IPCC Special Report on 1.5^{o}C Global Warming (SR15)

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7th Climate Change and Development in Africa Conference (CCDA-VII)
12th October, 2018

Rationale for the Report

- Long history of demand from vulnerable countries
- Paris Agreement

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.

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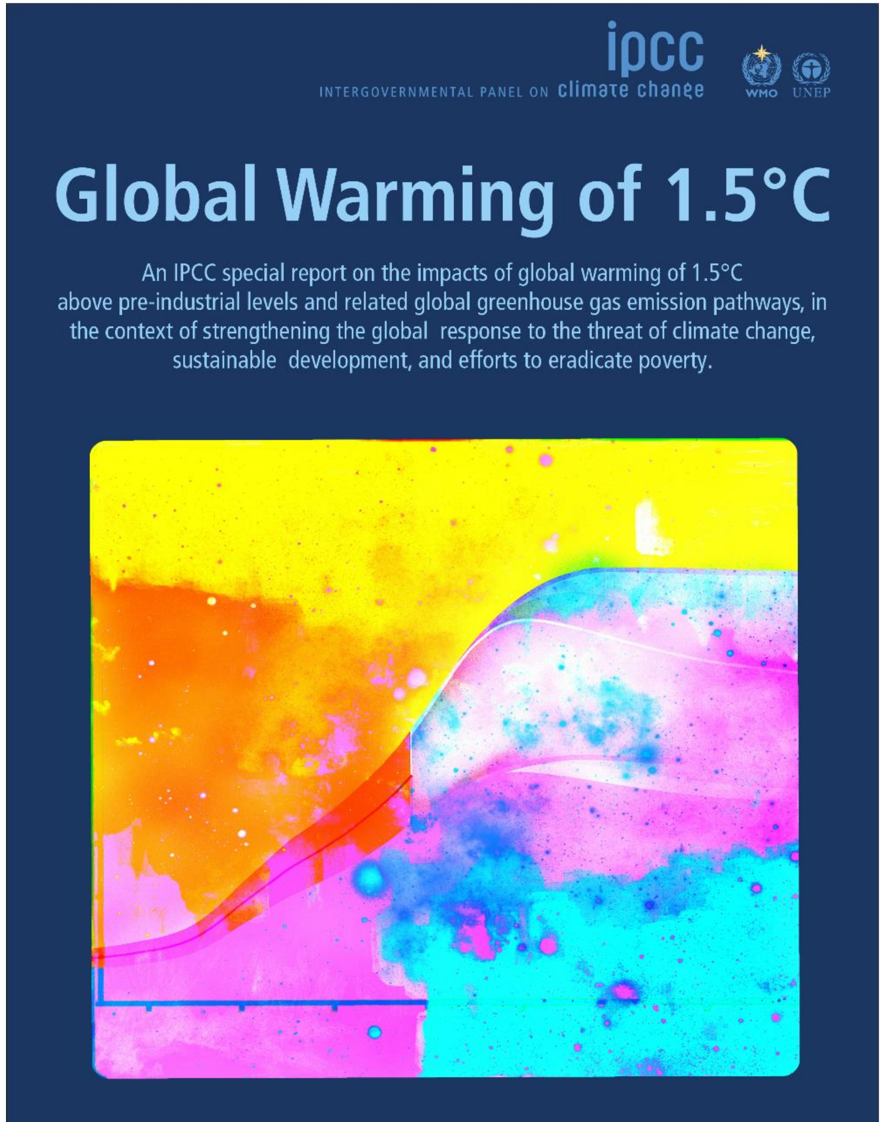
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Global Warming of 1.5°C
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The report in numbers

91 Authors from **40** Countries

133 Contributing authors

6000 Studies

1 113 Reviewers

42 001 Comments

Understanding Global Warming of 1.5°C

Ashley Cooper / Aurora Photos

Where are we now?

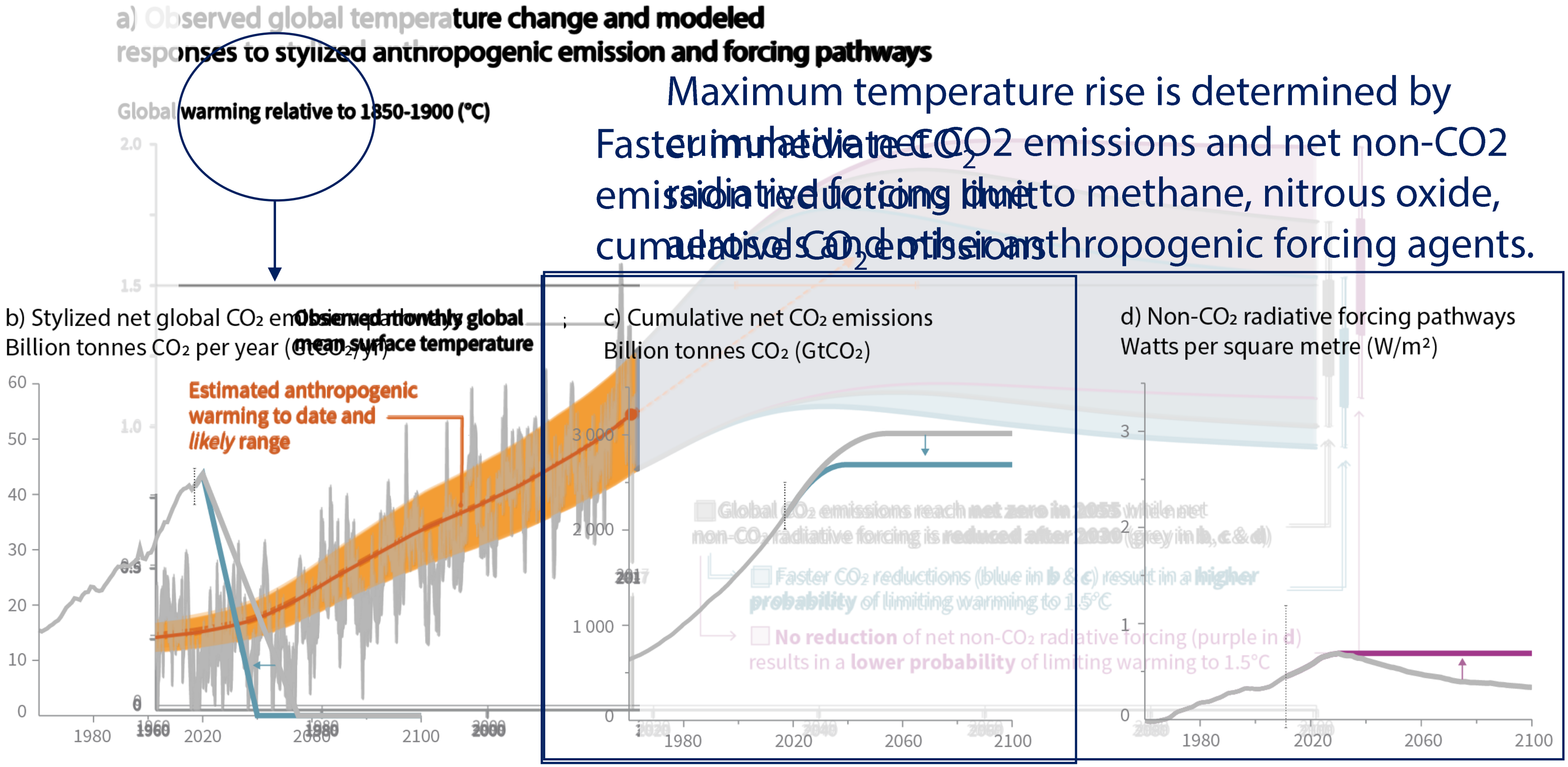
Since pre-industrial times, human activities have caused approximately 1°C of global warming.

- Already seeing consequences for people, nature and livelihoods
- At current rate, would reach 1.5°C between 2030 and 2052
- Past emissions alone do not commit the world to 1.5°C

SPM1 | Cumulative emissions of CO_2 and future non-CO_2 radiative forcing determine the probability of limiting warming to 1.5°C

Maximum temperature rise is determined by cumulative net CO2 emissions and net non-CO2 radiative forcing due to methane, nitrous oxide, aerosols and other anthropogenic forcing agents.

Faster immediate CO_2 emission reductions limit cumulative CO_2 emissions



Projected Climate Change, Potential Impacts and Associated Risks

Impacts of global warming 1.5°C


Jason Florio / Aurora Photos

At 1.5°C compared to 2°C:

- Less extreme weather where people live, including extreme heat and rainfall
- By 2100, global mean sea level rise will be around 10 cm lower but may continue to rise for centuries
- 10 million fewer people exposed to risk of rising seas

Impacts of global warming 1.5°C

Jason Florio / Aurora Photos

At 1.5°C compared to 2°C:

- Lower impact on biodiversity and species
- Smaller reductions in yields of maize, rice, wheat
- Global population exposed to increased water shortages is up to 50% less


Jason Florio / Aurora Photos

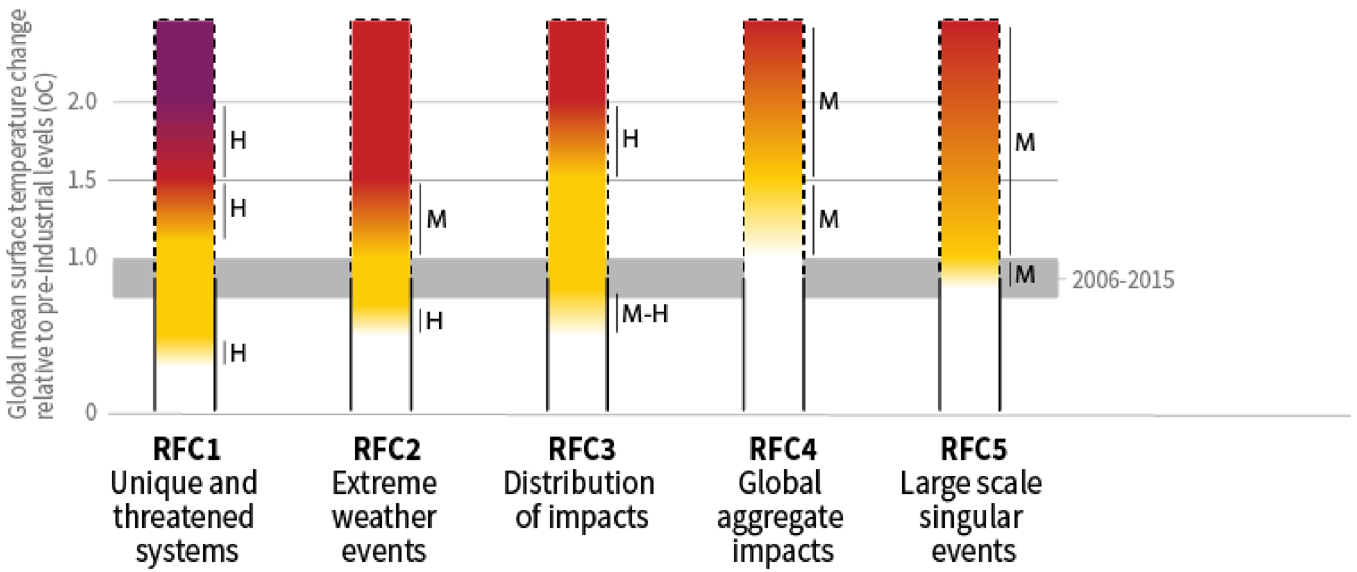
Impacts of global warming 1.5°C

At 1.5°C compared to 2°C:

- Lower risk to fisheries and the livelihoods that depend on them
- Up to several hundred million fewer people exposed to climate-related risk and susceptible to poverty by 2050

SPM2 | How the level of global warming affects impacts and/or risks associated with the Reasons for Concern (RFCs) and selected natural, managed and human systems

Impacts and risks associated with the Reasons for Concern (RFCs)



Confidence level for transition: L=Low, M=Medium, H=High and VH=Very high

INTERGOVERNMENTAL PANEL ON climate change

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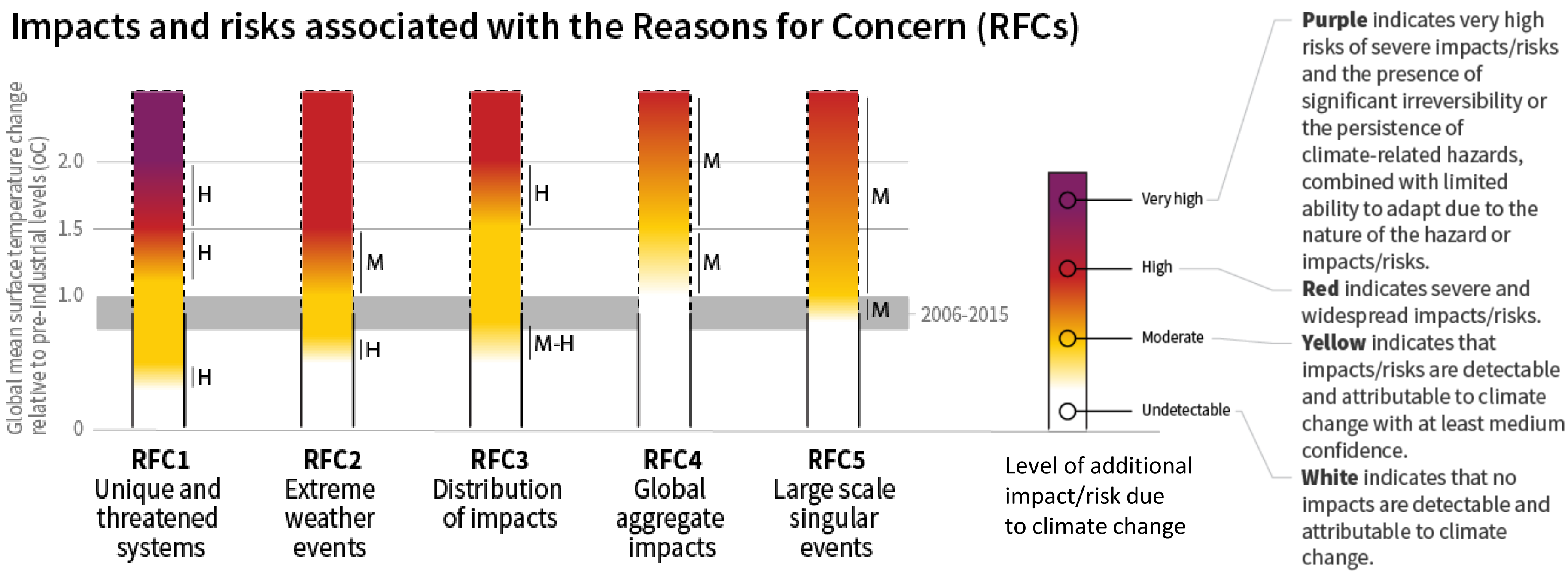

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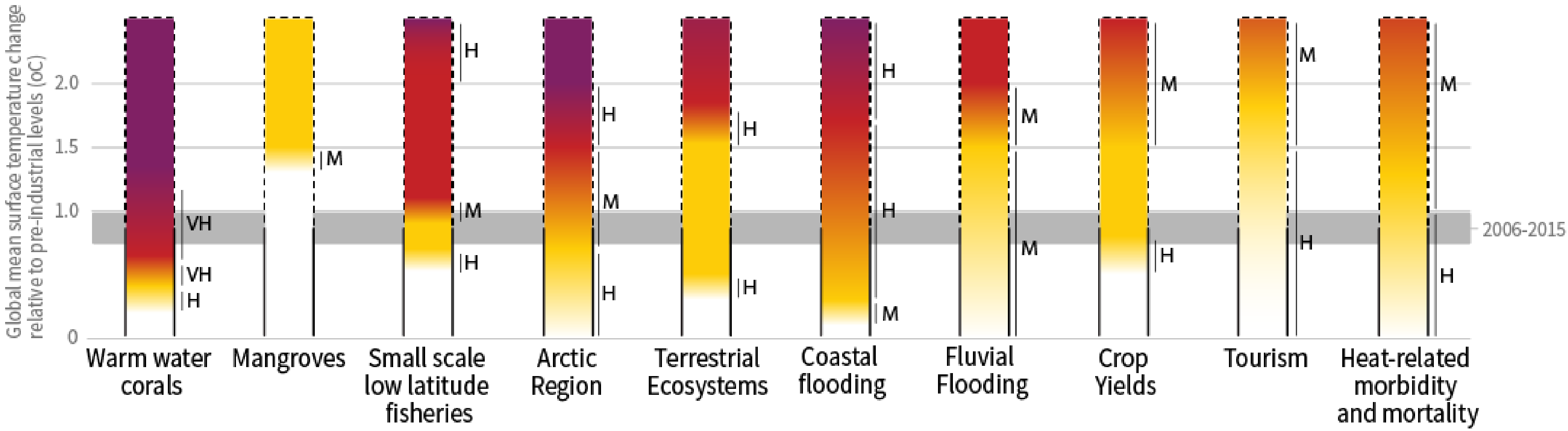
Impacts and risks for selected natural, managed and human systems



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Emission Pathways and System Transitions Consistent with 1.5°C Global Warming

Gerhard Zwerger-Schoner / Aurora Photos

Greenhouse gas emissions pathways

- To limit warming to 1.5°C, CO_2 emissions fall by about 45% by 2030 (from 2010 levels)
  - → Compared to 20% for 2°C
- To limit warming to 1.5°C, CO_2 emissions would need to reach 'net zero' around 2050
  - → Compared to around 2075 for 2°C
- Reducing non-CO_2 emissions would have direct and immediate health benefits

Greenhouse gas emissions pathways

Peter Essick / Aurora Photos

- Limiting warming to 1.5°C would require changes on an unprecedented scale
  - → Deep emissions cuts in all sectors
  - → A range of technologies
  - → Behavioural changes
  - → Increase investment in low carbon options

Peter Essick / Aurora Photos

Greenhouse gas emissions pathways

- Progress in renewables would need to be mirrored in other sectors
- We would need to start taking carbon dioxide out of the atmosphere
- Implications for food security, ecosystems and biodiversity

Peter Essick / Aurora Photos

Greenhouse gas emissions pathways

- National pledges are not enough to limit warming to 1.5°C
- Avoiding warming of more than 1.5°C would require CO_2 emissions to decline substantially before 2030

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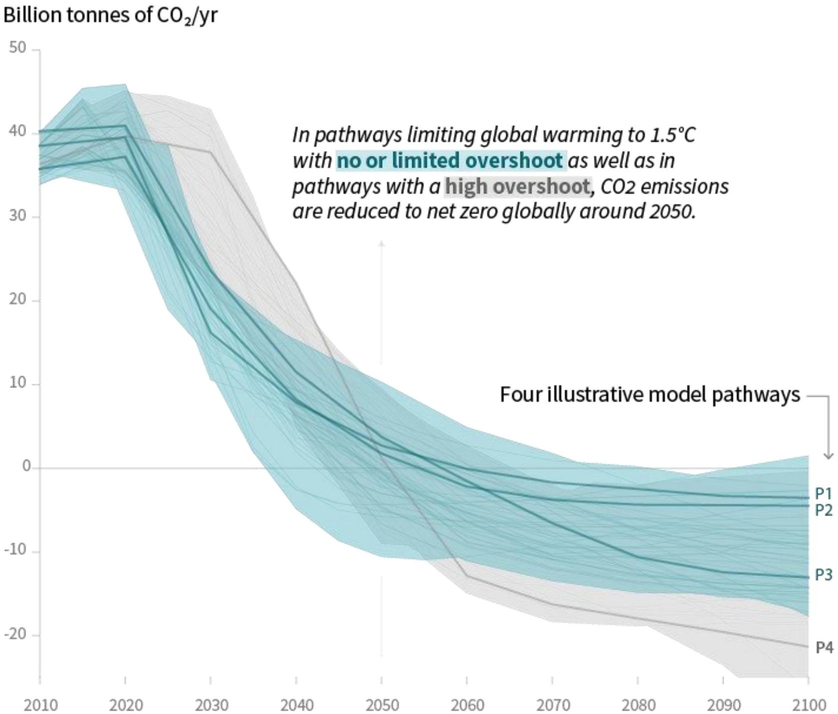
SPM3a | Global emissions pathway characteristics

Global total net CO_2 emissions

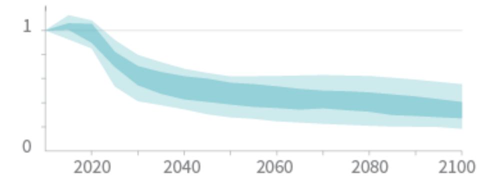


Timing of net zero CO_2
Line widths depict the 5-95th percentile and the 25-75th percentile of scenarios

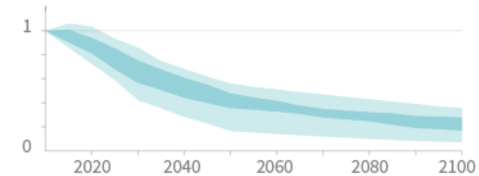
Non-CO_2 emissions relative to 2010

Emissions of non-CO_2 forcers are also reduced or limited in pathways limiting global warming to 1.5°C with **no or limited overshoot**, but they do not reach zero globally.

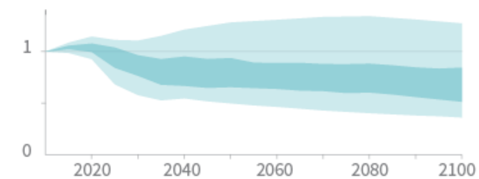
Methane emissions



Black carbon emissions



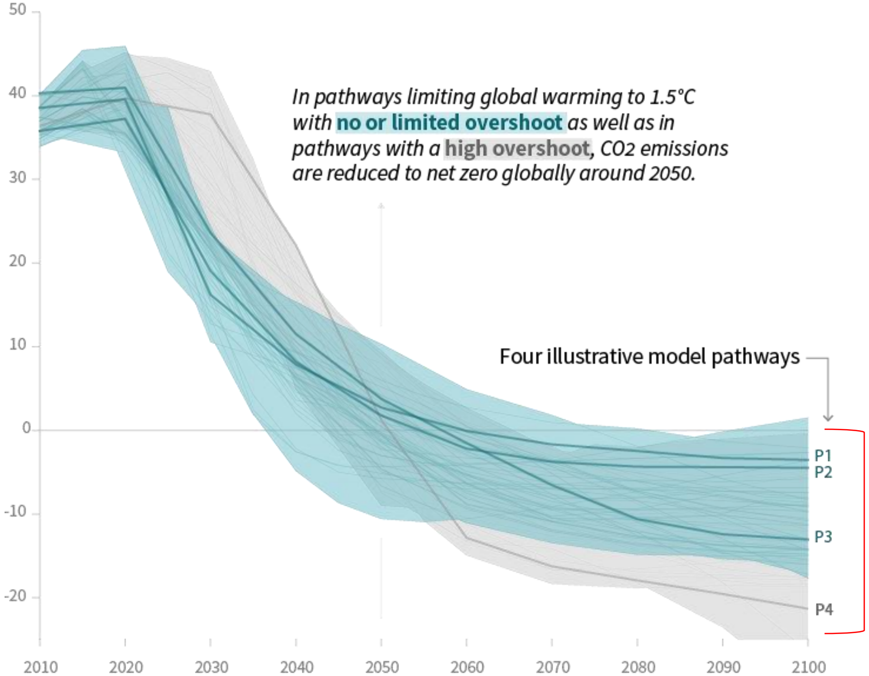
Nitrous oxide emissions



SPM3a | Global emissions pathway characteristics

Global total net CO_2 emissions

Billion tonnes of CO_2/yr



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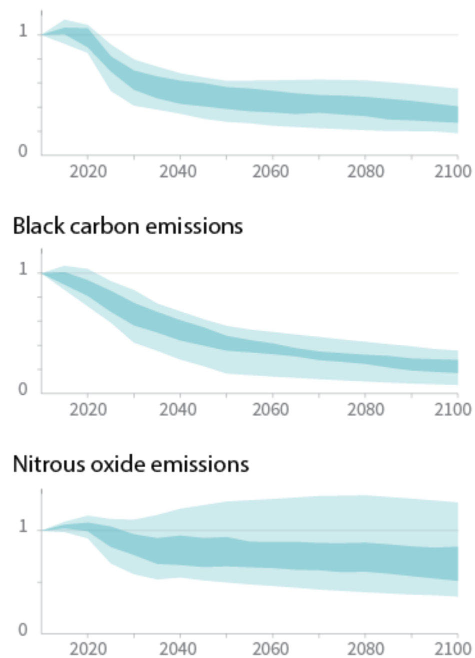
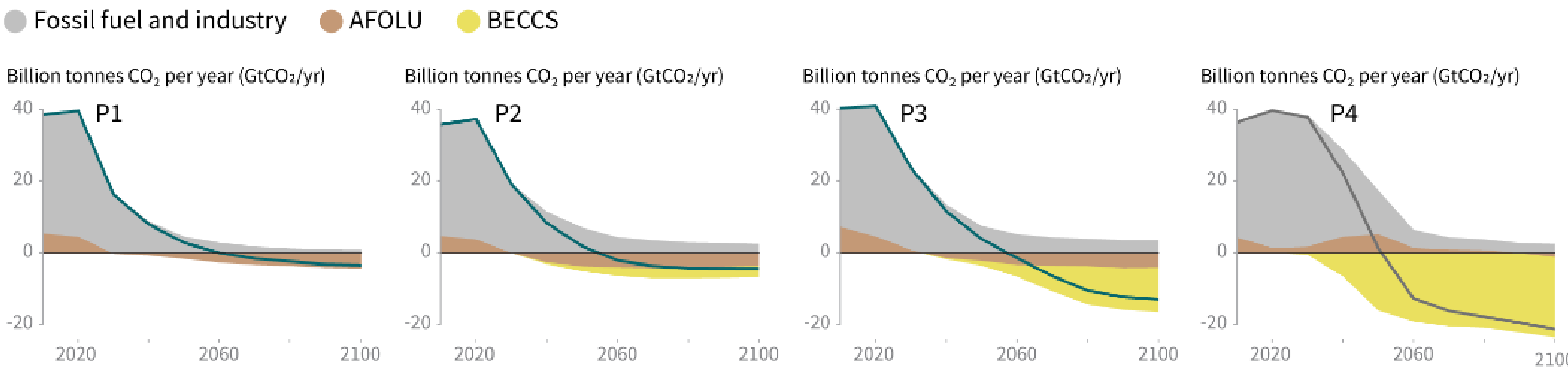


INTERGOVERNMENTAL PANEL ON climate change

SPM3b | Characteristics of four illustrative model pathways

Breakdown of contributions to global net CO_2 emissions in four illustrative model pathways



P1: A scenario in which social, business, and technological innovations result in lower energy demand up to 2050 while living standards rise, especially in the global South. A down-sized energy system enables rapid decarbonisation of energy supply. Afforestation is the only CDR option considered; neither fossil fuels with CCS nor BECCS are used.

P2: A scenario with a broad focus on sustainability including energy intensity, human development, economic convergence and international cooperation, as well as shifts towards sustainable and healthy consumption patterns, low-carbon technology innovation, and well-managed land systems with limited societal acceptability for BECCS.

P3: A middle-of-the-road scenario in which societal as well as technological development follows historical patterns. Emissions reductions are mainly achieved by changing the way in which energy and products are produced, and to a lesser degree by reductions in demand.

P4: A resource and energy-intensive scenario in which economic growth and globalization lead to widespread adoption of greenhouse-gas intensive lifestyles, including high demand for transportation fuels and livestock products. Emissions reductions are mainly achieved through technological means, making strong use of CDR through the deployment of BECCS.

SPM3b | Characteristics of four illustrative model pathways

Global indicators	P1	P2	P3	P4	**Interquartile range**
Pathway classification	No or low overshoot	No or low overshoot	No or low overshoot	High overshoot	No or low overshoot
CO_2 emission change in 2030 (% rel to 2010)	-58	-47	-41	4	(-59,-40)
↳ in 2050 (% rel to 2010)	-93	-95	-91	-97	(-104,-91)
Kyoto-GHG emissions in 2030 (% rel to 2010)*	-50	-49	-35	-2	(-55,-38)
↳ in 2050 (% rel to 2010)	-82	-89	-78	-80	(-93,-81)
*Final energy demand** in 2030 (% rel to 2010)*	-15	-5	17	39	(-12, 7)
↳ in 2050 (% rel to 2010)	-32	2	21	44	(-11, 22)
Renewable share in electricity in 2030 (%)	60	58	48	25	(47, 65)
↳ in 2050 (%)	77	81	63	70	(69, 87)
Primary energy from coal in 2030 (% rel to 2010)	-78	-61	-75	-59	(-78, -59)
↳ in 2050 (% rel to 2010)	-97	-77	-73	-97	(-95, -74)
from oil in 2030 (% rel to 2010)	-37	-13	-3	86	(-34,3)
↳ in 2050 (% rel to 2010)	-87	-50	-81	-32	(-78,-31)
from gas in 2030 (% rel to 2010)	-25	-20	33	37	(-26,21)
↳ in 2050 (% rel to 2010)	-74	-53	21	-48	(-56,6)
from nuclear in 2030 (% rel to 2010)	59	83	98	106	(44,102)
↳ in 2050 (% rel to 2010)	150	98	501	468	(91,190)
from biomass in 2030 (% rel to 2010)	-11	0	36	-1	(29,80)
↳ in 2050 (% rel to 2010)	-16	49	121	418	(123,261)
from non-biomass renewables in 2030 (% rel to 2010)	430	470	315	110	(243,438)
↳ in 2050 (% rel to 2010)	832	1327	878	1137	(575,1300)
Cumulative CCS until 2100 ($GtCO_2$)	0	348	687	1218	(550, 1017)
↳ of which BECCS ($GtCO_2$)	0	151	414	1191	(364, 662)
Land area of bioenergy crops in 2050 (million hectare)	22	93	283	724	(151, 320)
Agricultural CH_4 emissions in 2030 (% rel to 2010)	-24	-48	1	14	(-30,-11)
in 2050 (% rel to 2010)	-33	-69	-23	2	(-46,-23)
Agricultural N_2O emissions in 2030 (% rel to 2010)	5	-26	15	3	(-21,4)
in 2050 (% rel to 2010)	6	-26	0	39	(-26,1)

Temperature and emissions

Energy systems

Carbon dioxide removal

Agriculture

NOTE: Indicators have been selected to show global trends identified by the Chapter 2 assessment. National and sectoral characteristics can differ substantially from the global trends shown above.

** Kyoto-gas emissions are based on SAR GWP-100*
*** Changes in energy demand are associated with improvements in energy efficiency and behaviour change*

Strengthening the Global Response in the Context of Sustainable Development and Efforts to Eradicate Poverty

Climate change and people

Ashley Cooper/ Aurora Photos

- Close links to United Nations Sustainable Development Goals (SDGs)
- Mix of measures to adapt to climate change and reduce emissions can have benefits for SDGs
- National and sub-national authorities, civil society, the private sector, indigenous peoples and local communities can support ambitious action
- International cooperation is a critical part of limiting warming to 1.5°C

Implications for Africa

- Already experiencing massive climate impacts – e.g. crop production, tourism industries and hydropower generation
- Africa is especially vulnerable to future impacts, particularly in respect of water and food security, as well as impacts on health, human settlements, and infrastructure and ecosystem services.
- Hard to measure the costs of delay in adaptation finance, but likely lower at global warming of 1.5^{o}C than for 2^{o}C.
- The majority (81 out of 90) of the modeling scenarios exceed the 1.5˚C temperature threshold before dropping back down. What are the implications of different levels of overshoot, and length of overshoot?
- Implications of Carbon dioxide removal (CDR) – including bioenergy with carbon capture and storage and afforestation
- Equity and fairness in the efforts and burdens associated with keeping below the 1.5˚C temperature threshold.
- How to embed climate in development planning meaningfully?

Thank You

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