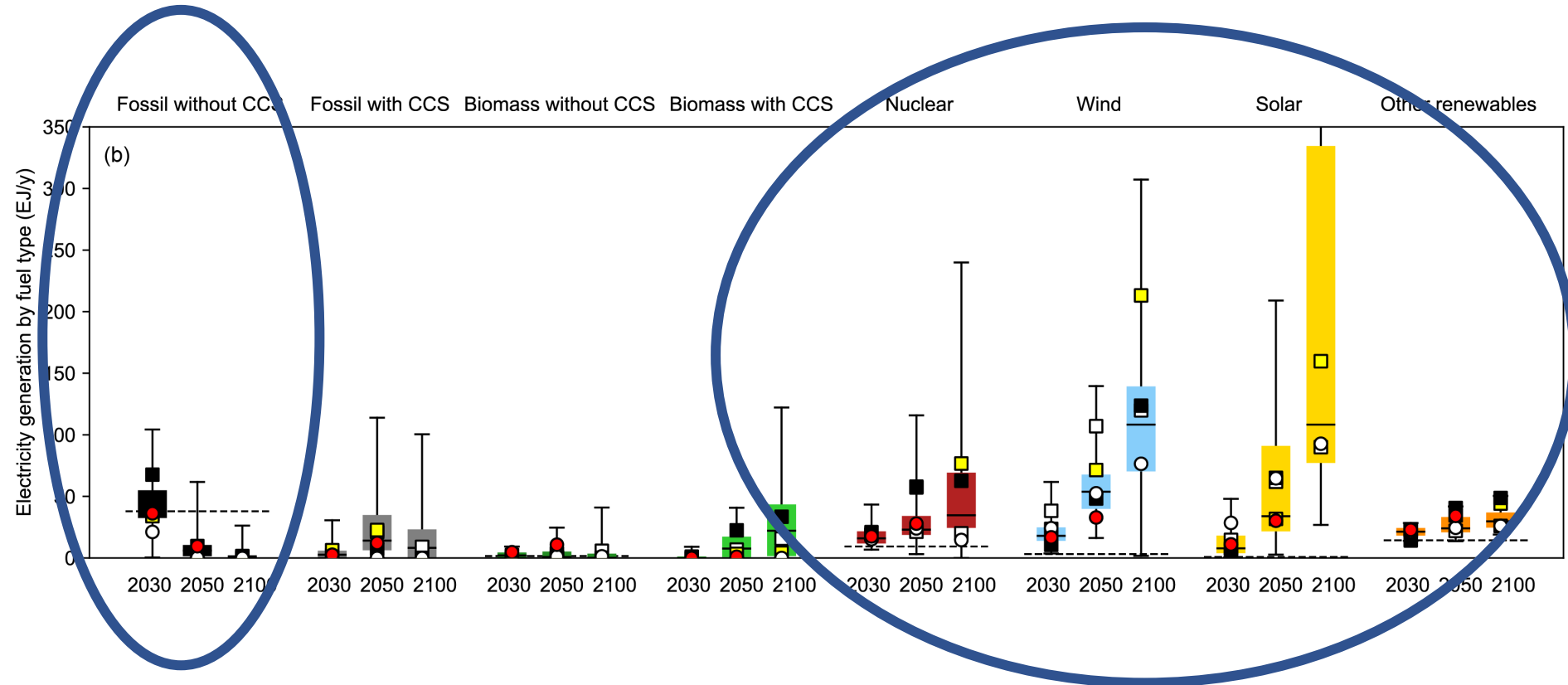
# Halting climate change needs zero emissions



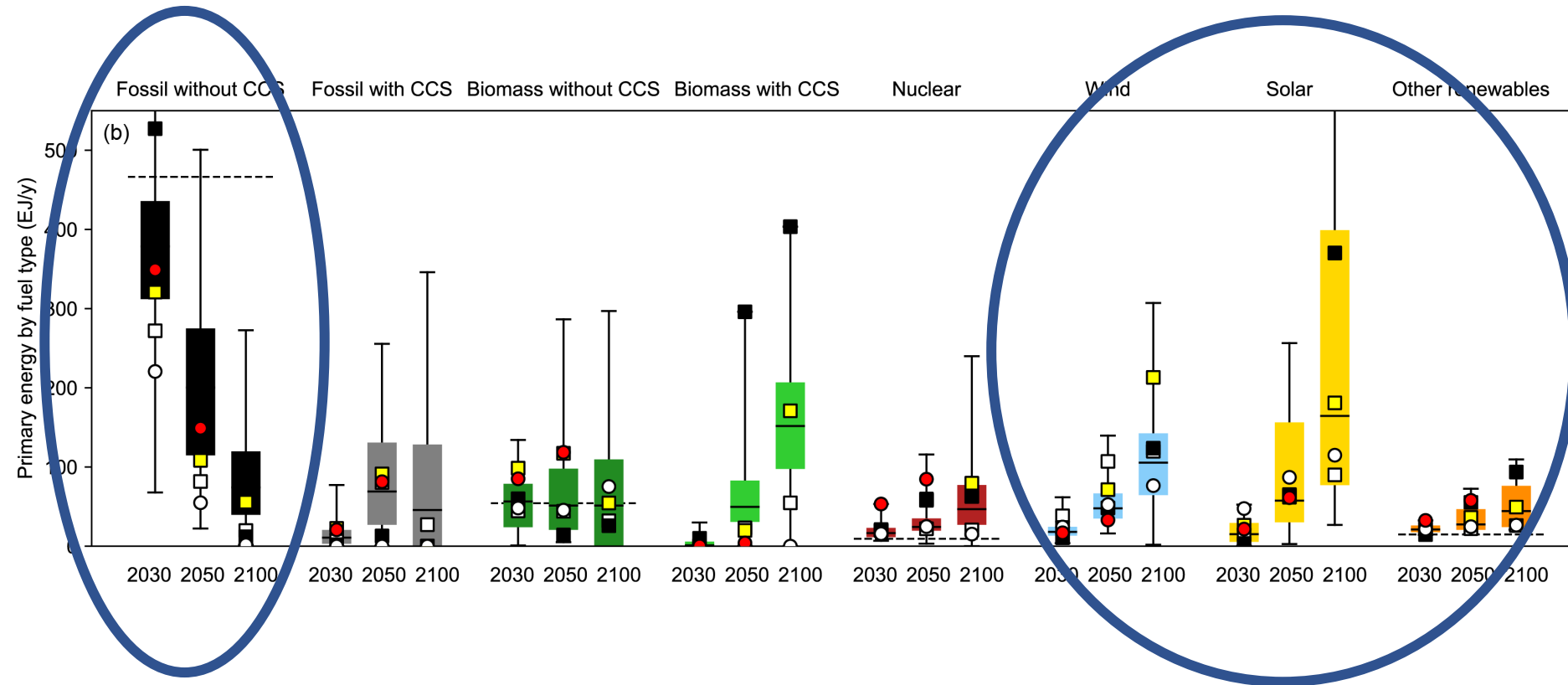
Limiting warming to **1.5°C** would require **rapid, far-reaching** changes on an **unprecedented scale**

1. In the next decade
2. In all systems
  - Energy
  - Land
  - Urban and infrastructure
  - Industrial
3. Stringent action everywhere

# Transition risk I: Global and sectoral pathways (power sector)



# Transition risk I: Global and sectoral pathways (primary energy)



# Transition risk I: Global and sectoral pathways



## Global primary energy in 1.5°C pathways

### Renewables scale up

meeting about 15% of primary energy in 2020

meeting 25-35% of primary energy in 2030

meeting 50-65% of primary energy in 2050

**Fossil fuels as a groups show a clear decline,**  
but with important variations until mid-century

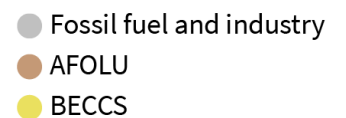
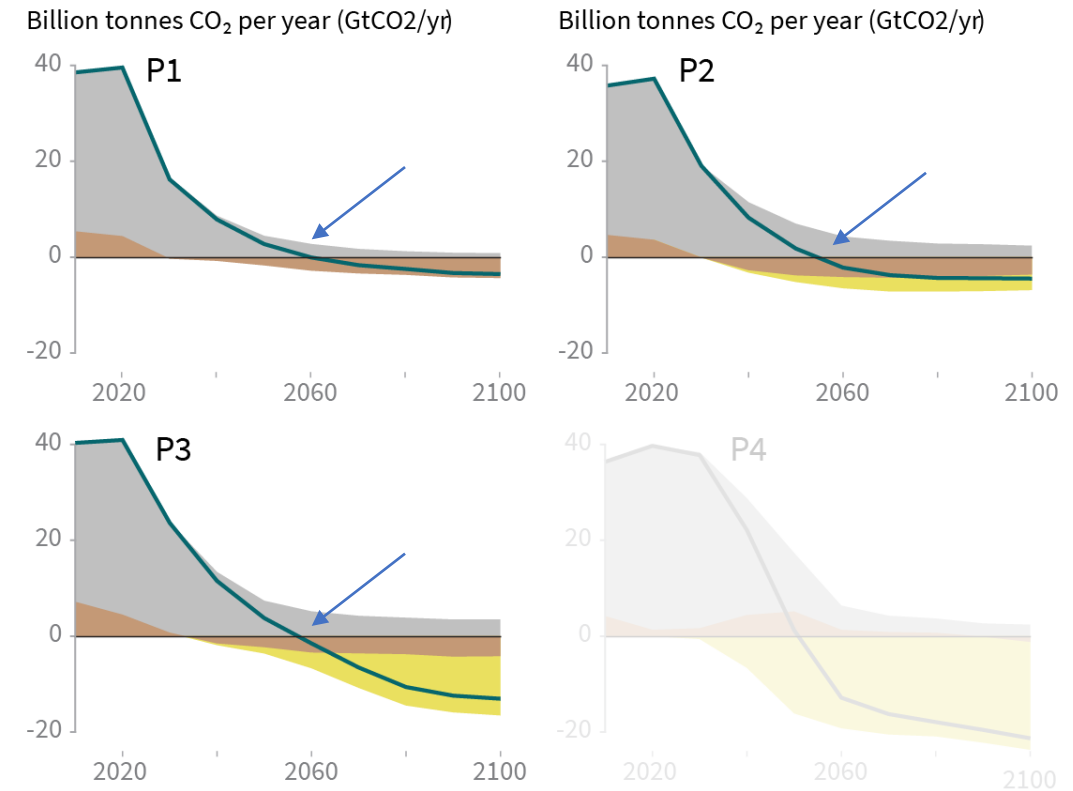
- **Coal:** strong decline in all pathways
- **Oil:** also declines but to a lesser degree
- **Gas:** use varies from strong reductions to increases from today's levels, depending on capture technologies (CCS)



# Transition risk II: Not all pathways are created equal



## Similar cumulative CO<sub>2</sub> until net zero, but different strategies



# Transition risk III: Mitigation choices matter for sustainable development



**Synergies:** health (SDG3), clean energy (SDG7), sustainable cities (SDG11), responsible production and consumption (SDG12), life below water (SDG14)

**Potential trade-offs:** no poverty (SDG1), no hunger (SDG2), clean water (SDG6), energy access (SDG7)

**Demand-side measures:** (reducing energy, materials, and land use ) allow to **maximize synergies**

**Strategic choices determine whether mitigation strategies support or counteract sustainable development**





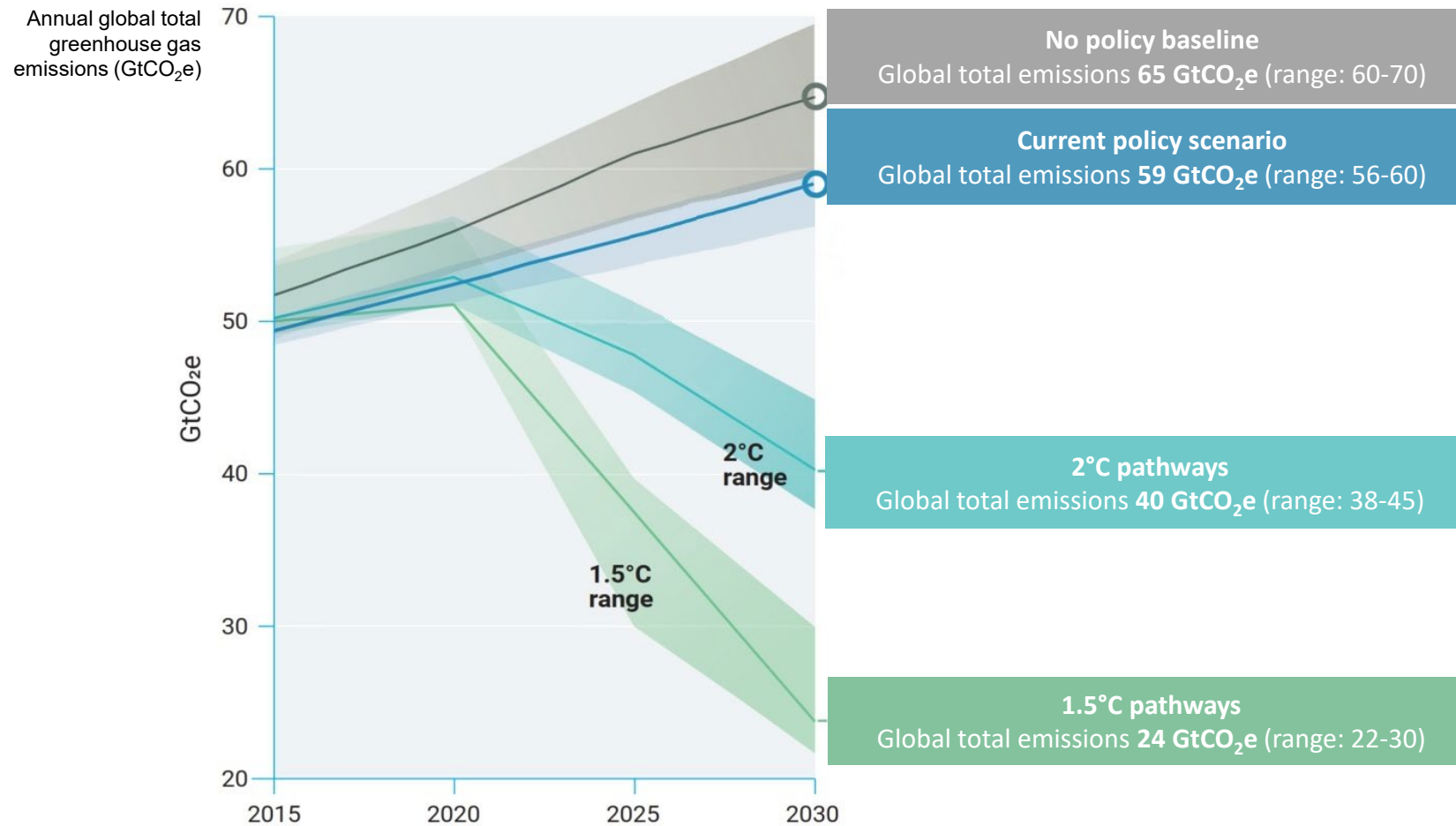
# Emissions Gap Report

2019



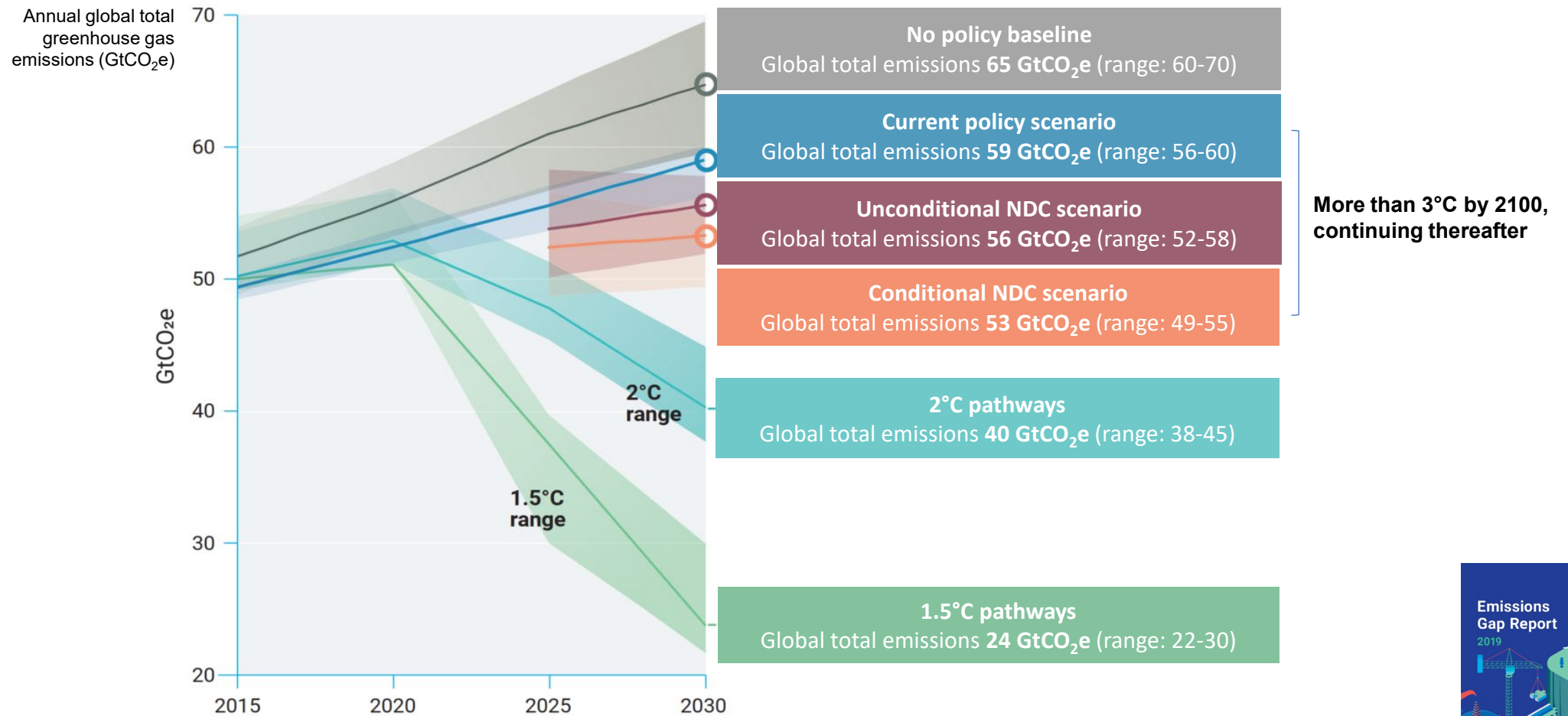
Reality check

# Reality check – we're not on track



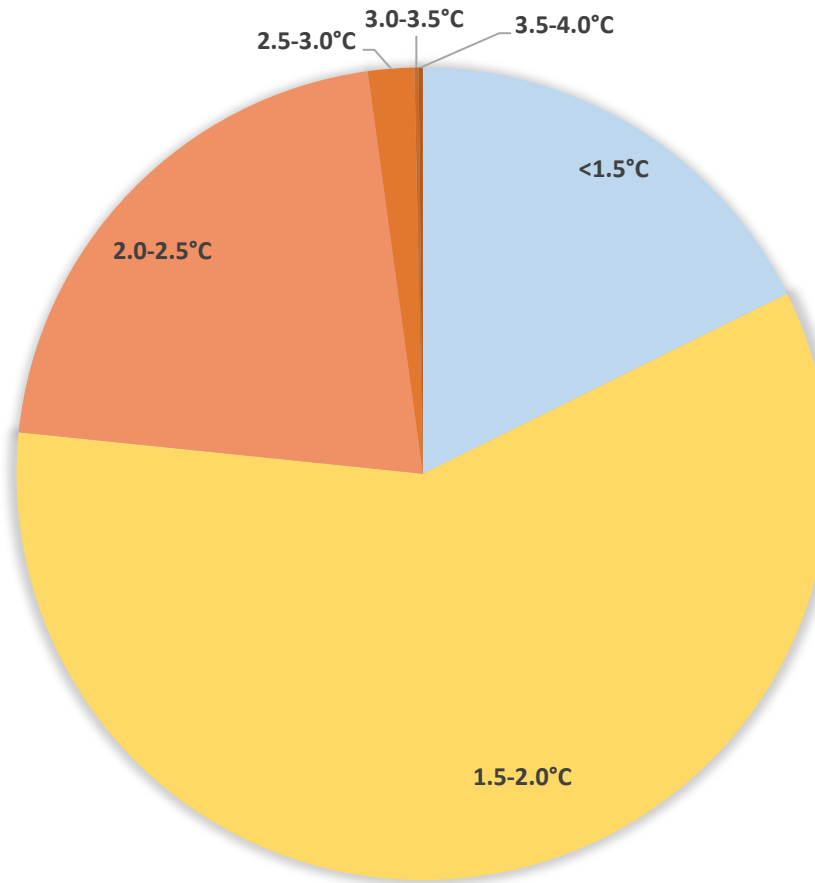


# Reality check – we're not on track



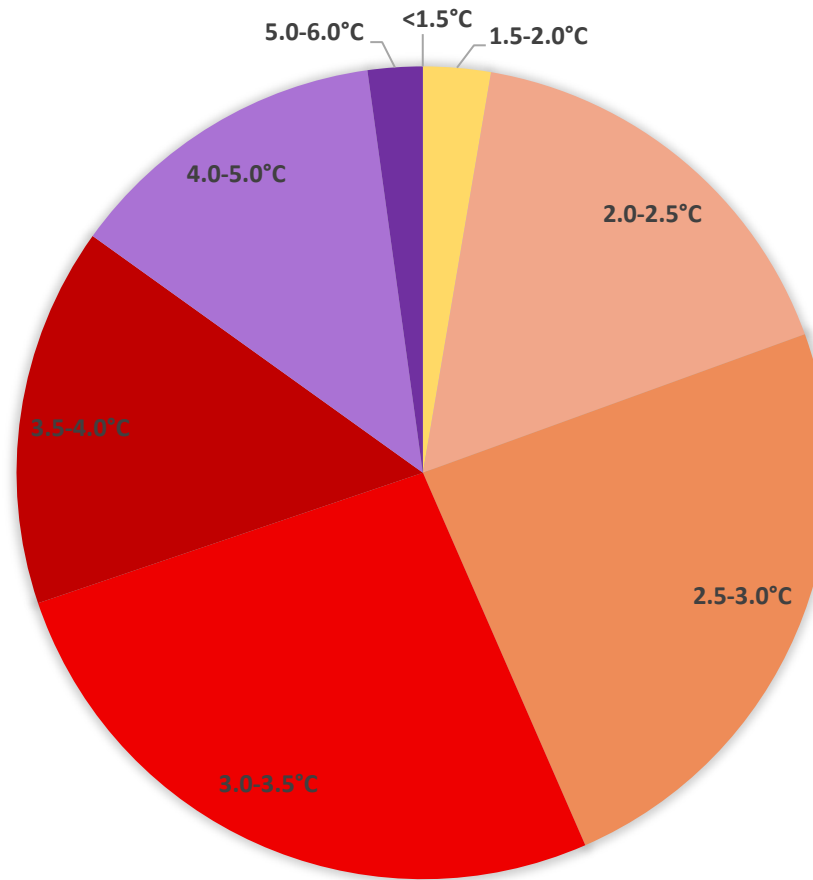
# Climate risk: our loaded dice of climate inaction

GLOBAL WARMING IN 2050 UNDER CURRENT PLEDGES



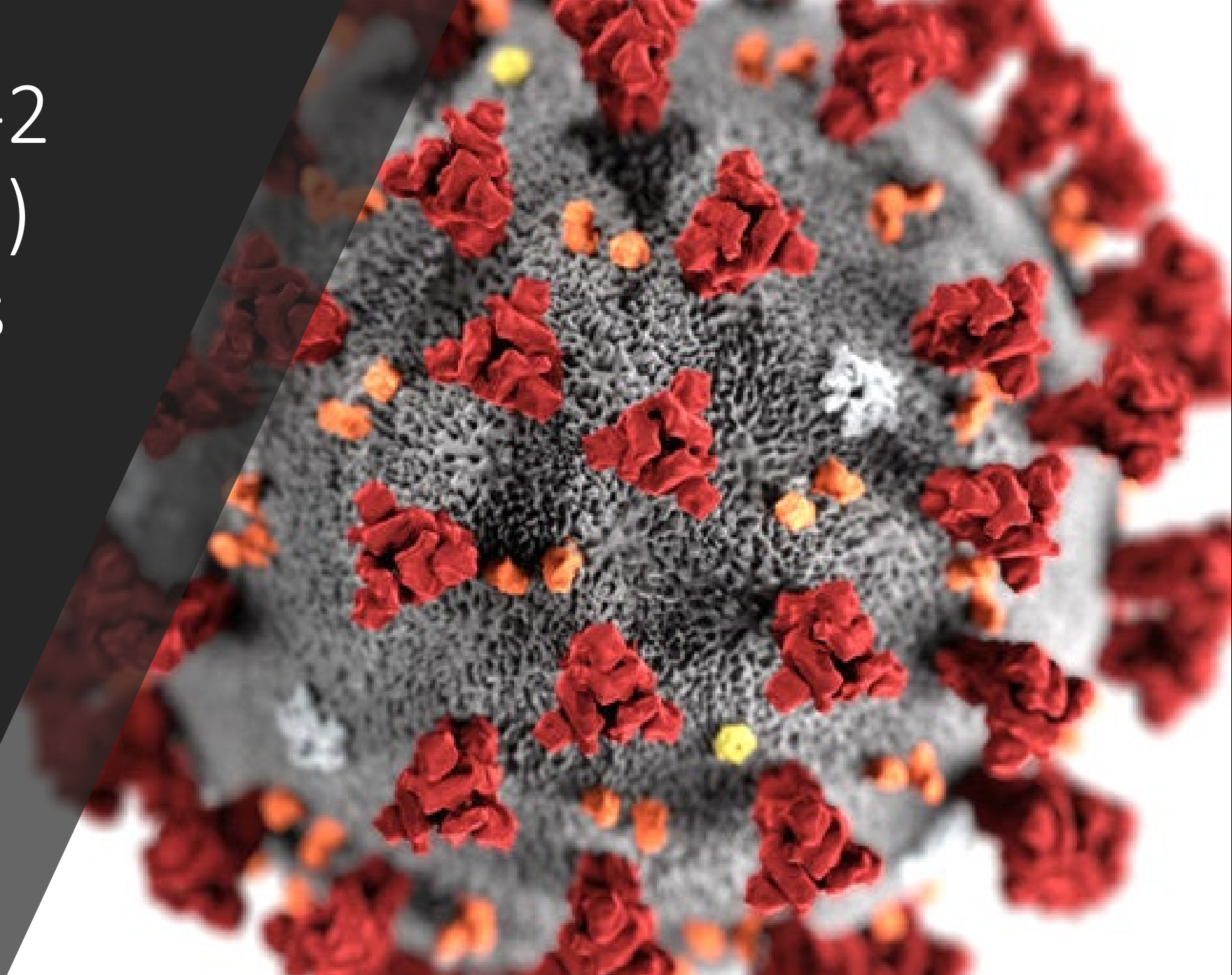
# Climate risk: our loaded dice of climate inaction

GLOBAL WARMING IN 2100 UNDER CURRENT PLEDGES

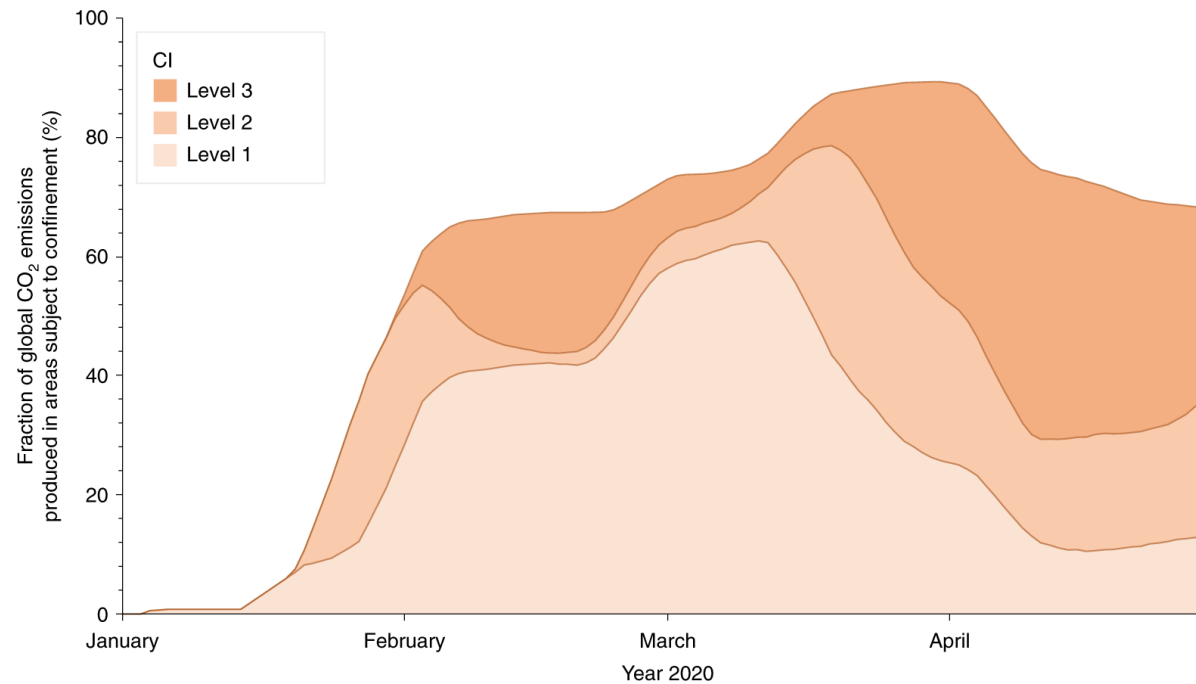




# CoV-SARS-2 (COVID-19) lockdowns

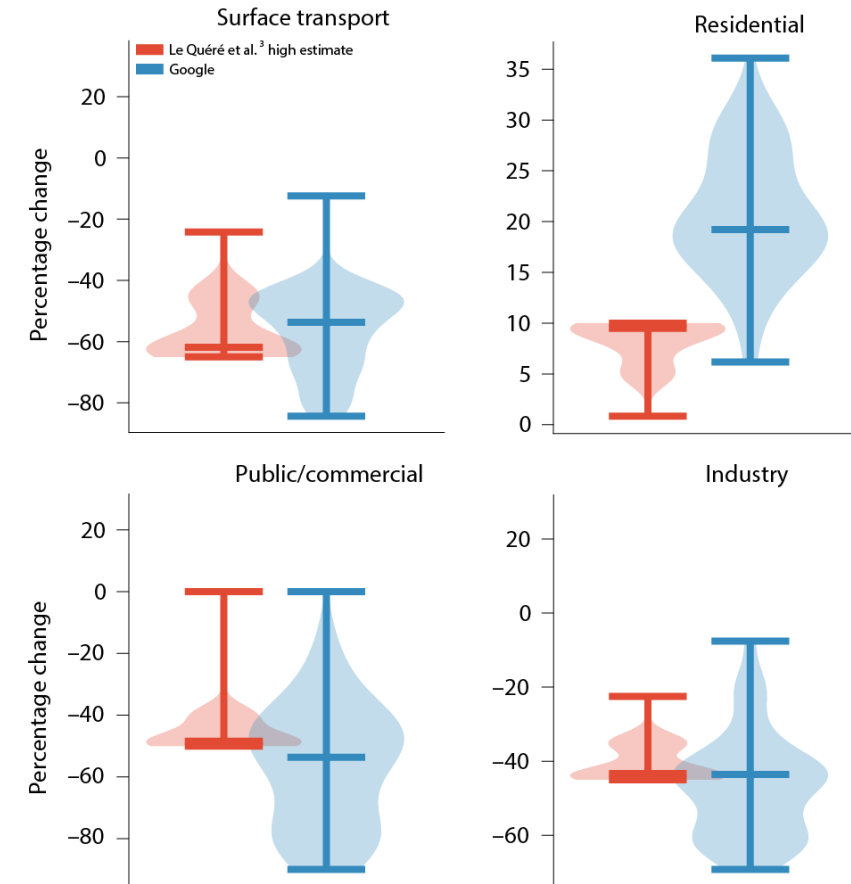


# COVID-19 is (temporarily) disrupting society



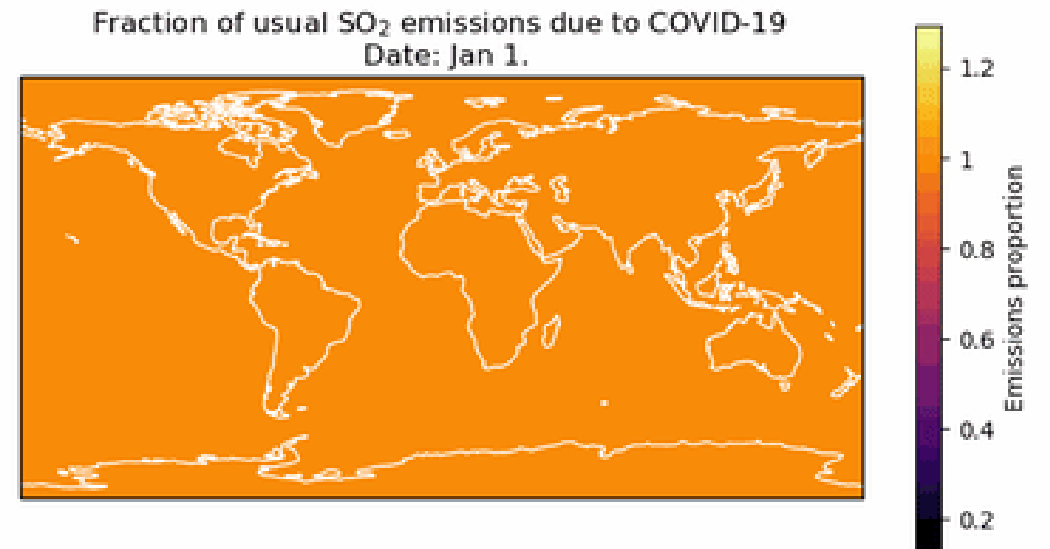
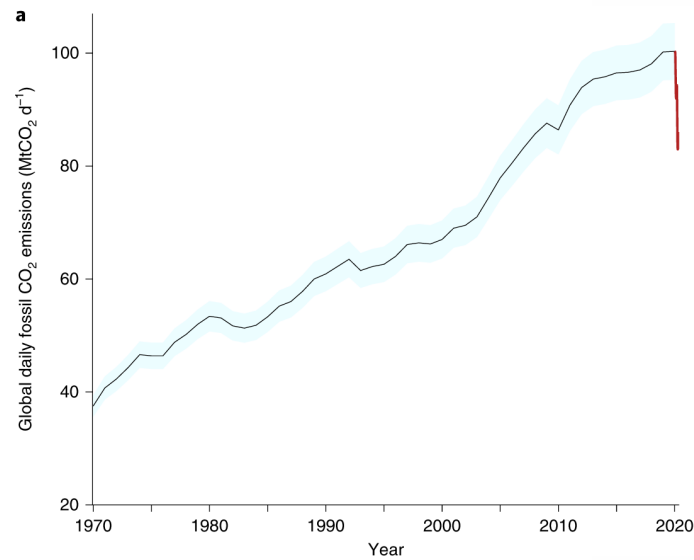
Level	Description
0	No restrictions
1	Policies targeted at long distance travel or groups of individuals where outbreak first nucleates
2	Regional policies that restrict an entire city, region or ~50% of society from normal daily routines
3	National policies that substantially restrict the daily routine of all but key workers

# COVID-19 is (temporarily) disrupting our activities





# COVID-19 is (temporarily) reducing emissions



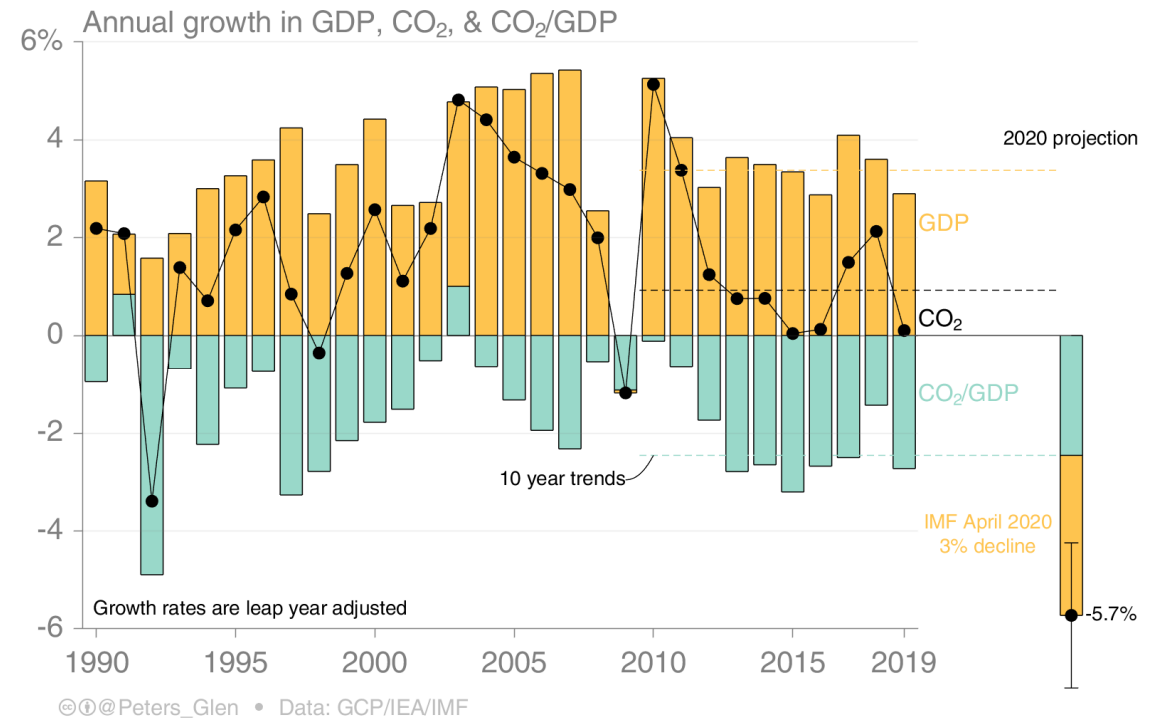
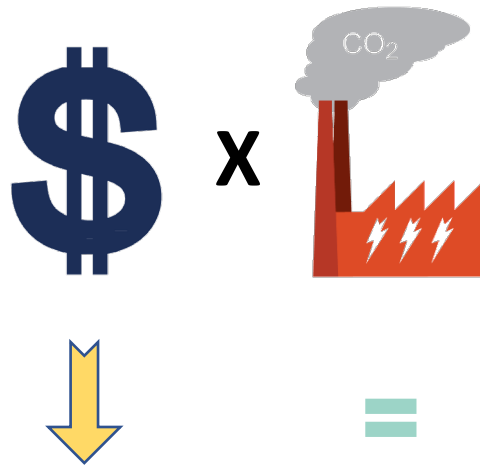
# COVID-19 lockdowns imply no structural change

CO<sub>2</sub> EMISSIONS =



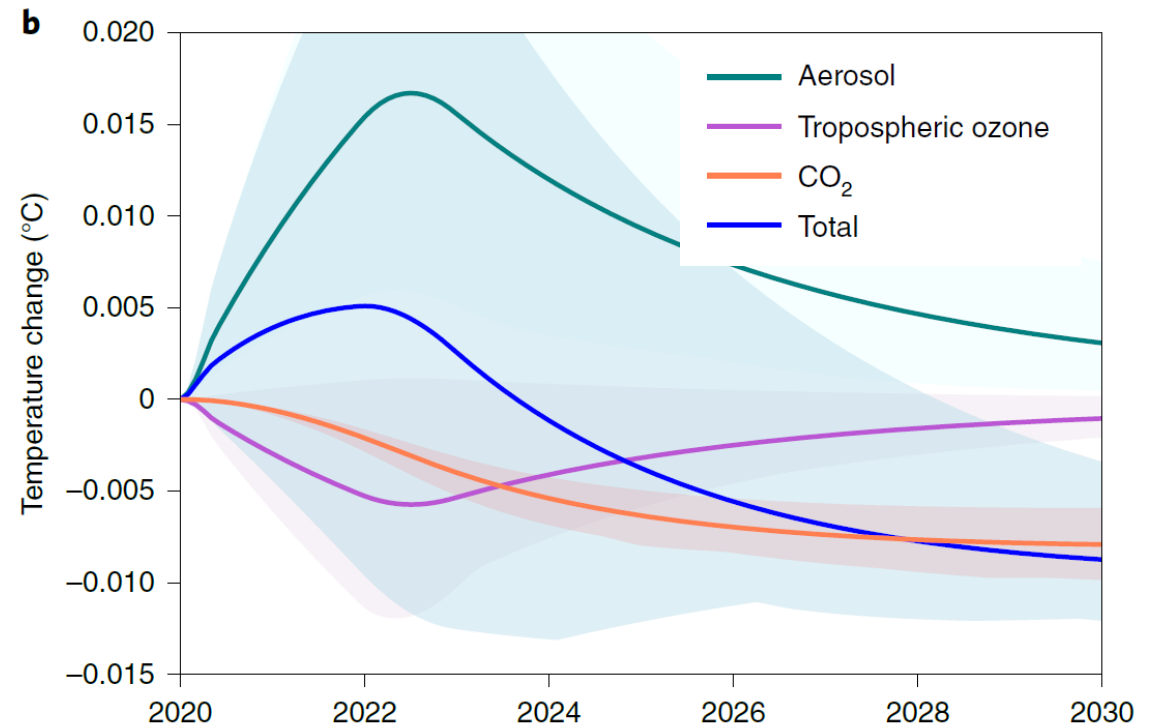
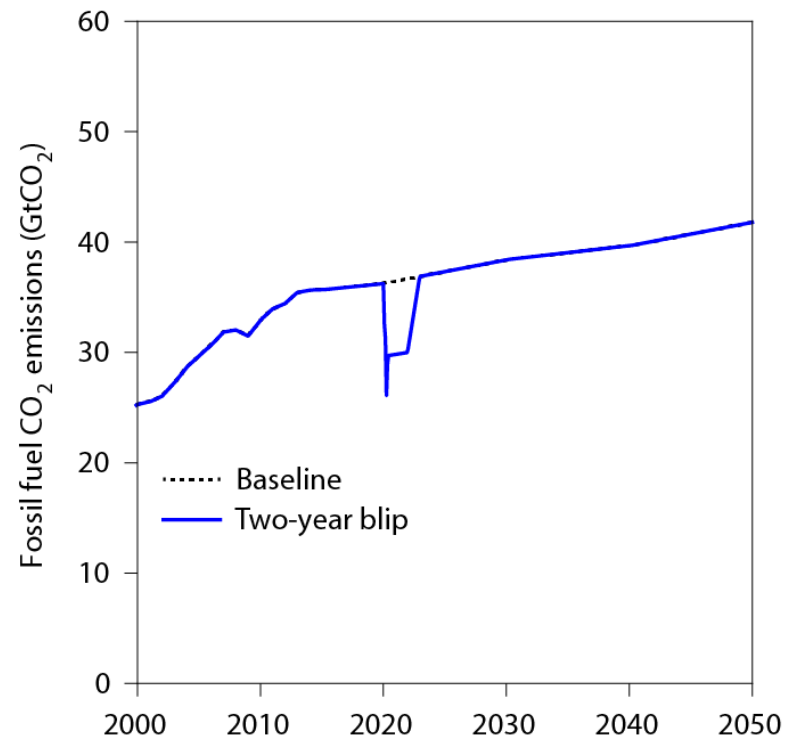
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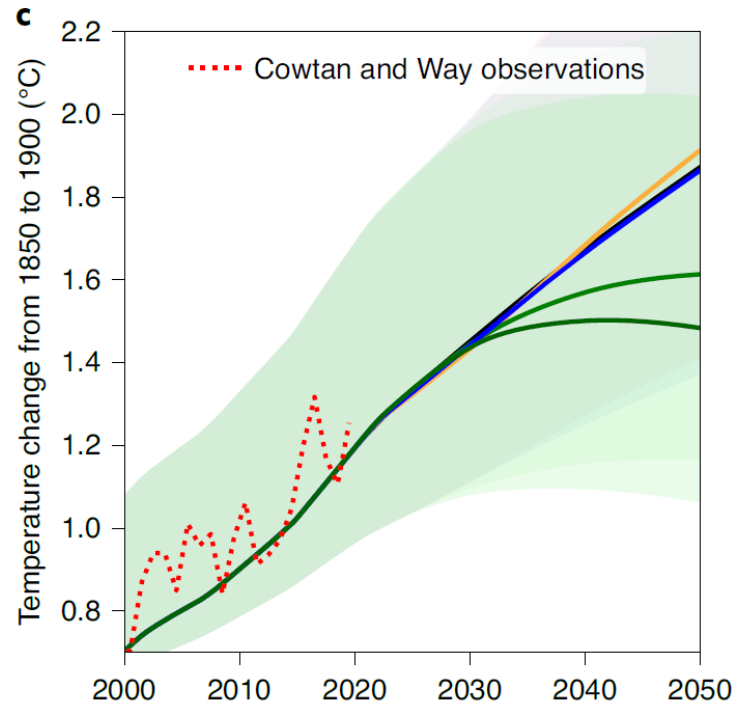
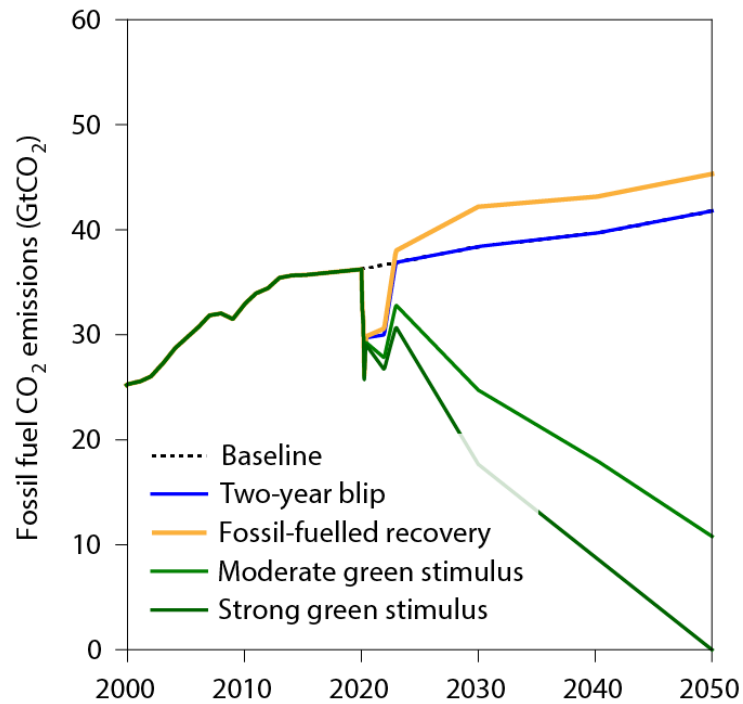




# COVID-19 is (barely) reducing temperatures

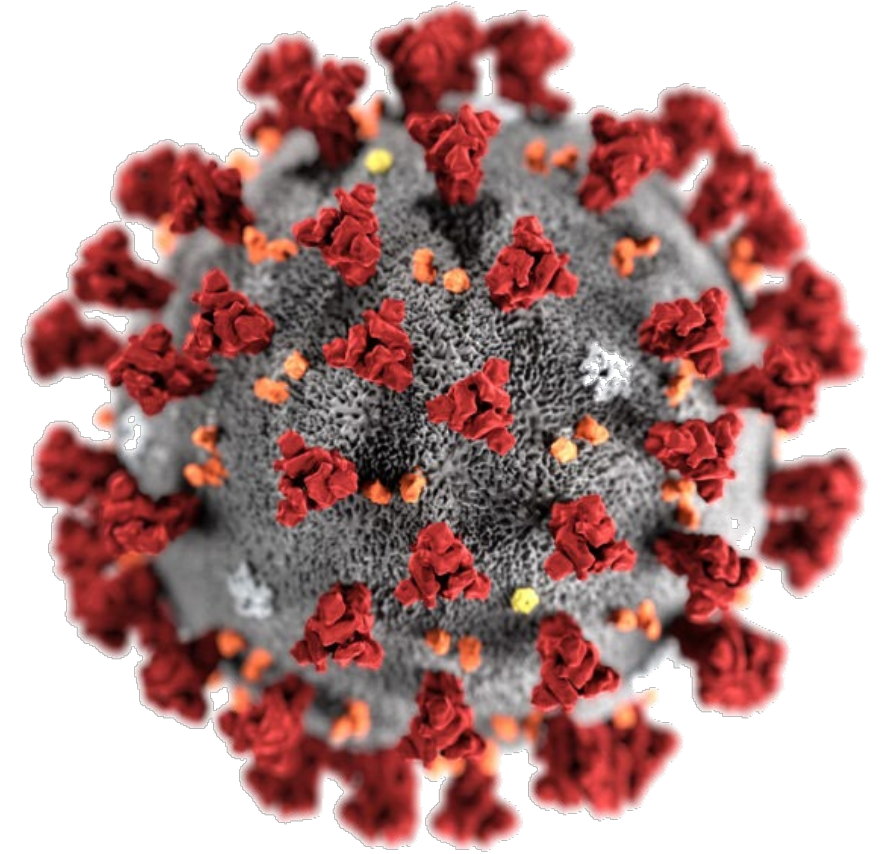


# COVID-19 response will determine climate change



# Climate and deep decarbonisation risks in a post-COVID world

- Unchanged climate risks, but increased vulnerability
- Exacerbated transition risks through:
  - Global recession
  - Risk of short-term, reactive thinking on stimulus
- Re-emphasized importance of broad range of societal concerns
- Post-COVID-19 response will determine climate change legacy





# Thank you

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nature  
climate change

ARTICLES

<https://doi.org/10.1038/s41558-020-0883-0>



## Current and future global climate impacts resulting from COVID-19

Piers M. Forster <sup>1</sup>✉, Harriet I. Forster<sup>2</sup>, Mat J. Evans <sup>3,4</sup>, Matthew J. Gidden<sup>5,6</sup>, Chris D. Jones <sup>7</sup>, Christoph A. Keller<sup>8,9</sup>, Robin D. Lamboll <sup>10</sup>, Corinne Le Quéré <sup>11,12</sup>, Joeri Rogelj <sup>6,10</sup>, Deborah Rosen<sup>1</sup>, Carl-Friedrich Schleussner <sup>5,13</sup>, Thomas B. Richardson<sup>1</sup>, Christopher J. Smith <sup>1,6</sup> and Steven T. Turnock <sup>1,7</sup>

# Dominant scenario framework results in 'unfair and risky' scenarios

- **Current situation:**

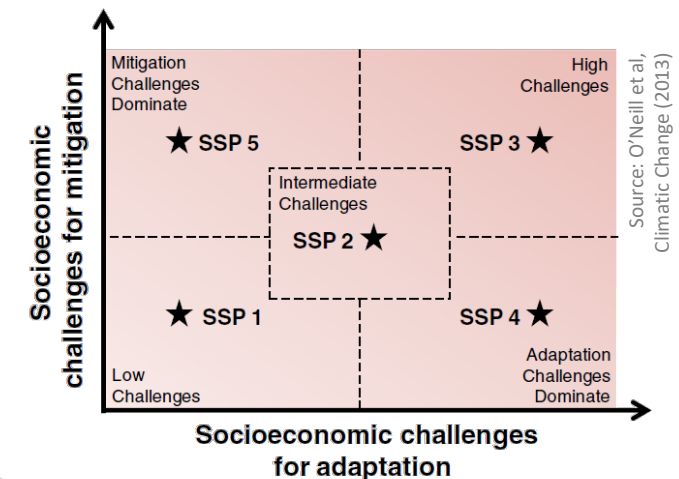
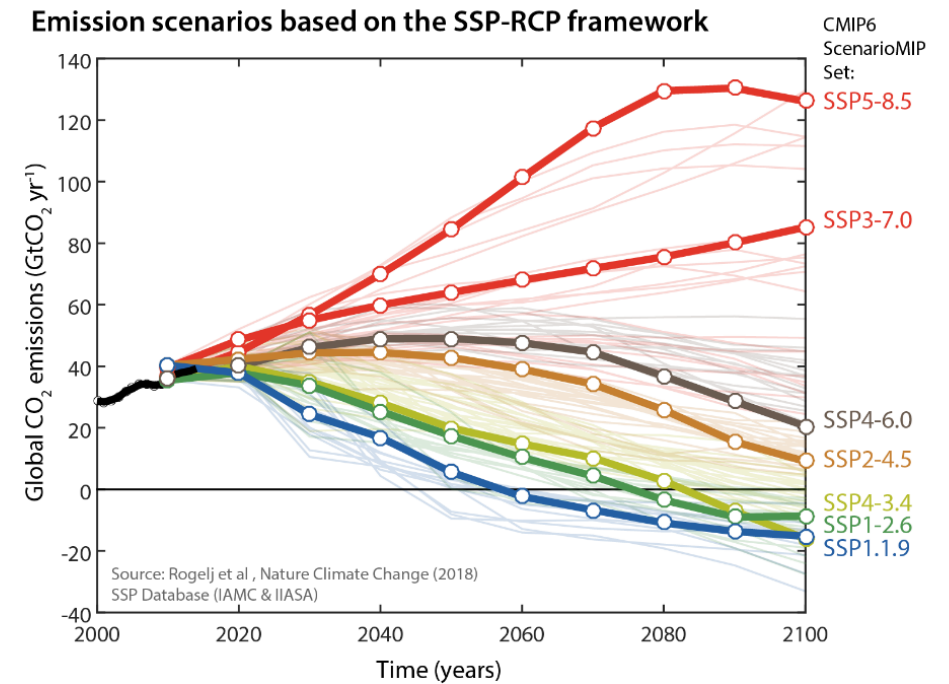
Shared Socioeconomic Pathways (SSP) & Representative Concentration Pathways (RCPs):  
Focus on **end-of-century (2100) forcing** outcome

- **Consequences:**

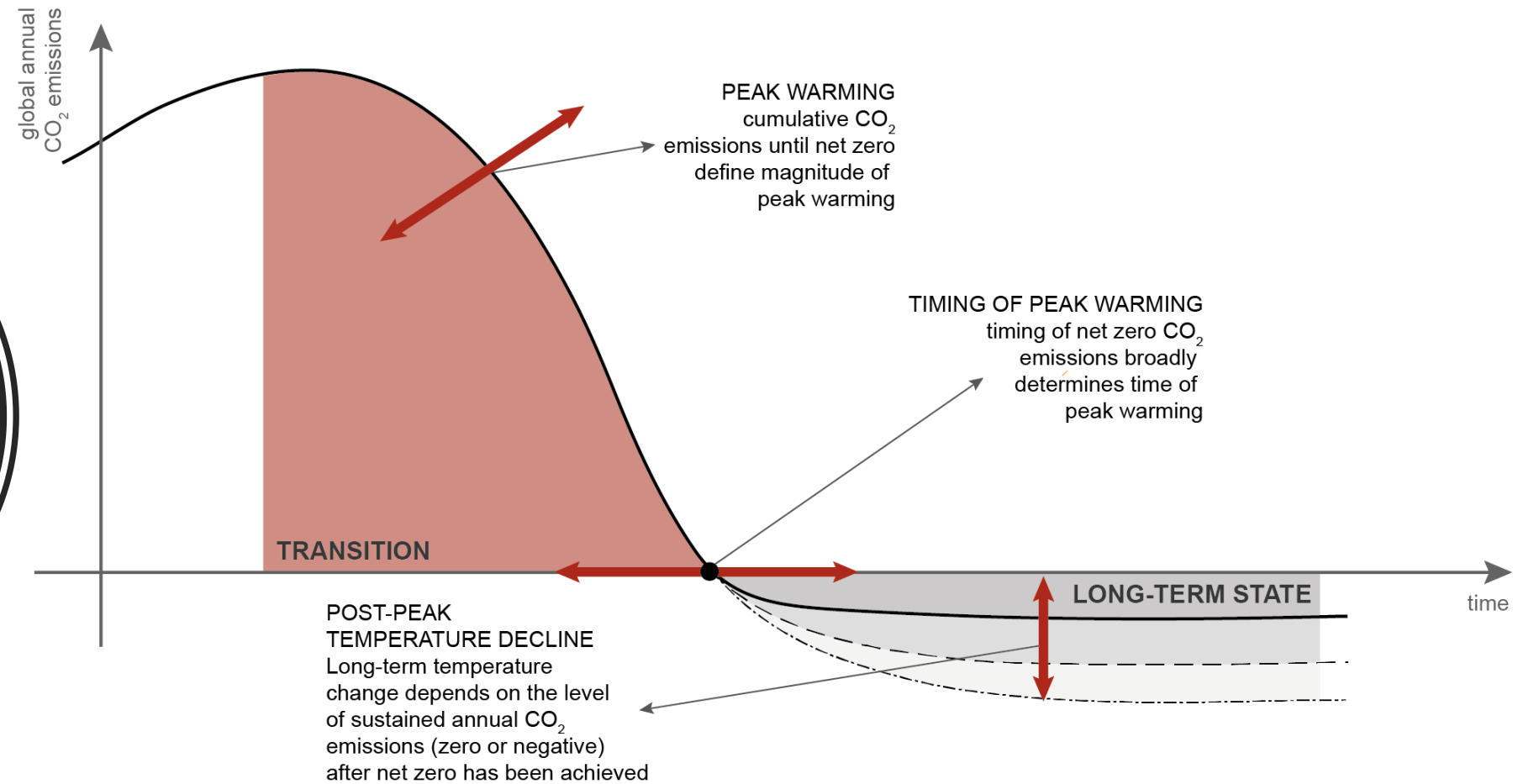
- **Climate policy inconsistency & cognitive dissonance** (overshooting)
- **Intergenerational equity and carbon-dioxide removal (CDR)**
- **Not directly compatible** with Paris Agreement
- Imprecise economic recommendations

- **SOLUTION: New scenario logic to resolve these issues**

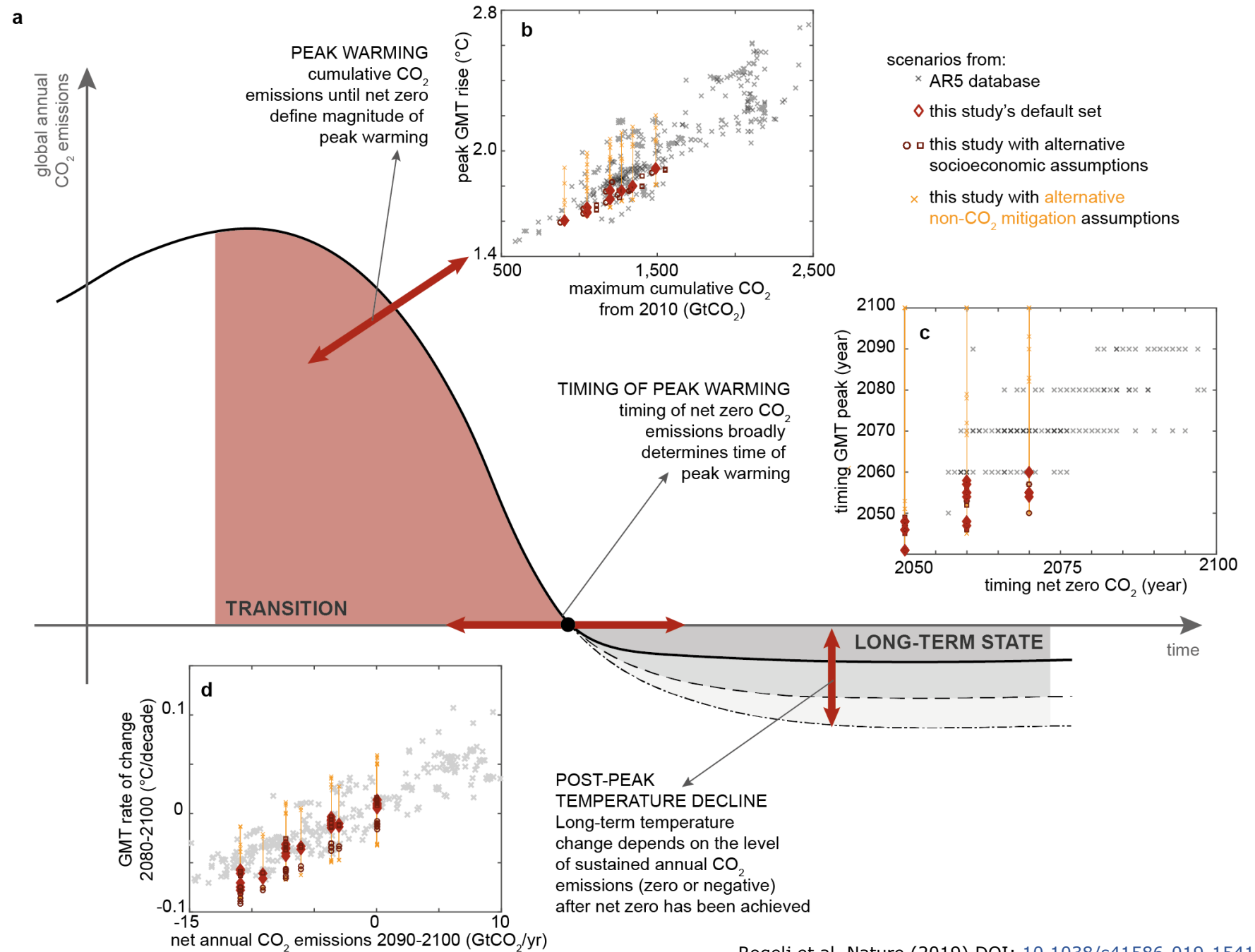
- capping global warming at a specific maximum level
- either temperature stabilization or reversal thereafter



A new scenario  
logic for the  
Paris Agreement  
long-term  
temperature  
goal



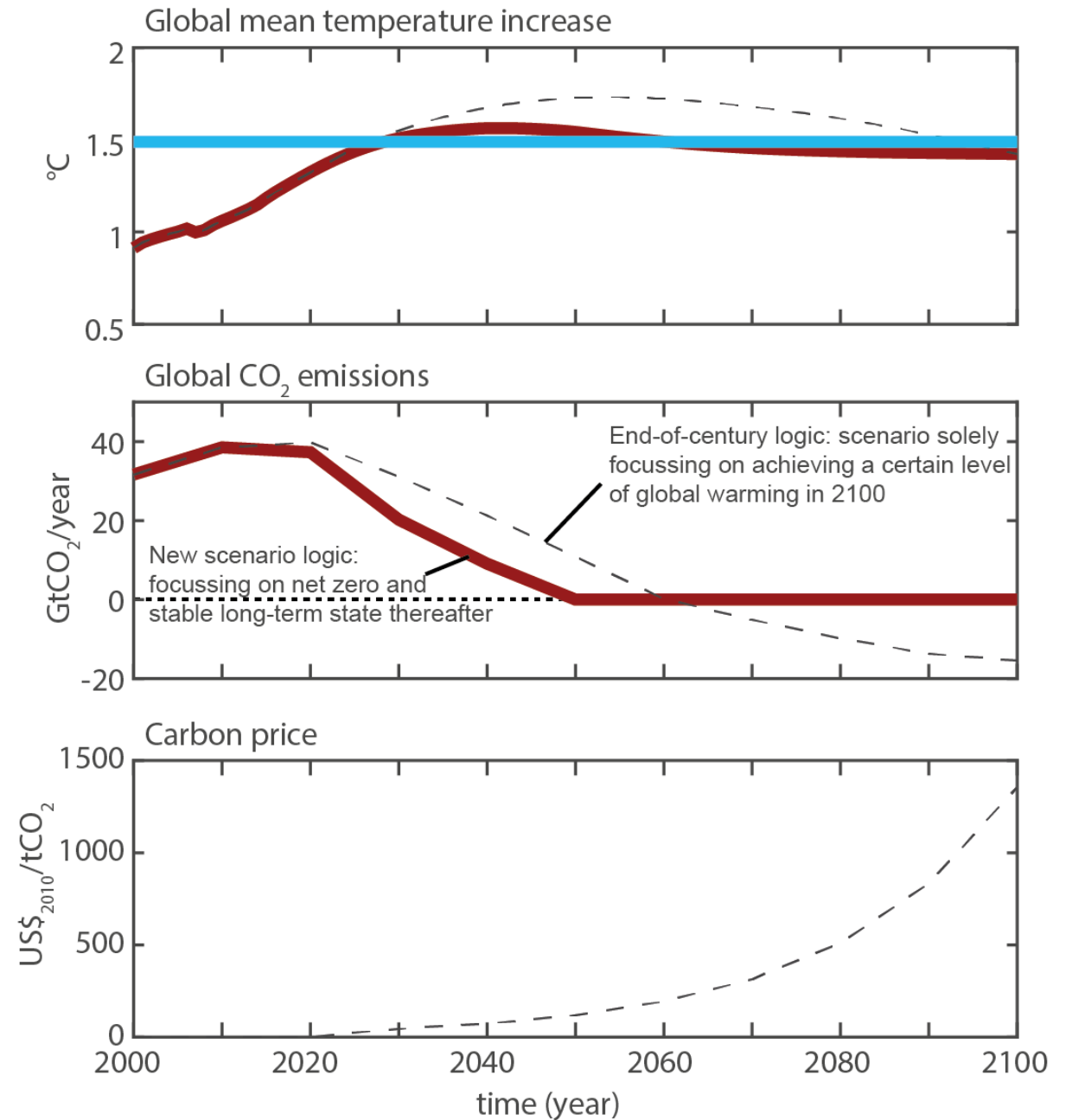
# A new scenario logic for the Paris Agreement long-term temperature goal





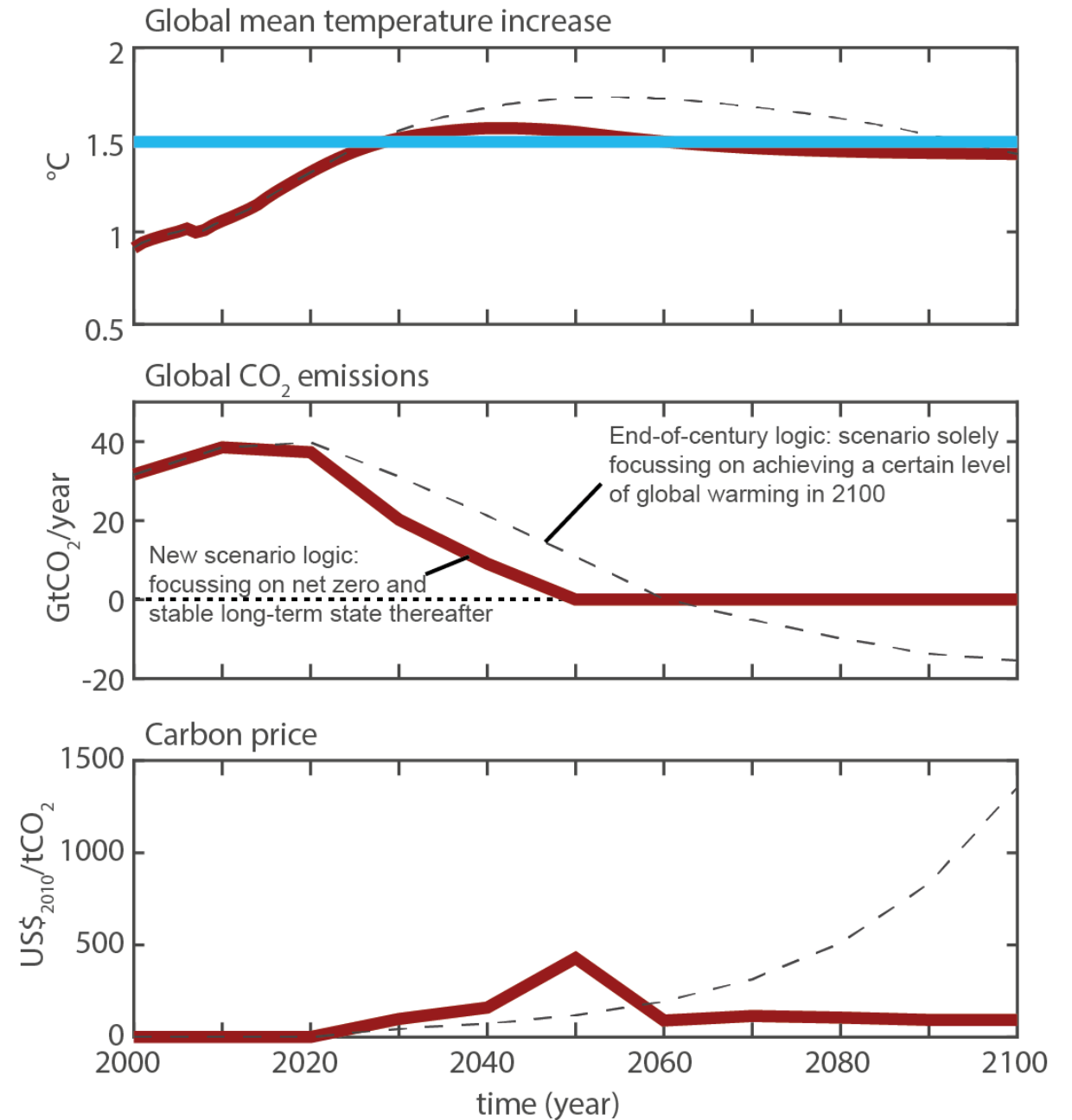
## Implications and insights of our new scenario logic

- Timing of cost-effective climate action for Paris Agreement becomes discount-rate independent



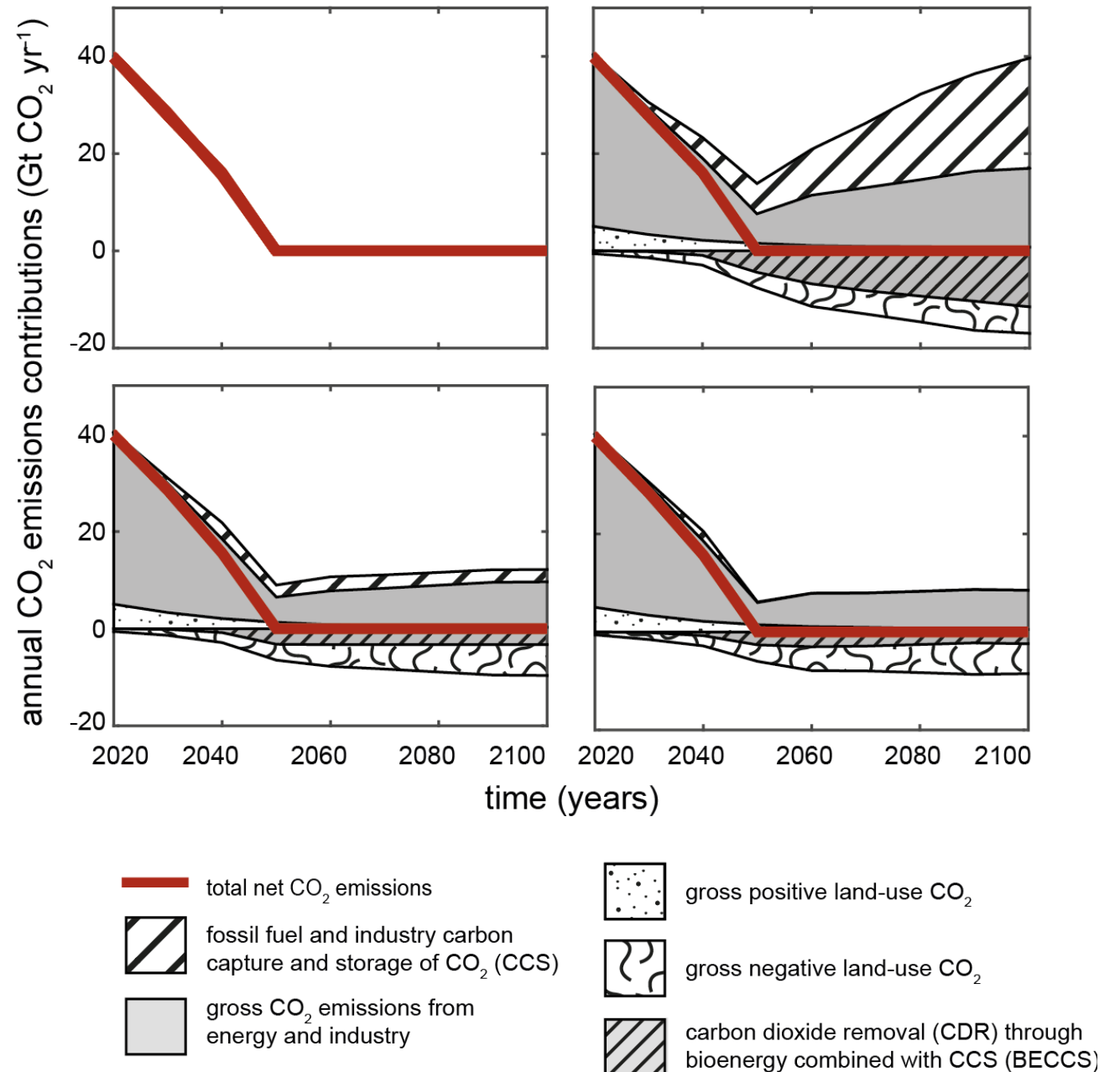
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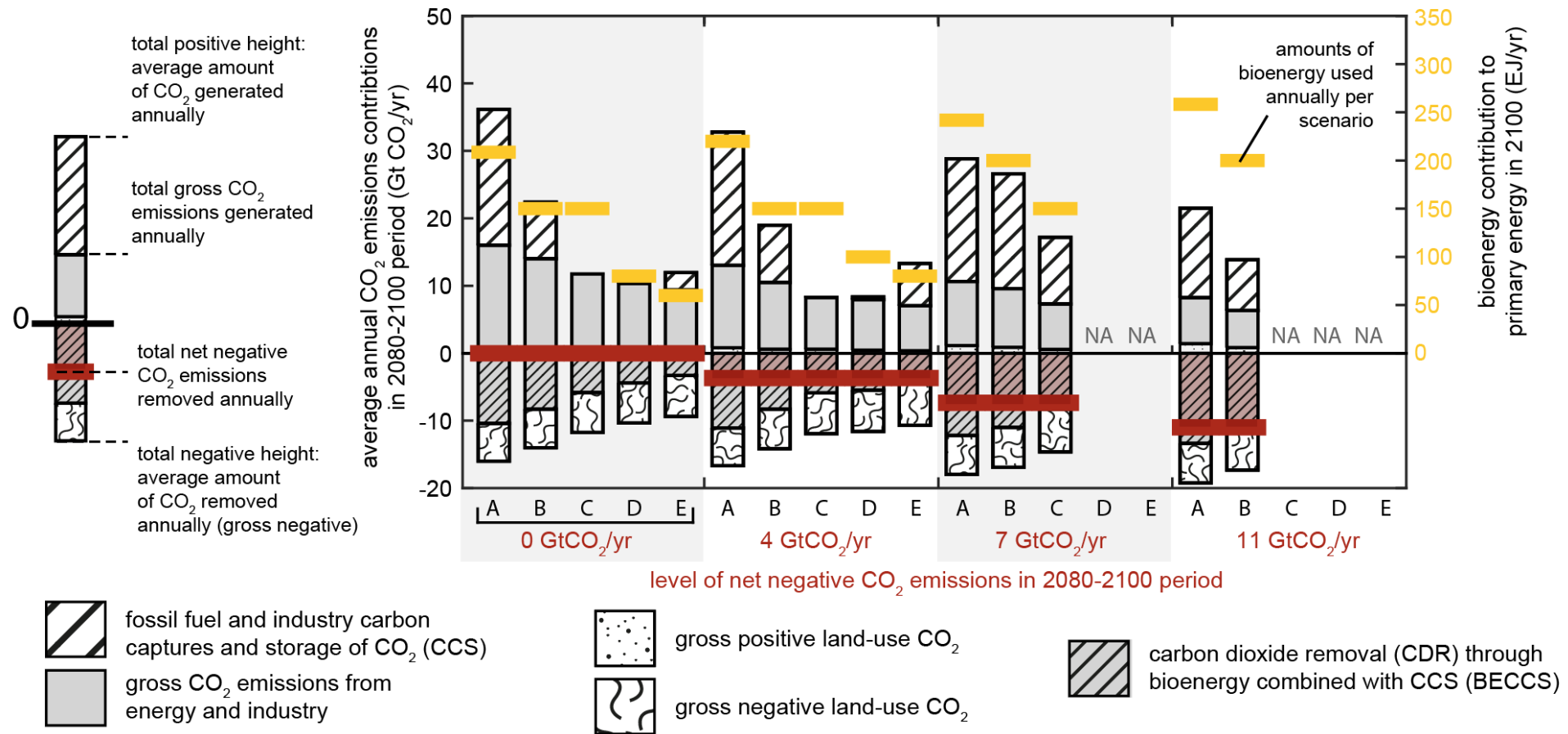
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- Timing of cost-effective climate action for Paris Agreement becomes discount-rate independent
- Fundamental shift in perception of cost of climate change mitigation over time
- Exploration of sustainable development implications without shifting climate ambition goal posts



# BACKGROUND: A new scenario logic for the Paris Agreement long-term temperature goal

## Different ways of achieving net zero and net negative global CO<sub>2</sub> emissions

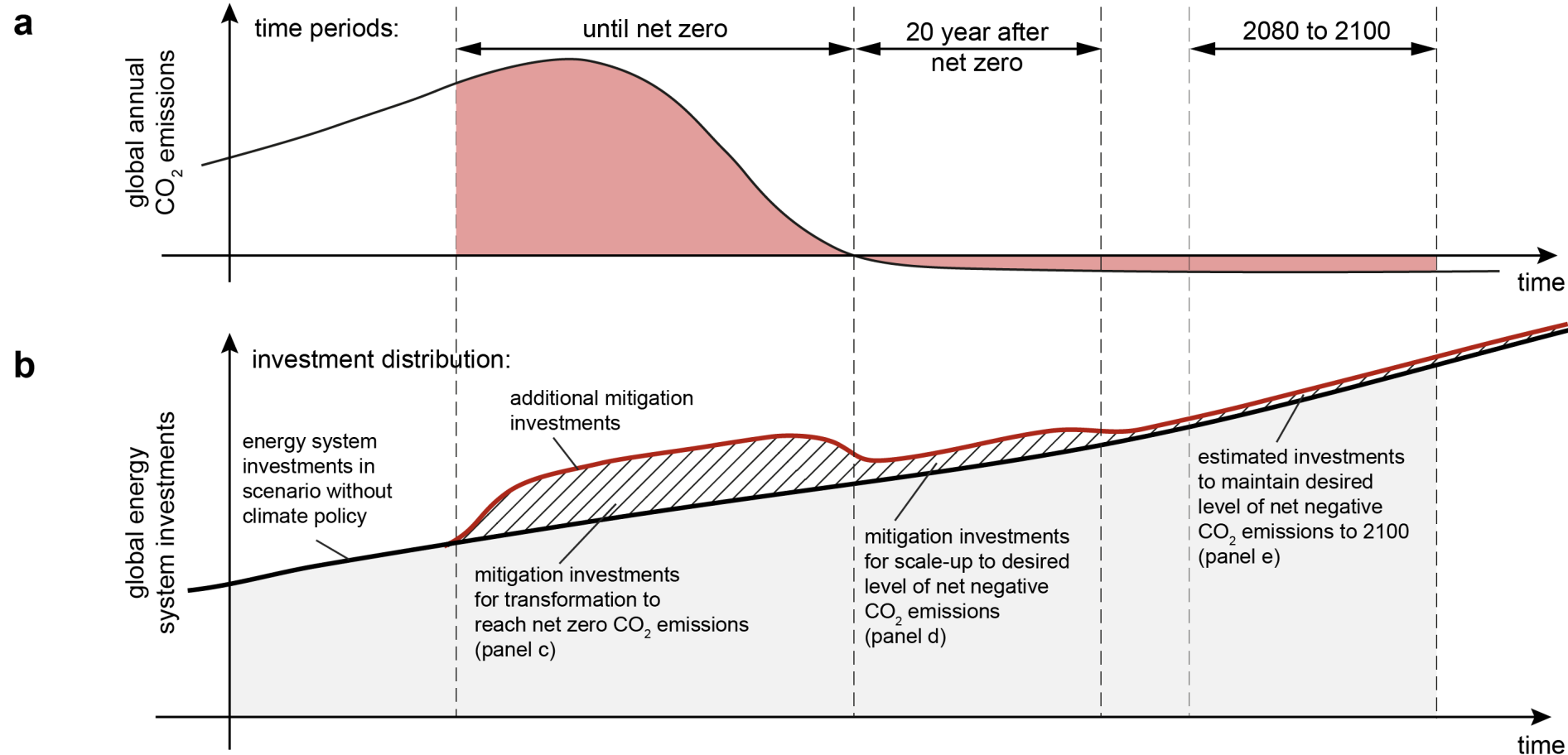




# BACKGROUND: A new scenario logic for the Paris Agreement long-term temperature goal

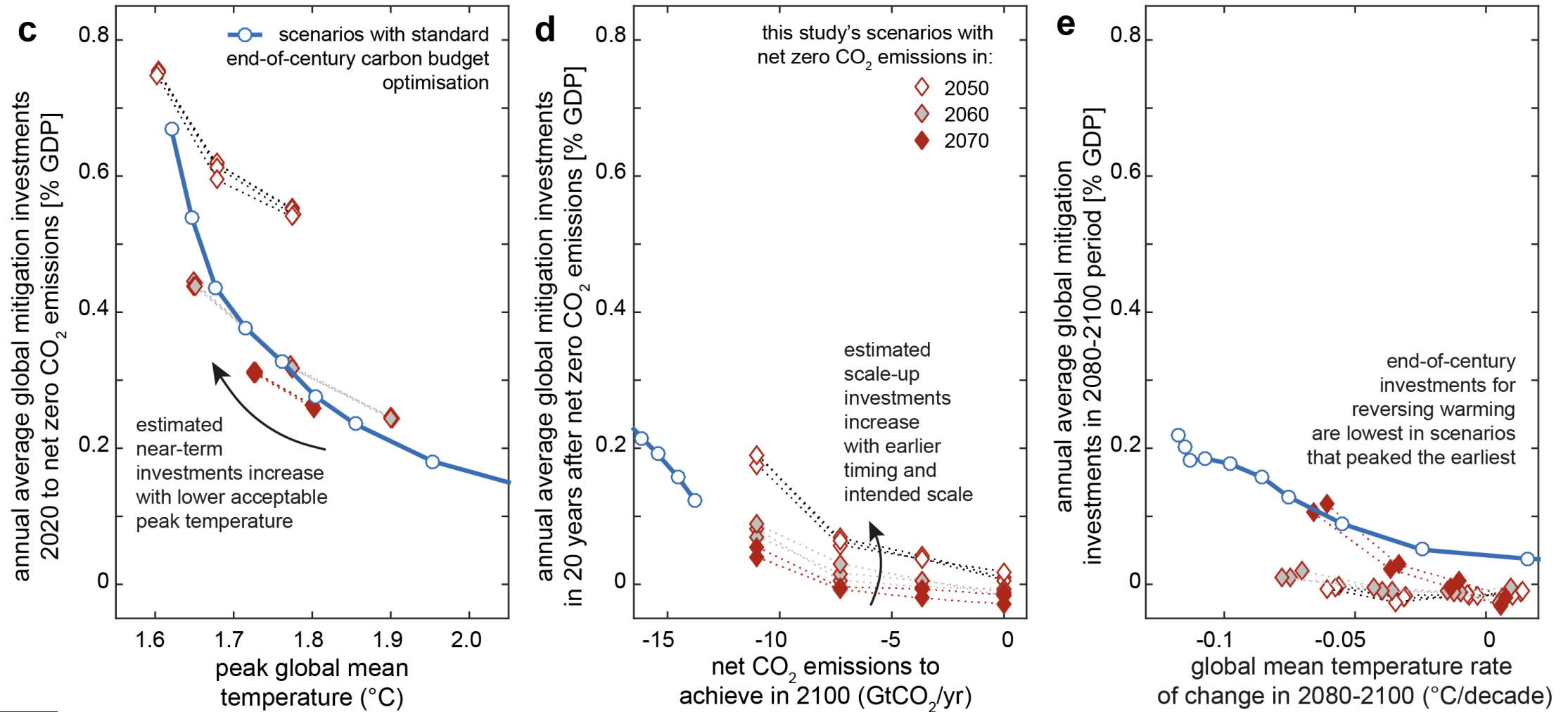
## Climate change investment implications of new scenario logic

**schematic:**



# BACKGROUND: A new scenario logic for the Paris Agreement long-term temperature goal

## Climate change investment implications of new scenario logic



# Thank you

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## nature

Article | Published: 18 September 2019

### A new scenario logic for the Paris Agreement long-term temperature goal

Joeri Rogelj , Daniel Huppmann, Volker Krey, Keywan Riahi, Leon Clarke, Matthew Gidden, Zebedee Nicholls & Malte Meinshausen

*Nature* **573**, 357–363(2019) | [Cite this article](#)

**9777** Accesses | **10** Citations | **114** Altmetric | [Metrics](#)



 **nature climate change**

Comment | Published: 28 October 2019

### A new generation of emissions scenarios should cover blind spots in the carbon budget space

Shinichiro Fujimori , Joeri Rogelj, Volker Krey & Keywan Riahi

*Nature Climate Change* **9**, 798–800(2019) | [Cite this article](#)

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