Chapter 2:
Mitigation pathways compatible with 1.5°C in the context of sustainable development

Joeri Rogelj
Coordinating Lead Author – IPCC SR1.5
Grantham Institute – Imperial College London
International Institute for Applied Systems Analysis (IIASA)

ipcc
INTERGOVERNMENTAL PANEL ON climate change
WMO UNEP

The remaining carbon budget

Image source: NASA blue marble

The remaining carbon budget

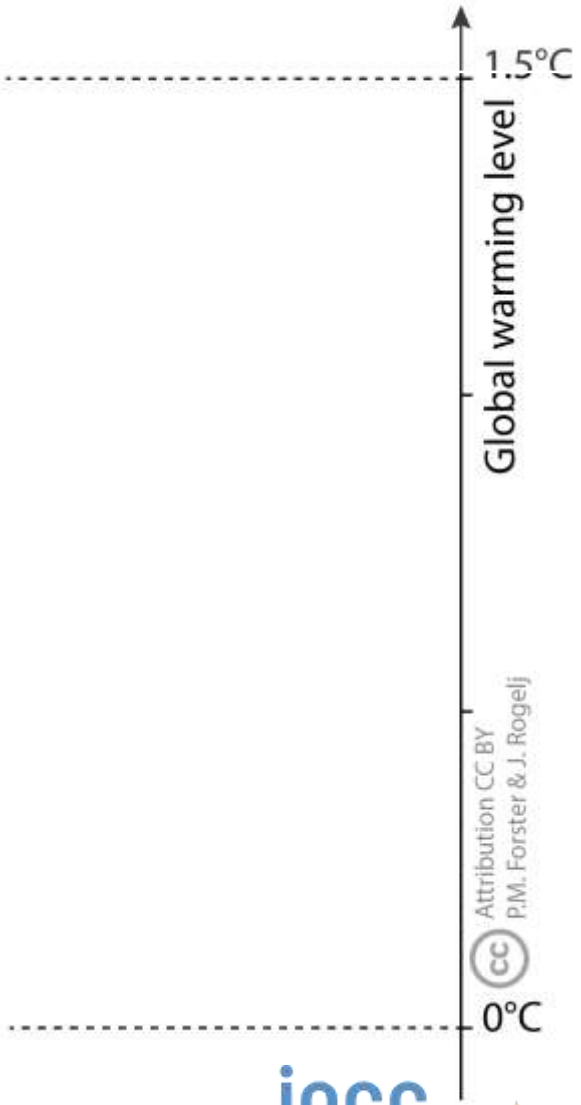


Image source: NASA blue marble

The remaining carbon budget

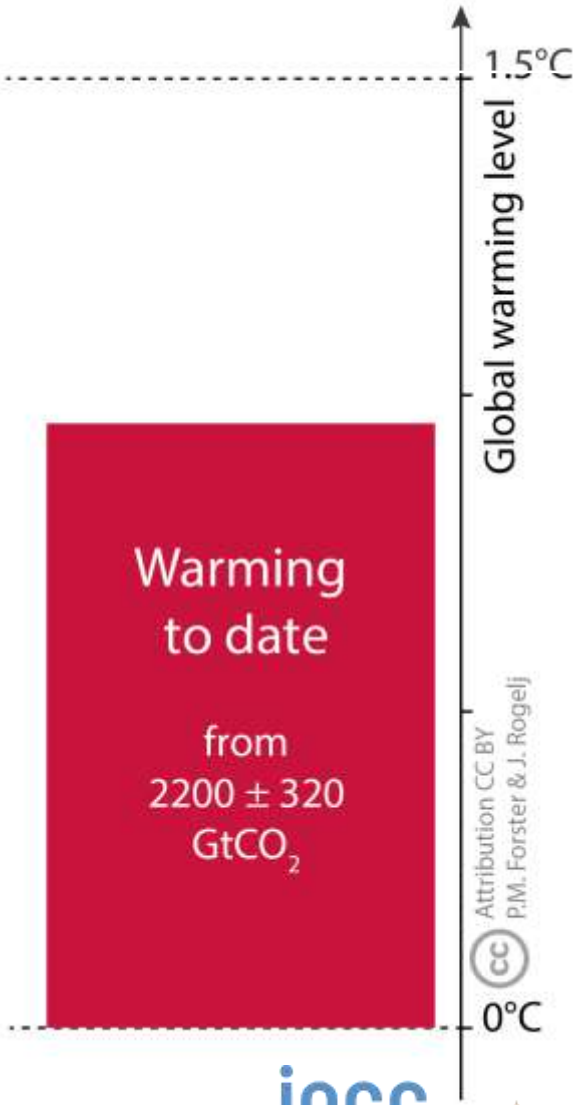


Image source: NASA blue marble

The remaining carbon budget

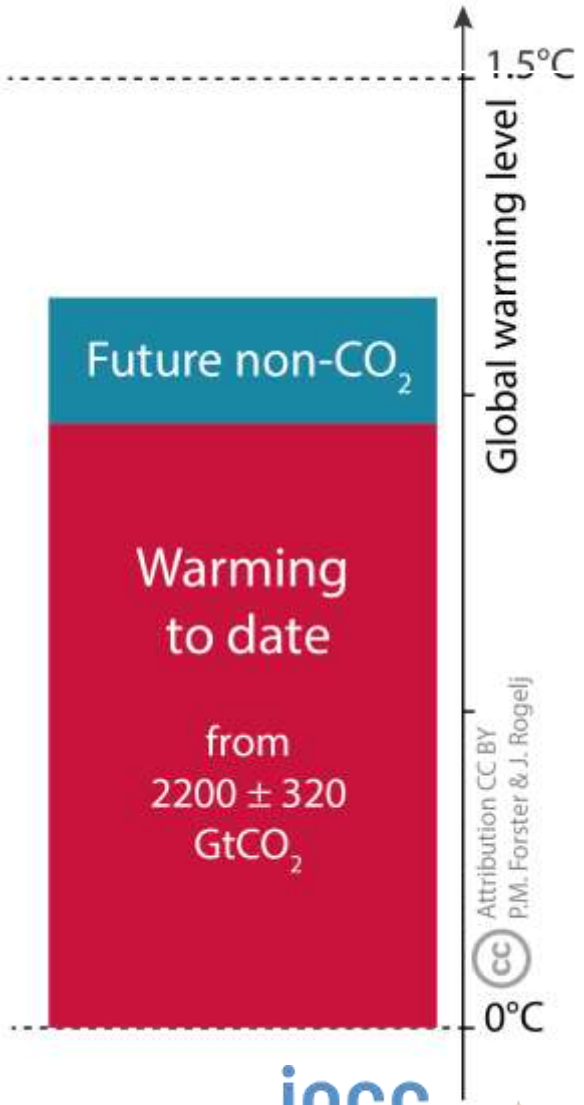


Image source: NASA blue marble

The remaining carbon budget

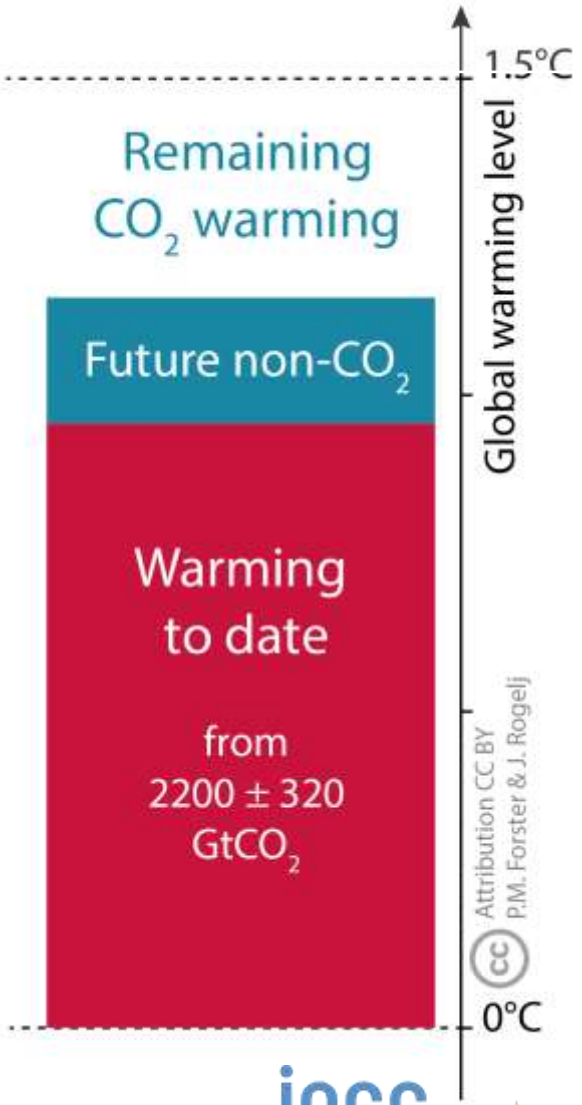
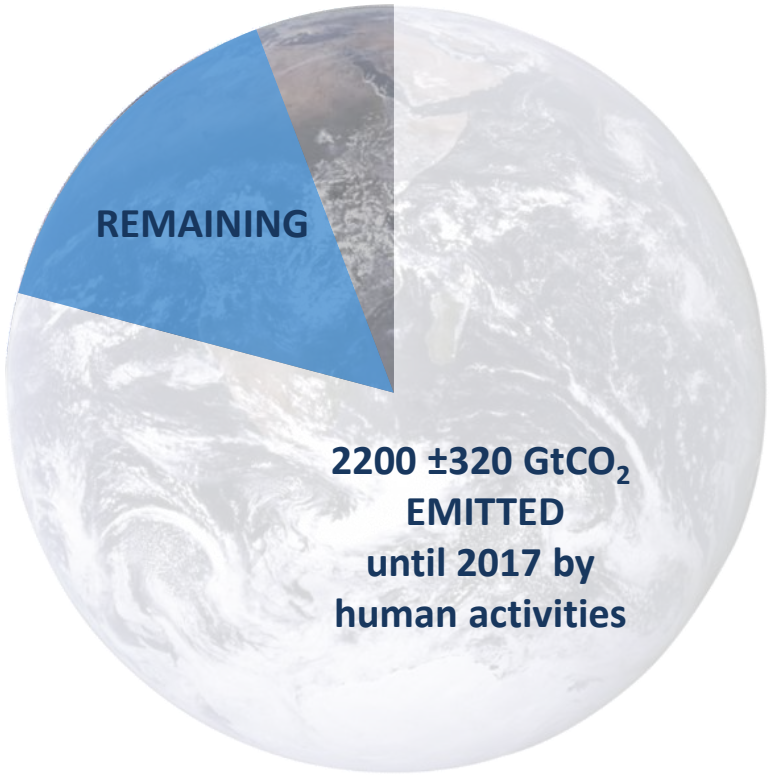


Image source: NASA blue marble

The remaining 1.5°C carbon budget



Remaining carbon budget

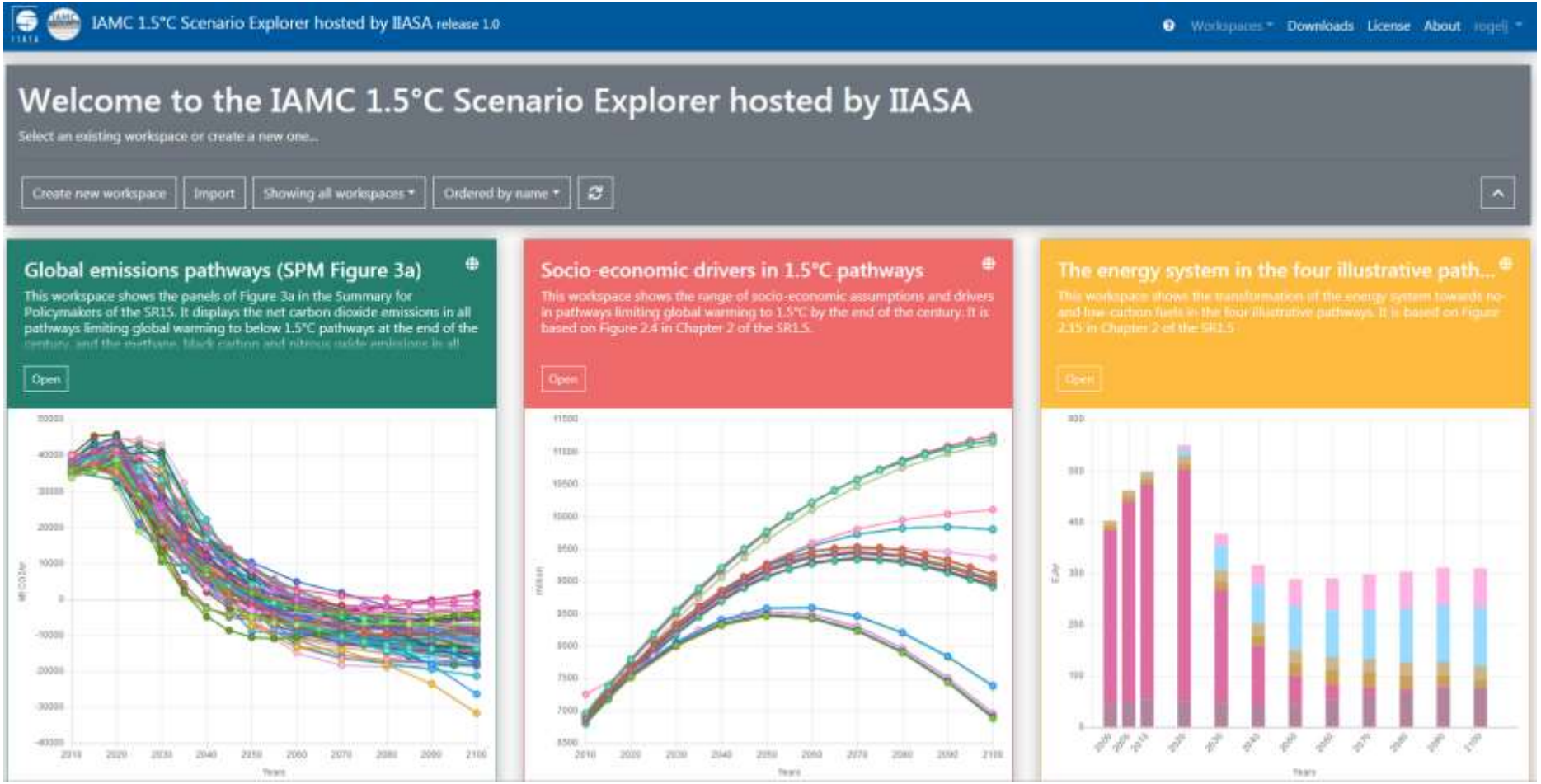
580 $GtCO_2$ left (50% chance of 1.5°C)
420 $GtCO_2$ left (66% chance of 1.5°C)

± 400 $GtCO_2$ geophysical uncertainty
± 250 $GtCO_2$ depends on non-CO_2 reductions
Unrepresented Earth system feedbacks reduce budget by 100 $GtCO_2$ until

Currently: 42 ± 3 $GtCO_2$/yr annually

Image background: NASA blue marble / Data: Chapter 2 IPCC SR1.5 for a global warming in GSAT

IAMC 1.5°C SCENARIO EXPLORER

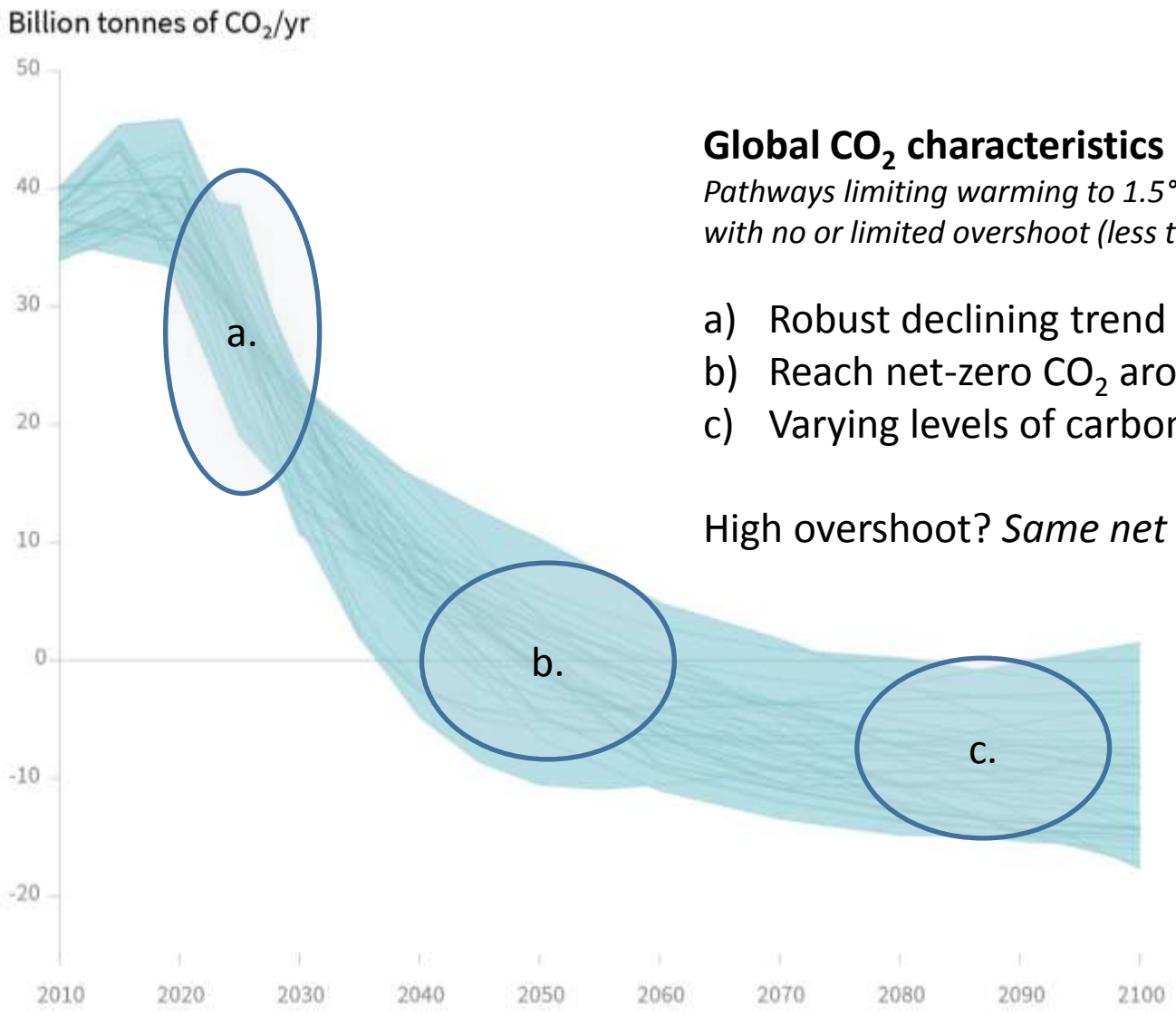


https://data.ene.iiasa.ac.at/iamc-1.5c-explorer/

ipcc
INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

The emission reduction challenge



Global CO_2 characteristics

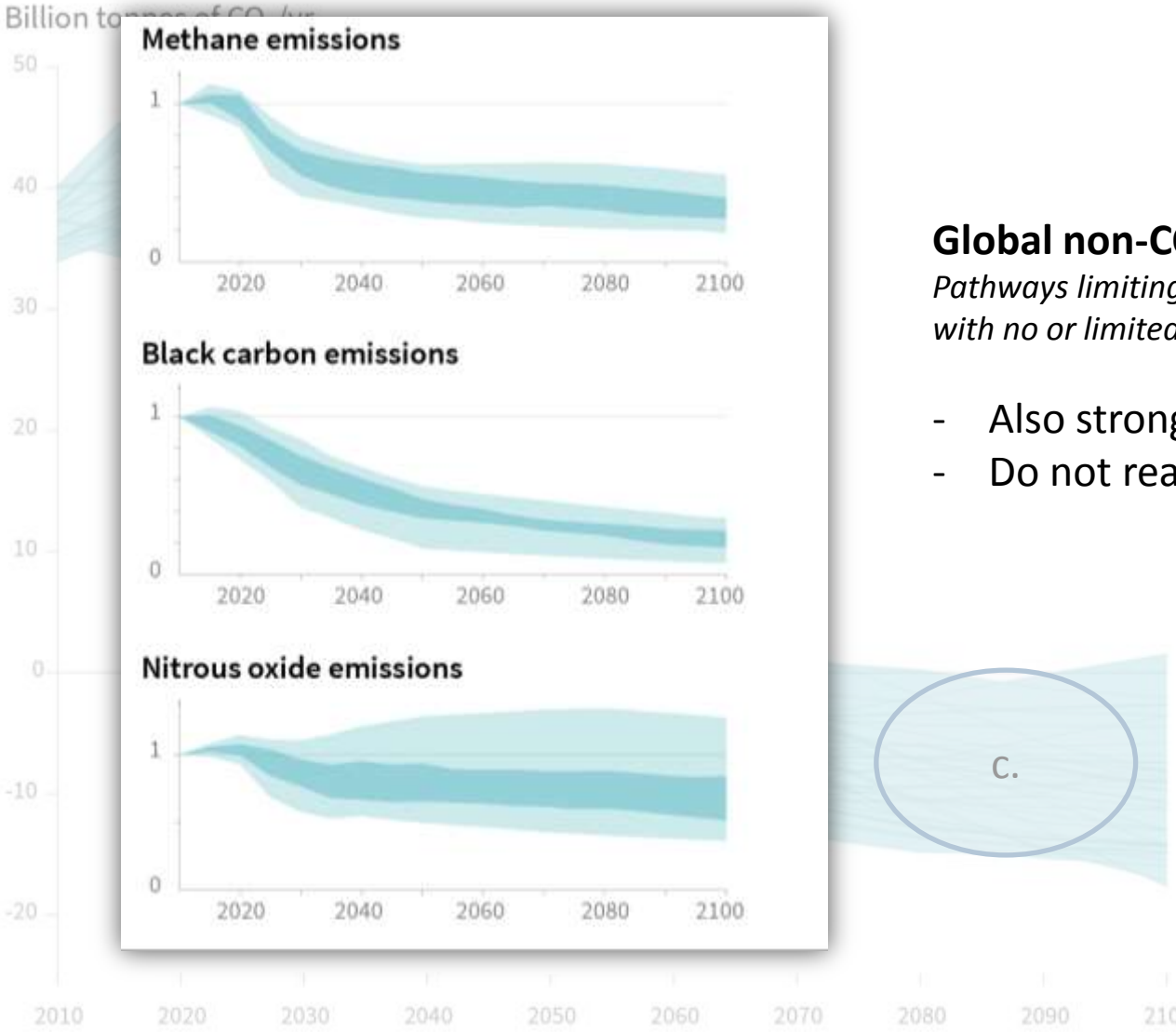
Pathways limiting warming to 1.5°C with no or limited overshoot (less than 0.1°C):

a) Robust declining trend in next decade
b) Reach net-zero CO_2 around mid-century
c) Varying levels of carbon-dioxide removal (CDR)

High overshoot? *Same net zero timing - More CDR*

Image source: IPCC SR1.5 SPM.3A

The emission reduction challenge



Global non-CO_2 characteristics

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

- Also strongly reduced
- Do not reach zero globally

Image source: IPCC SR1.5 SPM.3A

Not all 1.5°C pathways are created equal

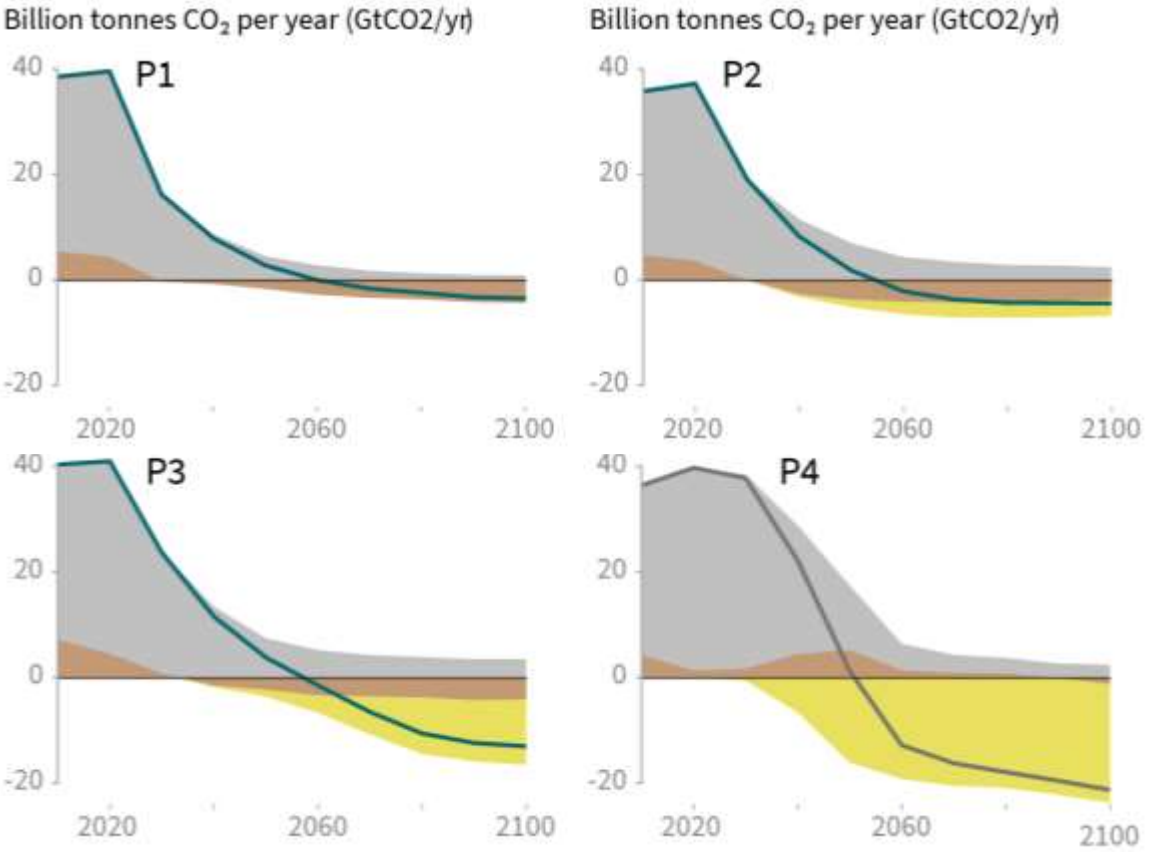


Image source: Natalie Behring (Aurora Photos) / IPCC SR1.5 SPM.3B

Where do we need to go?

Global greenhouse gas (GHG) in 2016: about 52 $GtCO_2e/yr$

2030 GHG emissions

1.5°C pathways	2°C pathways
with no or limited overshoot over 21st century	with at least 2/3rd chance during 21st century
25-30 $GtCO_2e/yr$	30-42 $GtCO_2e/yr$

Image source: www.vertic.ca

Where do we need to go?

Global greenhouse gas (GHG) in 2016: about 52 $GtCO_2e/yr$

2030 GHG emissions

1.5°C pathways	2°C pathways
with no or limited overshoot over 21st century	with at least 2/3rd chance during 21st century
25-30 $GtCO_2e/yr$	30-42 $GtCO_2e/yr$

Paris Agreement Pledges

NDC global GHG emissions in 2030

unconditional	conditional
52-58 $GtCO_2e/yr$	50-54 $GtCO_2e/yr$

From 2018-2030

400-560 $GtCO_2$ projected to be emitted

Image source: www.vertic.ca

Implications of where we are today

Implications of this mismatch:

- Current NDCs on track for 3°C this century

- Remaining 1.5°C carbon budget exhausted by 2030 or due to steepest reductions thereafter
- Commitment to higher maximum warming
- Commitment to large-scale carbon-dioxide removal (CDR) for ambitious climate targets
- Challenges increase, do not disappear, but are pushed one decade into the future

Image source: www.vertic.ca