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STELLENBOSCH, SOUTH AFRICA  
10 - 12 OCTOBER, 2018

Win more, lose less:

Capturing synergies between  
SDGs through agricultural research



©FAO/Luis Tato

# SDG interactions and agricultural research

## Challenges & Opportunities

**Jean-Pascal van Ypersele**  
**Twitter: @JPvanYpersele**

**Université catholique de Louvain, (Belgium)**  
**Former IPCC Vice-Chair (2008--2015)**  
**Member of the GSDR 2019 author team**

# Plan

- Where do I speak from?
- Climate situation and IPCC Special Report on 1.5C warming
- SDG interactions
- Maximizing synergies, minimizing trade-offs:  
Role of agricultural research
- Conclusions

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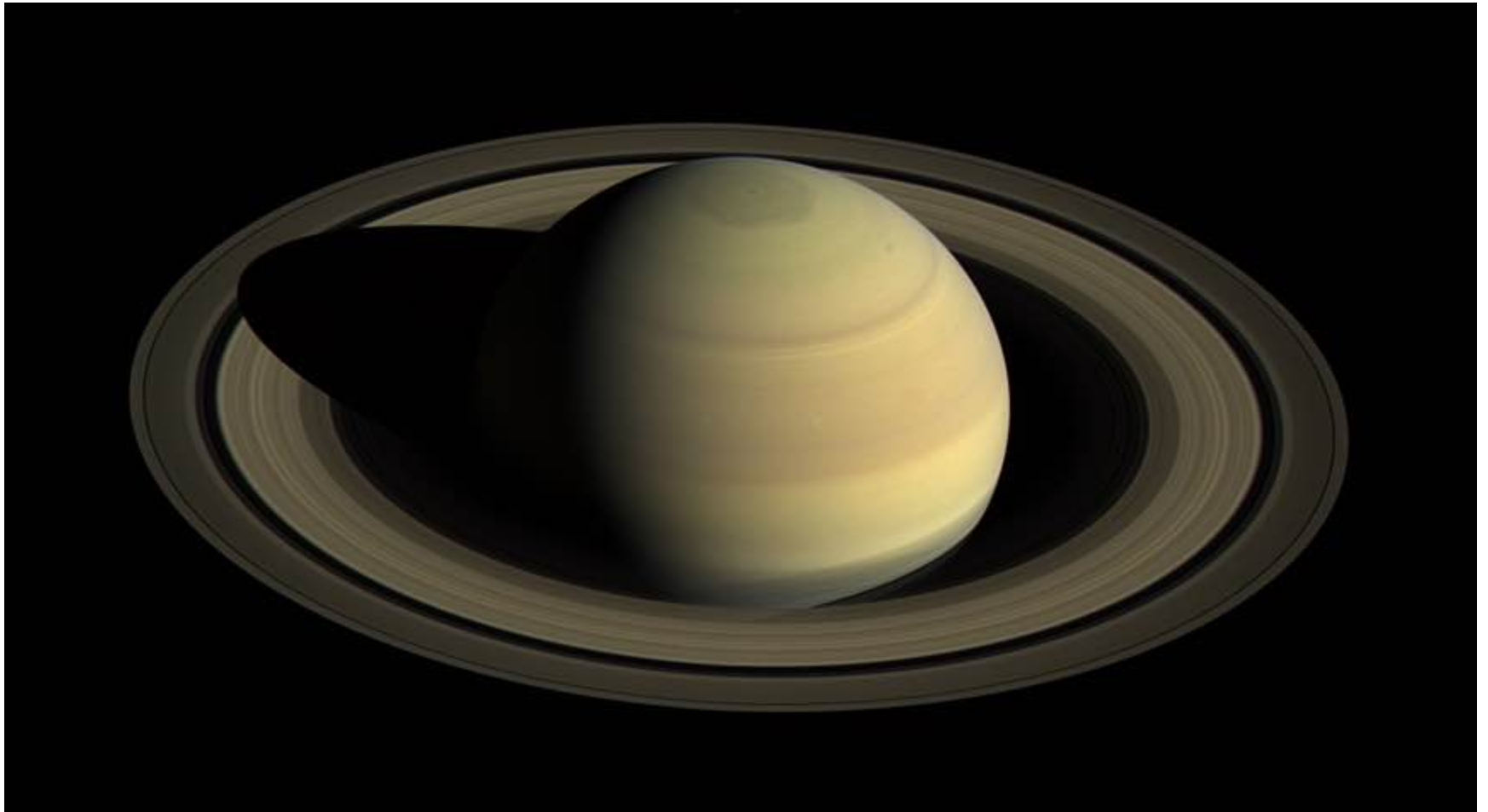


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# Where do I speak from?

Twitter: @JPvanYpersele

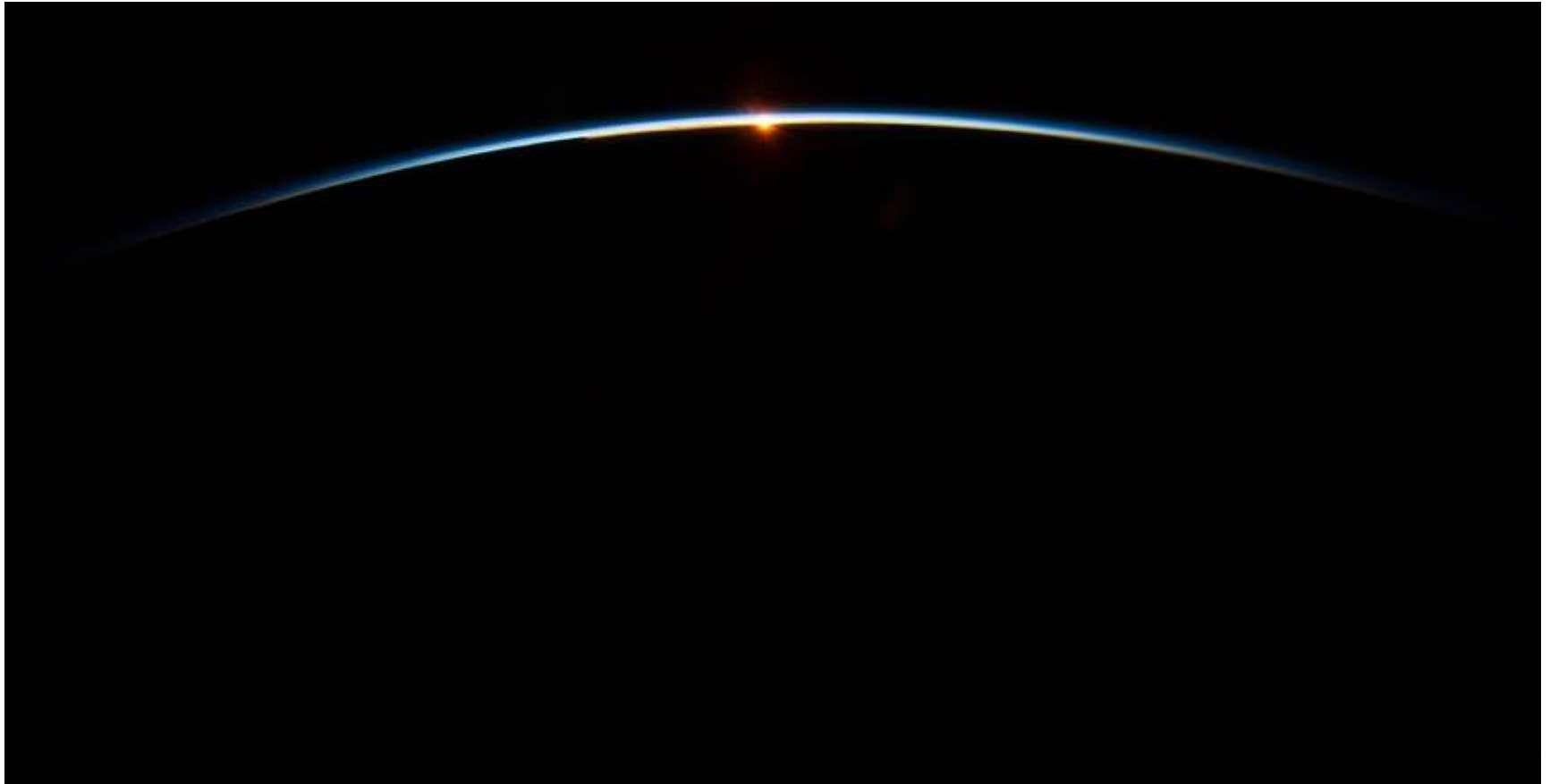
**Saturn, as seen on 25-4-2016 from a 3 million km distance by the Cassini satellite launched in October 1997, 40 years after Sputnik**



**That small blue dot is the Earth, as seen from Cassini, orbiting Saturn, 1.44 billion km from us, on 19-7-2013**



# **Our atmosphere is thin and fragile (as seen by ISS crew on 31 July 2013)**



Jean-Pascal van Ypersele  
([vanyp@climate.be](mailto:vanyp@climate.be))

# Let us think about the future of these children from Machakos (Kenya) in a warming climate



@JPvanYpersele  
April 2015

# Short CV

- Physicist, MSc (1980) & Ph.D.(1986) on effect of CO<sub>2</sub>-induced warming on climate
- Passion for « humanity-relevant » science
- Rio 1992, as Belgian Council for Sustainable Development representative, then science advisor at all UNFCCC COPs
- IPCC since 1995, Vice-Chair 2008-2015
- Co-author Global Sustainable Development Report 2019



# Why the IPCC ?

Established by WMO and UNEP in 1988

to provide **policy-makers** with an **objective source of information** about


- causes of climate change,
- potential environmental and socio-economic impacts,
- possible response options (adaptation & mitigation).

WMO=World Meteorological Organization  
UNEP= United Nations Environment Programme





# Global Sustainable Development Report (GSDR) 2019 drafted by the Group of 15 independent scientists



# Mandate agreed by UN Member States in July 2016

- The GSDR is one important component of the
  - **follow-up and review process** for the 2030 Agenda for Sustainable Development
- 
- The GSDR will **inform the UN High-Level Political Forum**
  - **(HLPF)**, and shall strengthen the science-policy interface and provide a strong evidence-based instrument to support policymakers in promoting poverty eradication and sustainable development
- The report will be **available for a wide range of stakeholders**,
  - including business and civil society as well as the wide public



# Scope of the report

- Guidance on the **state of global sustainable development**
  - from a scientific perspective, which will help address the implementation of the 2030 Agenda,
  - provide **lessons learned**, while focusing on challenges, address new and **emerging issues** and highlight emerging **trends and actions**.
- An **integrated approach and examine policy options**
  - with a view to sustaining the balance between the **three dimensions** of sustainable development. These policy options should be **in line with the 2030 Agenda** to inform its implementation
- Case studies with **regional** dimension, as well as **countries in special situations**

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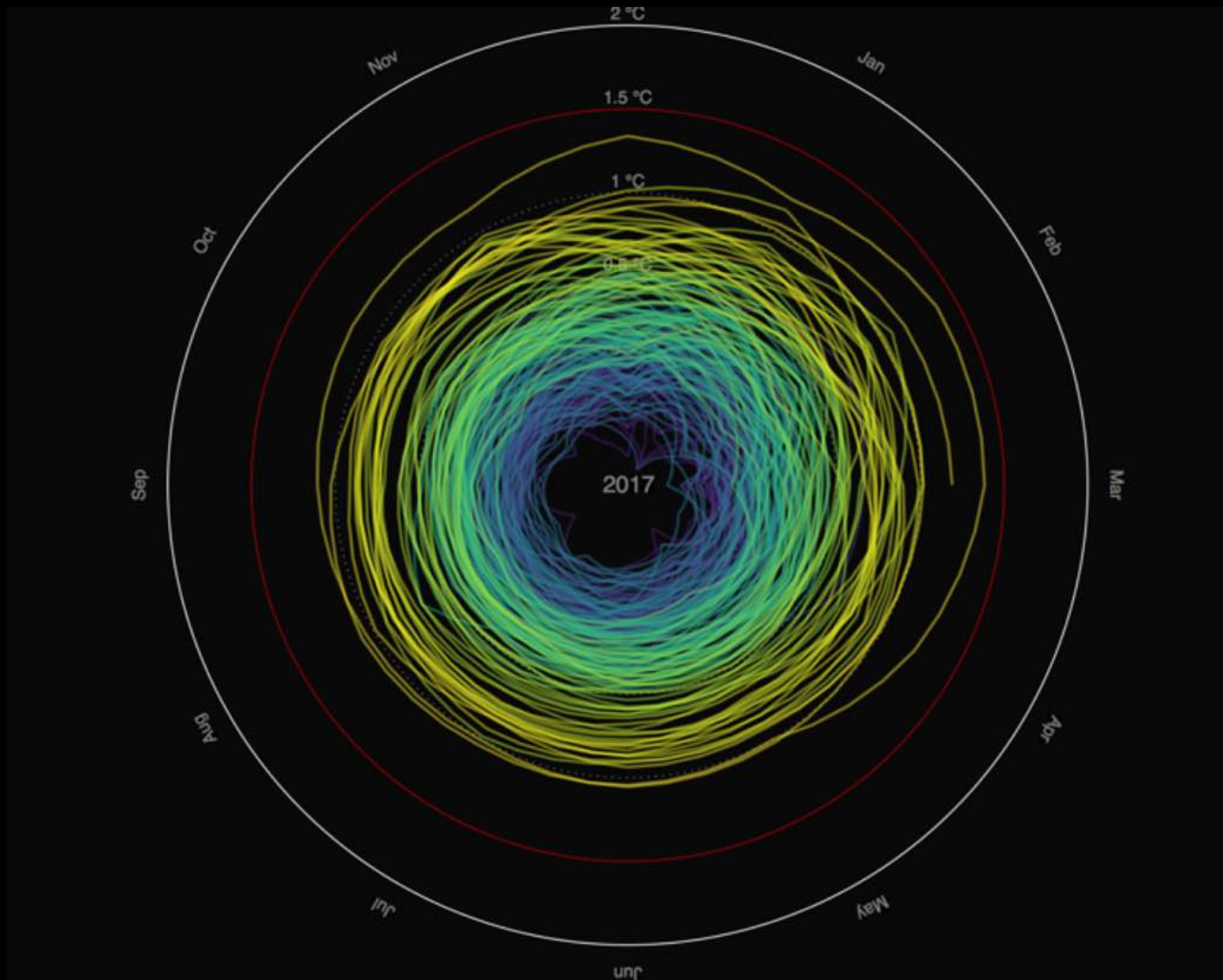


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# Climate situation and IPCC Special Report on 1.5C warming

Twitter: @JPvanYpersele

# Temperature spiral



Global Mean Temperature in °C relative to 1850 – 1900

Graph: Ed Hawkins (Climate Lab Book) – Data: HadCRUT4 global temperature dataset

Animated version available on <http://openclimatedata.net/climate-spirals/temperature>

Since 1950, **extreme hot days** and **heavy precipitation** have become more common



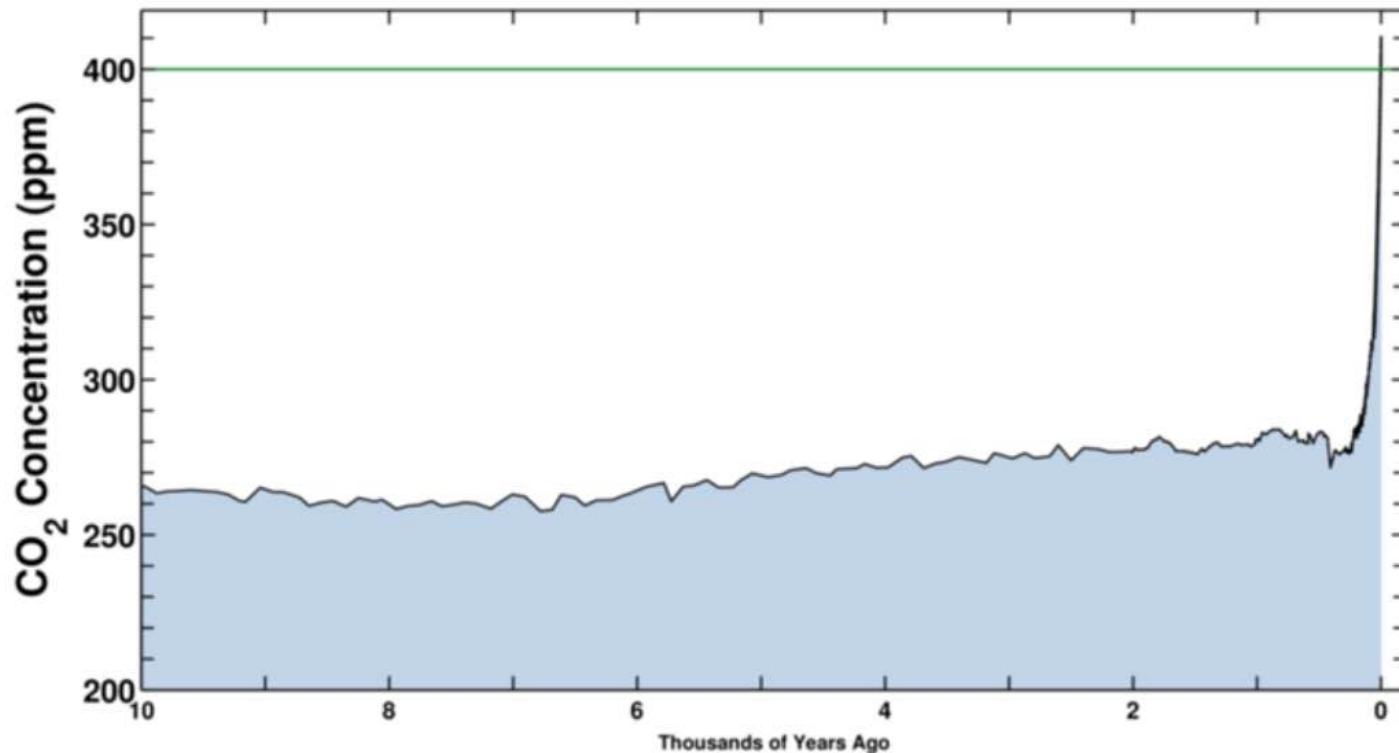
There is evidence that anthropogenic influences, including increasing atmospheric **greenhouse gas concentrations**, have changed these extremes

# CO<sub>2</sub> Concentration, 28 May 2018 (Keeling curve)

Latest CO<sub>2</sub> reading  
May 28, 2018

411.98 ppm

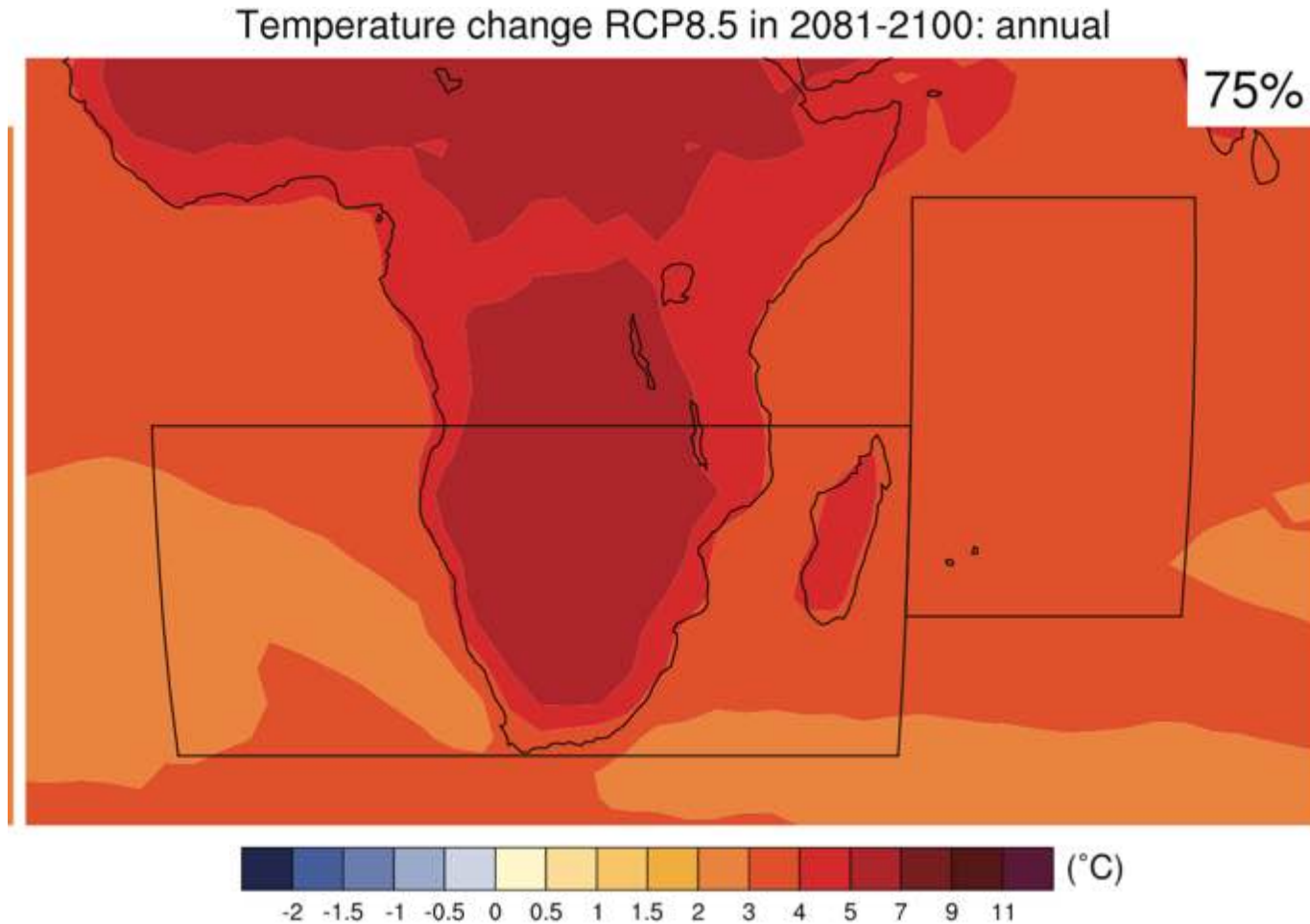
Ice-core data before 1958. Mauna Loa data after 1958.



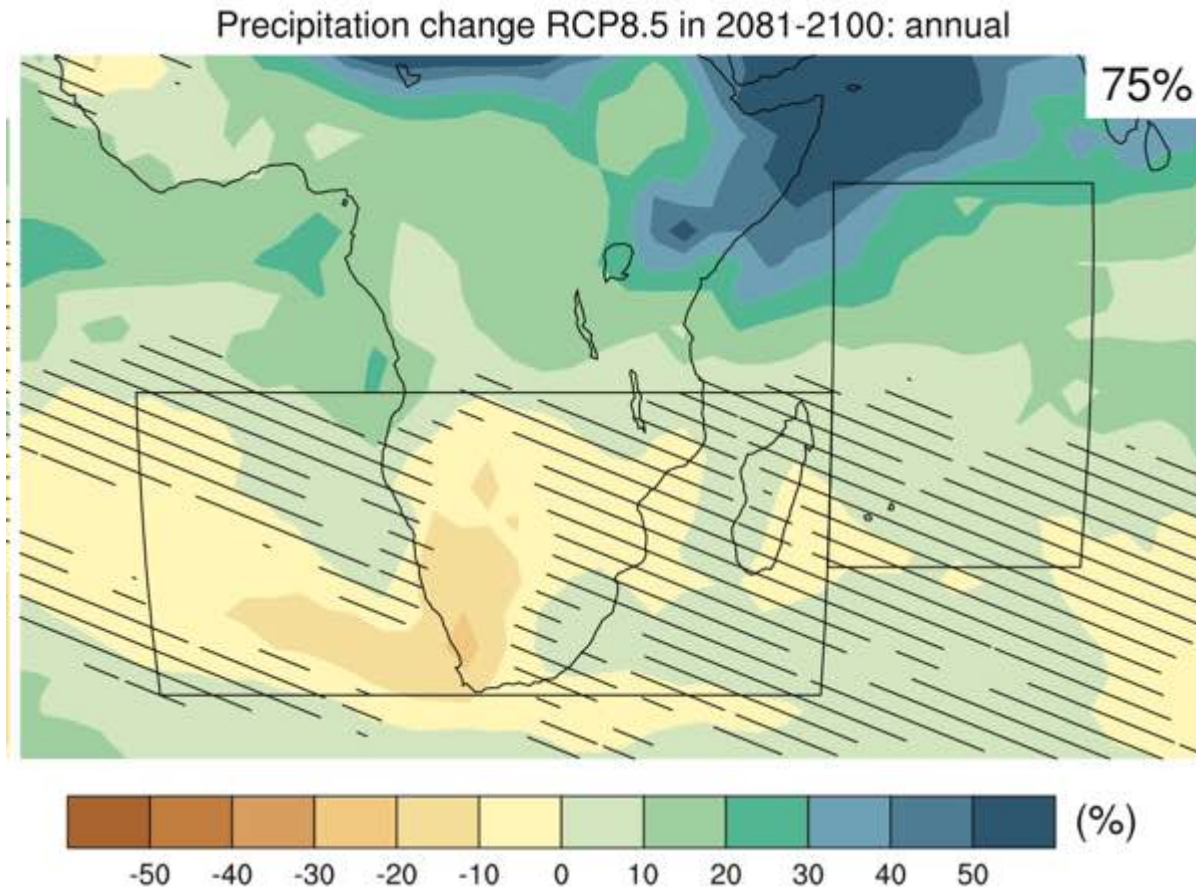
Source: [scripps.ucsd.edu/programs/keelingcurve/](https://scripps.ucsd.edu/programs/keelingcurve/)



# Map of temperature changes in 2081–2100 , with respect to 1986–2005 in the RCP8.5 scenario



# Map of precipitation changes in 2081–2100, with respect to 1986–2005 in the RCP8.5 scenario



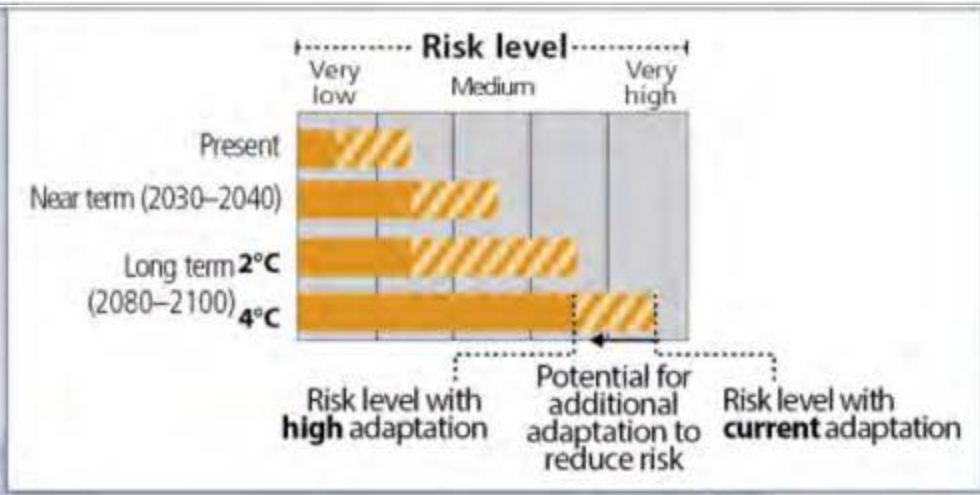
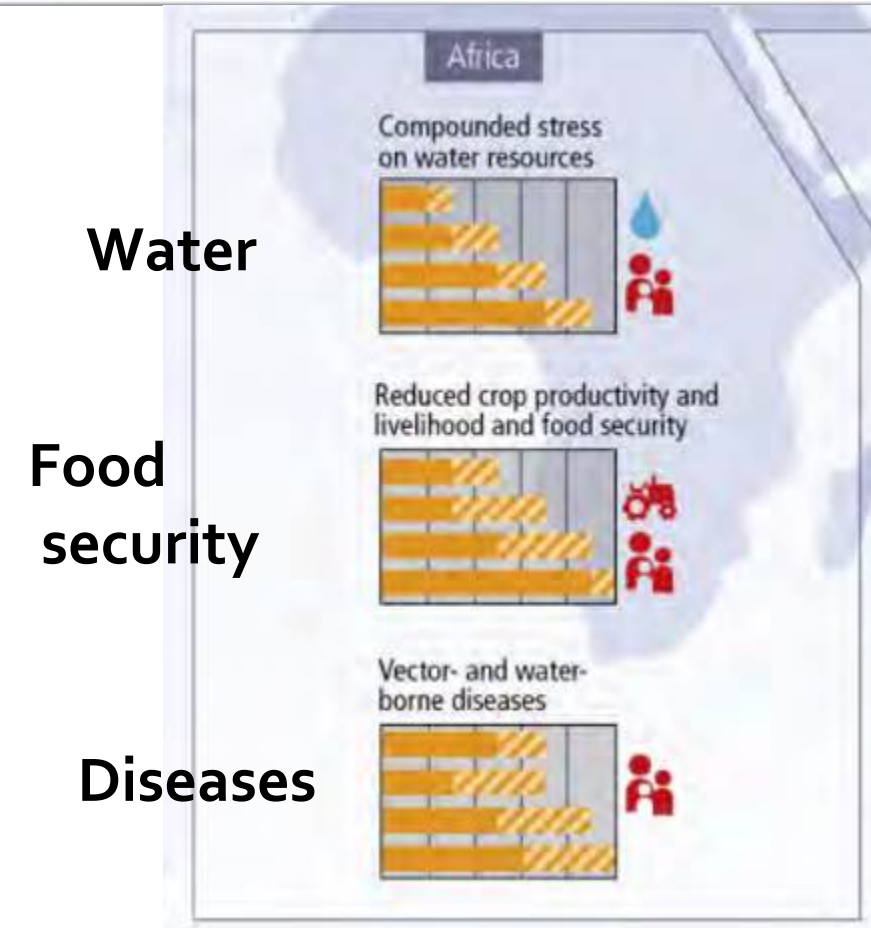
Regions where the projected change is less than one standard deviation of the natural internal variability



Regions where the projected change is large compared to natural internal variability, and where at least 90% of models agree on a sign of change



# Regional key risks and risk reduction through adaptation

Representative key risks for each region for













# Major climate risk for Africa: Agriculture

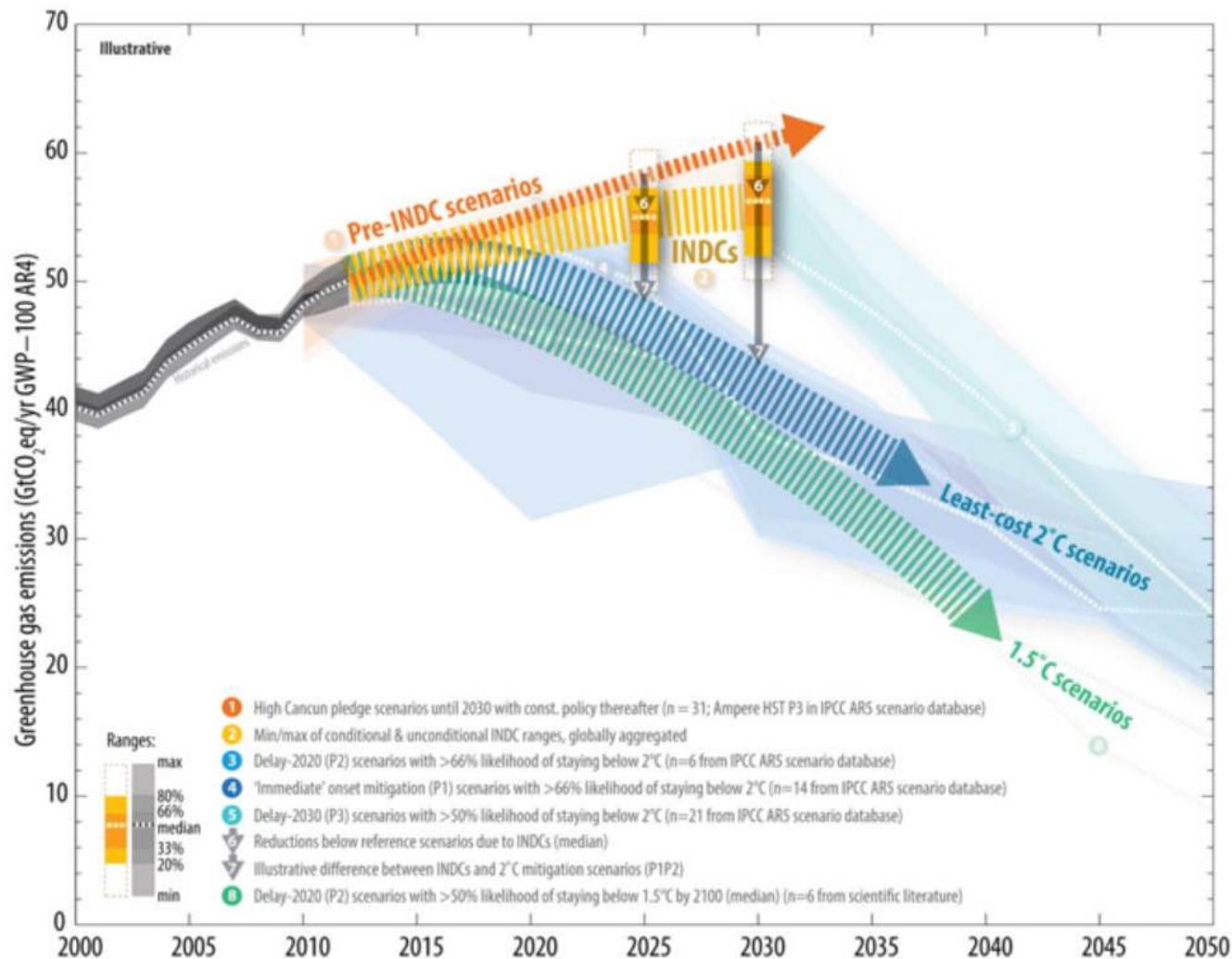
Lower agricultural yields due to heat and drought – with potentially serious consequences for food safety at all levels — and damages to food system infrastructure due to pests, diseases, and floods (*high degree of confidence*)

Facteurs climatiques	Échéancier	Risques et possibilités d'adaptation		
		Très faibles	Modérés	Très élevés
 	Moment présent	[Bar chart showing low to moderate risk]		
	Court terme (2030–2040)	[Bar chart showing moderate to high risk]		
	Long terme 2°C (2080–2100)	[Bar chart showing high to very high risk]		
	4°C	[Bar chart showing very high risk]		



Facteurs déterminants des incidences liées au climat									
									
Tendance au réchauffement	Température extrême	Tendance à l'assèchement	Précipitations extrêmes	Précipitations	Enneigement	Cyclones destructeurs	Niveau de la mer	Acidification des océans	Fertilisation par le dioxyde de carbone

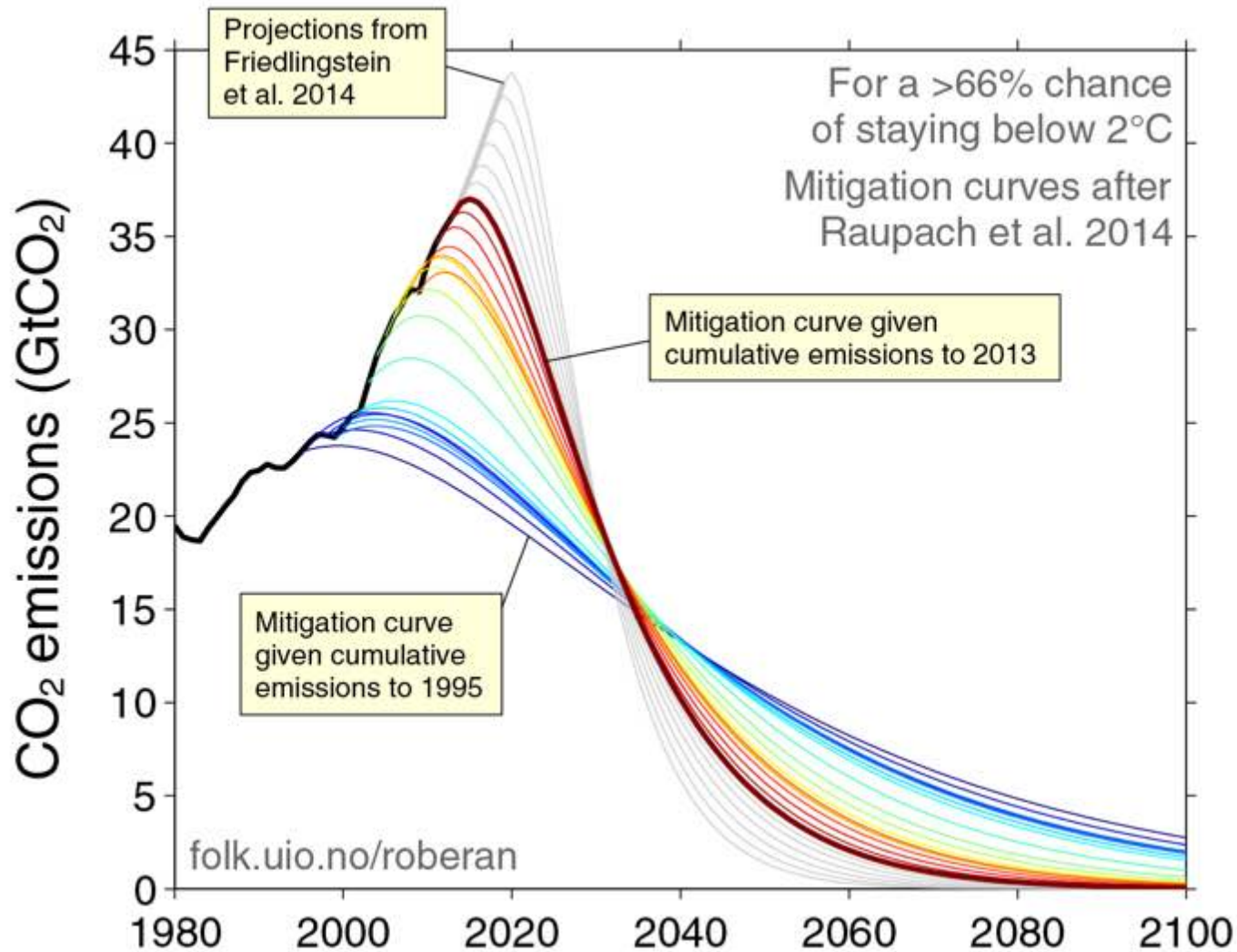
# Comparison of global emission levels in 2025 and 2030 resulting from the implementation of the intended nationally determined contributions



UNFCCC, Aggregate effect of the intended nationally determined contributions: an update

<http://unfccc.int/resource/docs/2016/cop22/eng/02.pdf>

# Limiting warming becomes much more difficult when the peak happens later



Source and details:

[http://folk.uio.no/roberan/t/global\\_mitigation\\_curves.shtml](http://folk.uio.no/roberan/t/global_mitigation_curves.shtml)

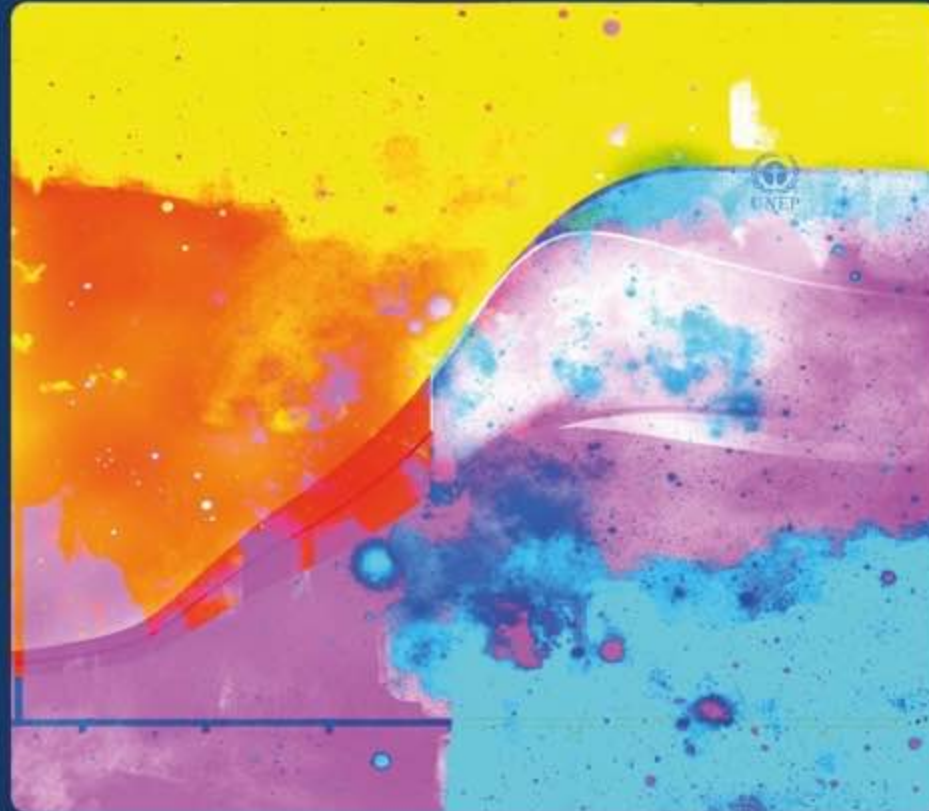
Risk = Hazard x Vulnerability x Exposure  
(Katrina flood victim, New Orleans, 2005)



AP Photo - Lisa Krantz (<http://lisakrantz.com/hurricane-katrina/zspbn1k4cn17phidupe4f9x5t1mzdr>)

# 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



# Understanding Global Warming of 1.5° C

## Where are we now?

Since preindustrial 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 2030 and 2052
- Past emissions alone do not commit the world to 1.5° C

# Projected Climate Change, Potential Impacts and Associated Risks

## Impacts of global warming 1.5° C

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
- 10 million fewer people exposed to risk of rising seas

## Impacts of global warming 1.5° C

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 water shortages up to 50% less

## Impacts of global warming 1.5° C

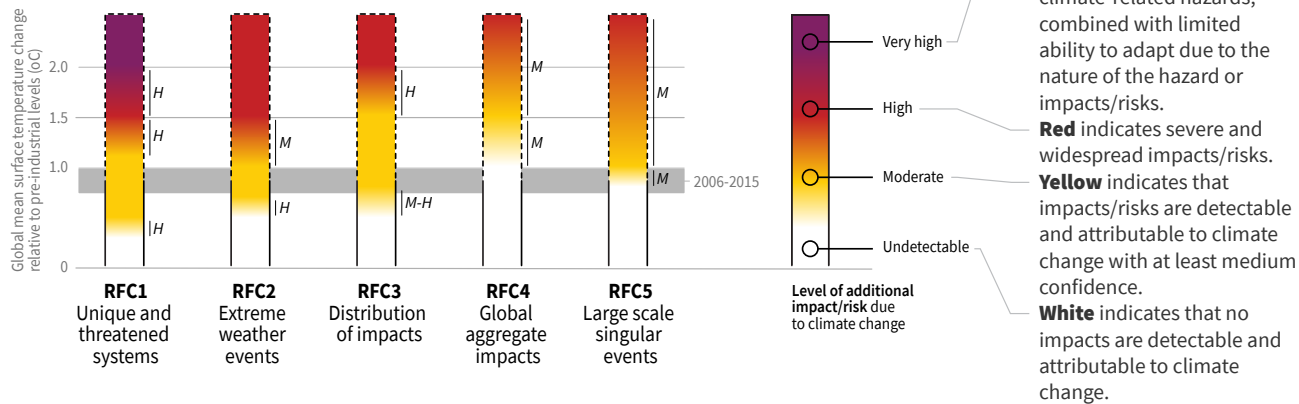
At 1.5° C compared to 2° C:

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

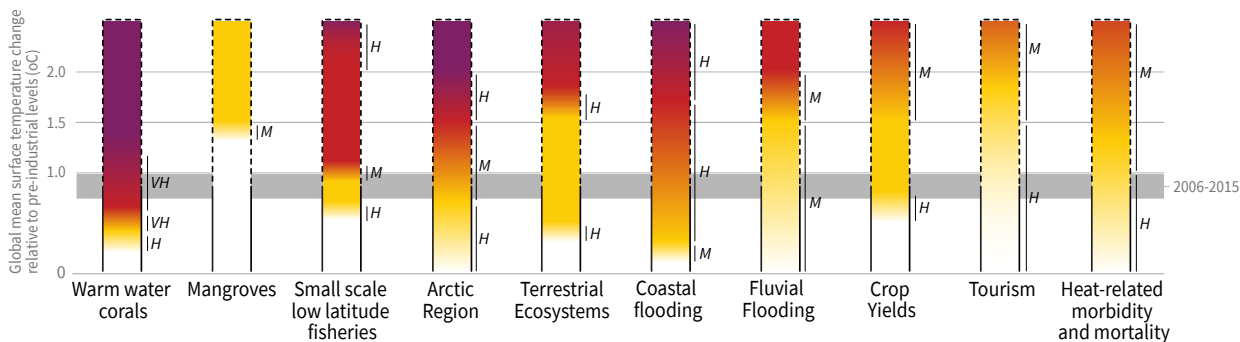
# How the level of global warming affects impacts and/or risks associated with the Reasons for Concern (RFCs) and selected natural, managed and human systems

Five Reasons For Concern (RFCs) illustrate the impacts and risks of different levels of global warming for people, economies and ecosystems across sectors and regions.

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



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



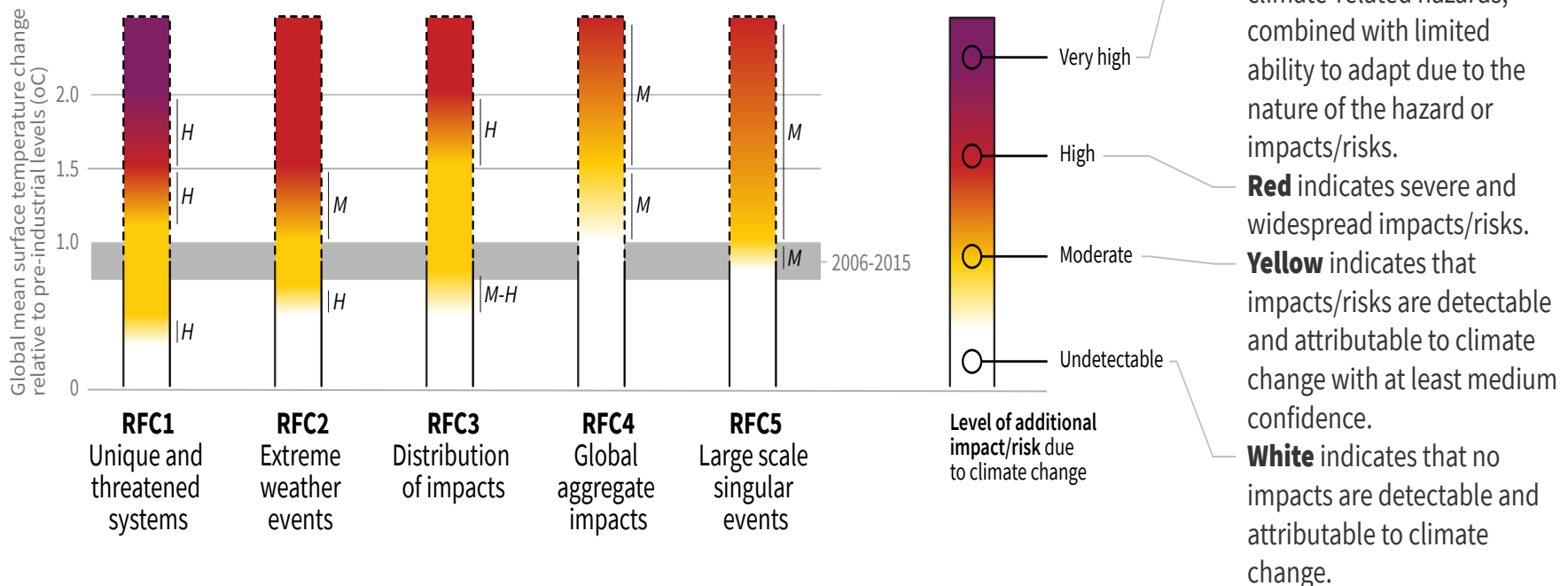
Confidence level for transition: L=Low, M=Medium, H=High and VH=Very high



# 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

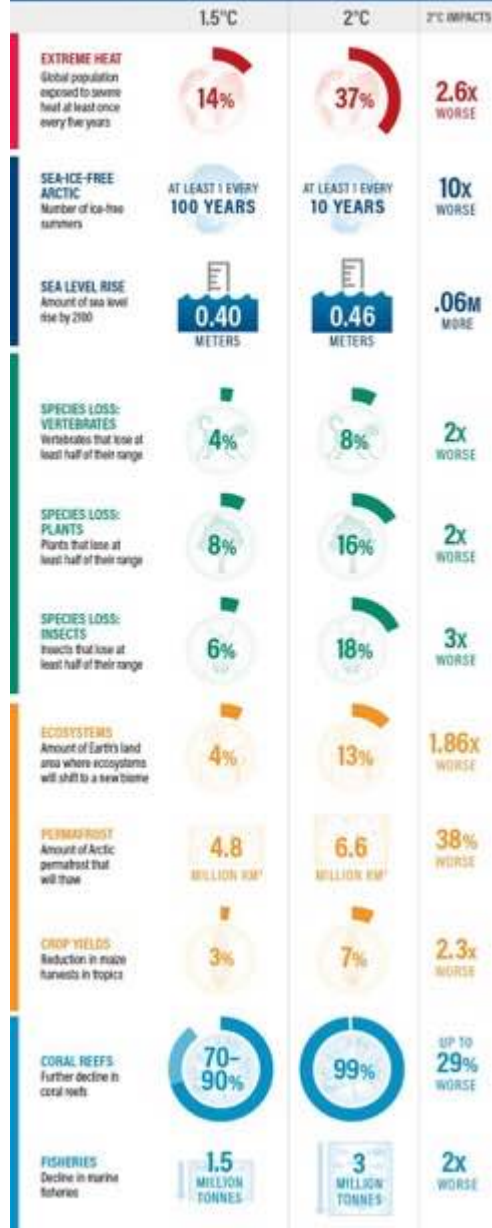
Five Reasons For Concern (RFCs) illustrate the impacts and risks of different levels of global warming for people, economies and ecosystems across sectors and regions.

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



# HALF A DEGREE OF WARMING MAKES A BIG DIFFERENCE:

EXPLAINING IPCC'S 1.5°C SPECIAL REPORT



Responsibility for content: WRI

# HALF A DEGREE OF WARMING MAKES A BIG DIFFERENCE:

EXPLAINING IPCC'S 1.5°C SPECIAL REPORT

	1.5°C	2°C	2°C IMPACTS
<b>EXTREME HEAT</b> Global population exposed to severe heat at least once every five years	<p>14%</p>	<p>37%</p>	<b>2.6x</b> WORSE
<b>SEA-ICE-FREE ARCTIC</b> Number of ice-free summers	AT LEAST 1 EVERY <b>100 YEARS</b>	AT LEAST 1 EVERY <b>10 YEARS</b>	<b>10x</b> WORSE
<b>SEA LEVEL RISE</b> Amount of sea level rise by 2100	<p><b>0.40</b> METERS</p>	<p><b>0.46</b> METERS</p>	<b>.06M</b> MORE
<b>SPECIES LOSS: VERTEBRATES</b> Vertebrates that lose at least half of their range	<p>4%</p>	<p>8%</p>	<b>2x</b> WORSE
<b>SPECIES LOSS: PLANTS</b> Plants that lose at least half of their range	<p>8%</p>	<p>16%</p>	<b>2x</b> WORSE
<b>SPECIES LOSS: INSECTS</b> Insects that lose at least half of their range	<p>6%</p>	<p>18%</p>	<b>3x</b> WORSE

Responsibility for content: WRI

**SPECIES LOSS: VERTEBRATES**  
Vertebrates that lose at least half of their range



**2x**  
WORSE

**SPECIES LOSS: PLANTS**  
Plants that lose at least half of their range



**2x**  
WORSE

**SPECIES LOSS: INSECTS**  
Insects that lose at least half of their range



**3x**  
WORSE

**ECOSYSTEMS**  
Amount of Earth's land area where ecosystems will shift to a new biome



**1.86x**  
WORSE

**PERMAFROST**  
Amount of Arctic permafrost that will thaw



**38%**  
WORSE

**CROP YIELDS**  
Reduction in maize harvests in tropics



**2.3x**  
WORSE

**CORAL REEFS**  
Further decline in coral reefs



**UP TO 29%**  
WORSE

**FISHERIES**  
Decline in marine fisheries



**2x**  
WORSE

Responsibility for content: WRI

# IPCC SR15: Impacts on biodiversity

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- B3.1 Of 105,000 species studied,

**6% of insects, 8% of plants and 4% of vertebrates** are projected to lose over half of their climatically determined geographic range for global warming of **1.5°C**,

compared with:

**18% of insects, 16% of plants and 8% of vertebrates** for global warming of **2°C** (medium confidence).

# IPCC SR15: Increasing climate-related risks

- B5. Climate-related **risks** to health, livelihoods, **food** security, water supply, human security, and economic growth are projected to **increase with global warming of 1.5°C** and increase further with 2°C.
- B5.1 **Limiting global warming to 1.5°C**, compared with 2°C, **could reduce the number of people both exposed** to climate-related risks and susceptible to poverty **by up to several hundred million by 2050** (medium confidence).

# IPCC SR15: Impacts on agriculture

- B5.3 Limiting warming to 1.5°C, compared with 2°C, is projected to result in smaller net reductions in **yields of maize, rice, wheat**, and potentially other cereal crops, particularly in sub-Saharan Africa, Southeast Asia, and Central and South America; and in the CO<sub>2</sub> dependent, and in the **nutritional quality of rice and wheat** (high confidence). **Reductions in projected food availability are larger at 2°C than at 1.5°C of global warming in the Sahel, southern Africa, the Mediterranean, central Europe, and the Amazon** (medium confidence). **Livestock are projected to be adversely affected** with rising temperatures, depending on the extent of changes in feed quality, spread of diseases, and water resource availability (high confidence).

## IPCC SR15: Compound risks

- B5.6 Exposure to multiple and compound climate-related risks increases between 1.5°C and 2°C of global warming, with **greater proportions of people both so exposed and susceptible to poverty in Africa and Asia** (high confidence). For global warming from 1.5°C to 2°C, **risks across energy, food, and water sectors could overlap spatially and temporally**, creating new and exacerbating current hazards, exposures, and vulnerabilities that could affect increasing numbers of people and regions (medium confidence)



# Adaptation

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- B6.2 Adaptation is expected to be **more challenging for ecosystems, food** and health systems **at 2°C** of global warming than for 1.5°C (medium confidence).
- Some **vulnerable regions**, including small islands and Least Developed Countries, are projected to experience high **multiple interrelated climate risks even at global warming of 1.5°C** (high confidence).

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

# Greenhouse gas emissions pathways

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

# Greenhouse gas emissions pathways

- 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

# Greenhouse gas emissions pathways

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

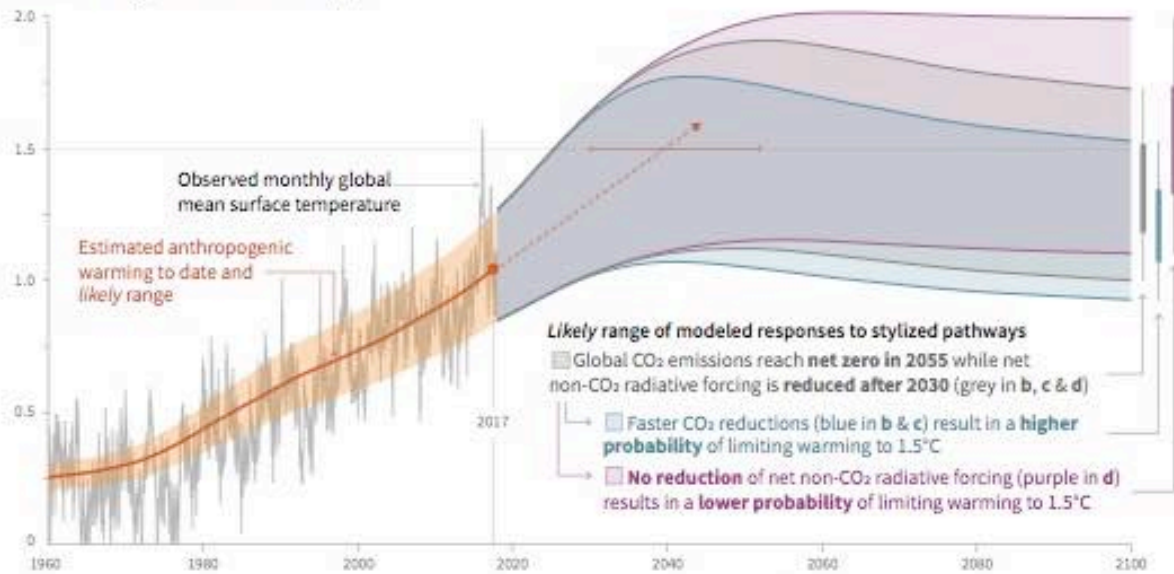
# Greenhouse gas emissions pathways

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

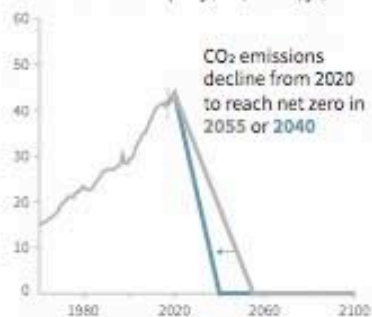
# Cumulative emissions of CO<sub>2</sub> and future non-CO<sub>2</sub> radiative forcing determine the probability of limiting warming to 1.5°C

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

Global warming relative to 1850-1900 (°C)

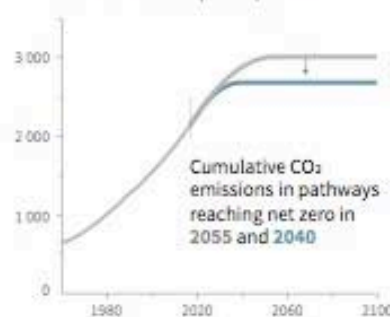


### b) Stylized net global CO<sub>2</sub> emission pathways Billion tonnes CO<sub>2</sub> per year (GtCO<sub>2</sub>/yr)



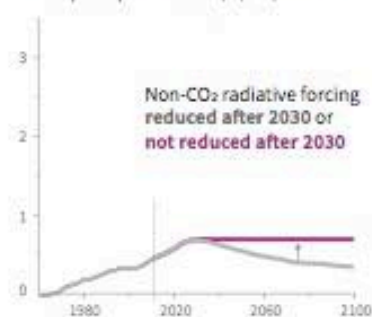
Faster immediate CO<sub>2</sub> emission reductions limit cumulative CO<sub>2</sub> emissions shown in panel (c).

### c) Cumulative net CO<sub>2</sub> emissions Billion tonnes CO<sub>2</sub> (GtCO<sub>2</sub>)



Maximum temperature rise is determined by cumulative net CO<sub>2</sub> emissions and net non-CO<sub>2</sub> radiative forcing due to methane, nitrous oxide, aerosols and other anthropogenic forcing agents.

### d) Non-CO<sub>2</sub> radiative forcing pathways Watts per square metre (W/m<sup>2</sup>)

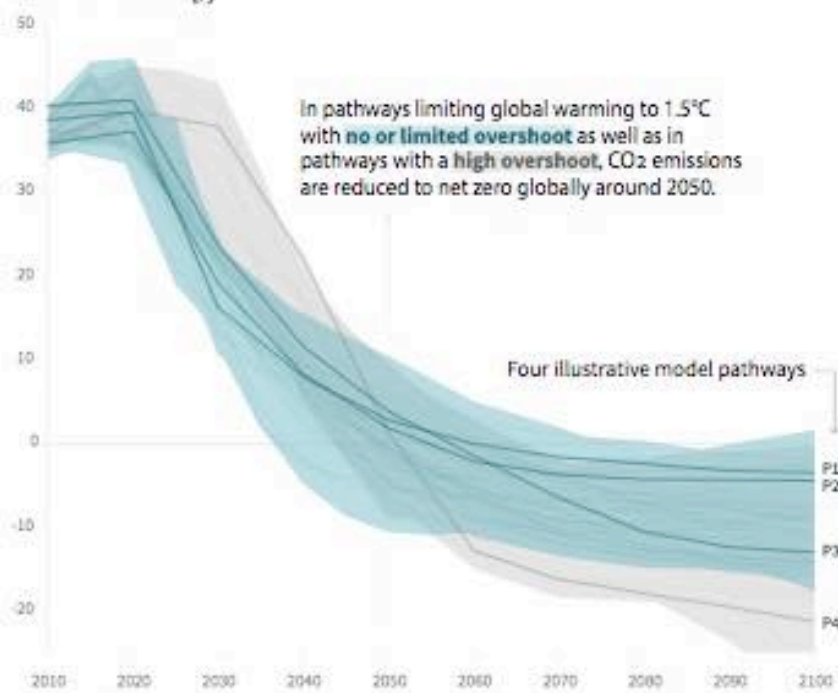


## Global emissions pathway characteristics

General characteristics of the evolution of anthropogenic net emissions of CO<sub>2</sub>, and total emissions of methane, black carbon, and nitrous oxide in model pathways that limit global warming to 1.5°C with no or limited overshoot. Net emissions are defined as anthropogenic emissions reduced by anthropogenic removals. Reductions in net emissions can be achieved through different portfolios of mitigation measures illustrated in Figure SPM3B.

### Global total net CO<sub>2</sub> emissions

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



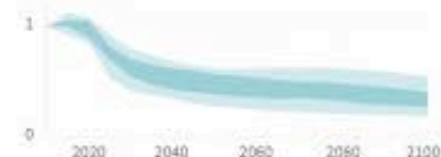
In pathways limiting global warming to 1.5°C with **no or limited overshoot** as well as in pathways with a **high overshoot**, CO<sub>2</sub> emissions are reduced to net zero globally around 2050.

Four illustrative model pathways

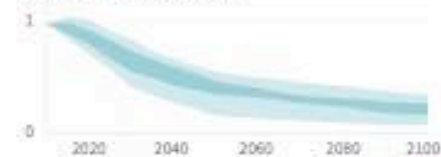
### Non-CO<sub>2</sub> emissions relative to 2010

Emissions of non-CO<sub>2</sub> 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.

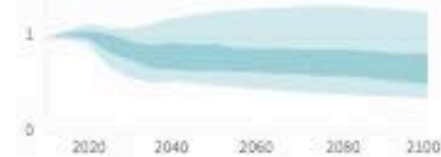
#### Methane emissions



#### Black carbon emissions



#### Nitrous oxide emissions



#### Timing of net zero CO<sub>2</sub>

Line widths depict the 5-95th percentile and the 25-75th percentile of scenarios

Pathways limiting global warming to 1.5°C with no or low overshoot

Pathways with high overshoot

Pathways limiting global warming below 2°C (Not shown above)

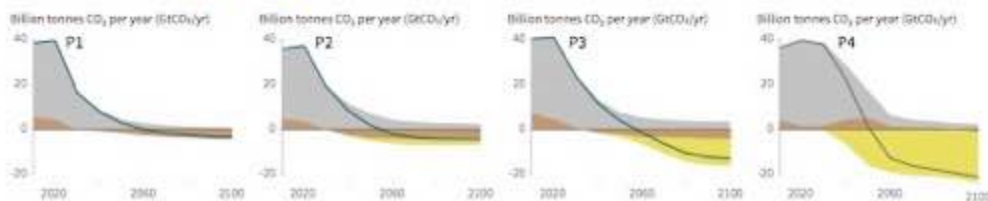


## Characteristics of four illustrative model pathways

Different mitigation strategies can achieve the net emissions reductions that would be required to follow a pathway that limit global warming to 1.5°C with no or limited overshoot. All pathways use Carbon Dioxide Removal (CDR), but the amount varies across pathways, as do the relative contributions of Bioenergy with Carbon Capture and Storage (BECCS) and removals in the Agriculture, Forestry and Other Land Use (AFOLU) sector. This has implications for the emissions and several other pathway characteristics.

### Breakdown of contributions to global net CO<sub>2</sub> emissions in four illustrative model pathways

■ Fossil fuel and industry ■ AFOLU ■ BECCS



**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-wind 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.

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 <sub>2</sub> emission change in 2030 (% rel to 2010)	-58	-47	-41	4	[-55, 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	25	44	[-11, 22]
Renewable share in electricity in 2030 (%)	80	58	48	25	[47, 65]
in 2050 (%)	77	61	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	-82	[-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, 8]
from nuclear in 2030 (% rel to 2010)	55	83	98	106	[44, 102]
in 2050 (% rel to 2010)	130	98	101	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, 263]
from non-biomass renewables in 2030 (% rel to 2010)	430	470	315	110	[243, 438]
in 2050 (% rel to 2010)	832	1327	979	1337	[575, 1300]
Cumulative CCS until 2100 (GtCO <sub>2</sub> )	0	348	687	1218	[510, 1017]
of which BECCS (GtCO <sub>2</sub> )	0	151	414	1191	[884, 962]
Land area of bioenergy crops in 2050 (million hectares)	22	93	263	724	[131, 320]
Agricultural CH <sub>4</sub> emissions in 2030 (% rel to 2010)	-24	-48	1	14	[-35, 11]
in 2050 (% rel to 2010)	-33	-69	-23	2	[-46, 28]
Agricultural N <sub>2</sub> O emissions in 2030 (% rel to 2010)	5	-26	15	3	[-25, 4]
in 2050 (% rel to 2010)	6	-26	0	39	[-26, 1]

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.

Source: IPCC Special Report on Global Warming of 1.5°C.

\* Kyoto gas emissions are based on SRI GWP 100

\*\* Changes in energy demand are associated with improvements in energy efficiency and behaviour change

**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.

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 <sub>2</sub> emission change in 2030 (% rel to 2010)	-58	-47	-41	4	(-53, -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, 32)
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, 436)
in 2050 (% rel to 2010)	832	1327	878	1137	(575, 1300)
Cumulative CCS until 2100 (GtCO <sub>2</sub> )	0	348	667	1218	(556, 1017)
of which BECCS (GtCO <sub>2</sub> )	0	151	414	1391	(364, 662)
Land area of bioenergy crops in 2050 (million hectare)	22	93	283	724	(151, 320)
Agricultural CH <sub>4</sub> 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 <sub>2</sub> O emissions in 2030 (% rel to 2010)	5	-26	15	3	(-21, 4)
in 2050 (% rel to 2010)	6	-26	0	39	(-26, 1)

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

Source: IPCC Special Report on Global Warming of 1.5°C

## For 3 illustrative model pathways that limit warming with no or limited overshoot

	P1	P2	P3
CO <sub>2</sub> (%rel to 2010) (2030/2050)	-58 / - 93	-47 / -95	-41 / -91
Primary energy from biomass (%rel to 2010) (2030/2050)	-11 / -16	0 / +49	+36 / +121
BECCS (GtCO <sub>2</sub> total →2100)	0	151	414
Land for bioenergy crops in 2050 (Mha)	22	93	283
Agric. CH <sub>4</sub> (2030 / 2050)	-24 / -33	-48 / -69	+1 / -23
Agric. N <sub>2</sub> O	+5 / +6	-26 / -26	+15 / 0

IPCC SR15  
Fig SPM 3b



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

## Climate change and people

- 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

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# SDG Interactions

Twitter: @JPvanYpersele



# SUSTAINABLE DEVELOPMENT GOALS



# Les 17 Objectifs de Développement Durable, adoptés par l'ONU en septembre 2015



**OBJECTIFS DE DÉVELOPPEMENT DURABLE**



**SOLIDARITÉ climatique**  
UN MOUVEMENT ANIMÉ PAR **geres**



# **If well designed, measures to prevent climate change could offer so many opportunities:**

- Co-benefits in reduced pollution, health improvement, employment, gender equality, food security, reduced poverty, energy independence...**
- Opportunities to shift the tax burden away from labour, incentivise, and fund sustainable development**
- Opportunities to integrate research results in a useful, policy-relevant way, accross disciplines (including social sciences)**

**Example of Synergies:  
Combustion of fossil fuels,  
wood, and biomass also cause  
air pollution, which kills 7  
million people per year (World Health  
Organization, 2018)**

**Opportunity: Addressing the causes of  
climate change can also improve air  
quality and wellbeing**

# Children are particularly sensitive to air pollution



Photo: Indiatoday.in, 6-12-2017

## An example from SR15:

- **C3.5 Some AFOLU-related CDR** (Carbon Dioxide Removal) measures such as restoration of natural ecosystems and soil carbon sequestration **could provide co-benefits** such as improved biodiversity, soil quality, and local **food security**. If deployed at large scale, they **would require governance systems** enabling sustainable land management to conserve and protect land carbon stocks and other ecosystem functions and services (medium confidence). (Figure SPM.4) {2.3.3, 2.3.4, 2.4.2, 2.4.4, 3.6.2, 5.4.1, Cross-Chapter Boxes 3 in Chapter 1 and 7 in Chapter 3, 4.3.2, 4.3.7, 4.4.1, 4.5.2, Table 2.4}

Nilsson et al. (2016) have proposed a simple framework for rating relationships between SDG targets along a scale of interaction (also in Schmalzbauer & Visbeck (2016) :

- |                   |                 |
|-------------------|-----------------|
| - 3 cancelling    | + 1 enabling    |
| - 2 counteracting | + 2 reinforcing |
| - 1 constraining  | + 3 indivisible |
| 0 consistent      |                 |

# Scale to score the influence of one SDG or target on another

Schmalzbauer B., Visbeck M. (Eds.) 2016.  
 The contribution of science in implementing the Sustainable Development Goals.  
 German Committee Future Earth, Stuttgart/Kiel

Interaction	Name	Explanation	Example
+3	Indivisible	Inextricably linked to the achievement of another goal.	Ending all forms of discrimination against women and girls is indivisible from ensuring women's full and effective participation and equal opportunities for leadership.
+2	Reinforcing	Aids the achievement of another goal.	Providing access to electricity reinforces water-pumping and irrigation systems. Strengthening the capacity to adapt to climate-related hazards reduces losses caused by disasters.
+1	Enabling	Creates conditions that further another goal.	Providing electricity access in rural homes enables education, because it makes it possible to do homework at night with electric lighting.
0	Consistent	No significant positive or negative interactions.	Ensuring education for all does not interact significantly with infrastructure development or conservation of ocean ecosystems.
-1	Constraining	Limits options on another goal.	Improved water efficiency can constrain agricultural irrigation. Reducing climate change can constrain the options for energy access.
-2	Counteracting	Clashes with another goal.	Boosting consumption for growth can counteract waste reduction and climate mitigation.
-3	Cancelling	Makes it impossible to reach another goal.	Fully ensuring public transparency and democratic accountability cannot be combined with national-security goals. Full protection of natural reserves excludes public access for recreation.

## Indicative linkages between mitigation options and sustainable development using SDGs (The linkages do not show costs and benefits)

Mitigation options deployed in each sector can be associated with potential positive effects (synergies) or negative effects (trade-offs) with the Sustainable Development Goals (SDGs). The degree to which this potential is realized will depend on the selected portfolio of mitigation options, mitigation policy design, and local circumstances and context. Particularly in the energy-demand sector, the potential for synergies is larger than for trade-offs. The bars group individually assessed options by level of confidence and take into account the relative strength of the assessed mitigation-SDG connections.

Length shows strength of connection

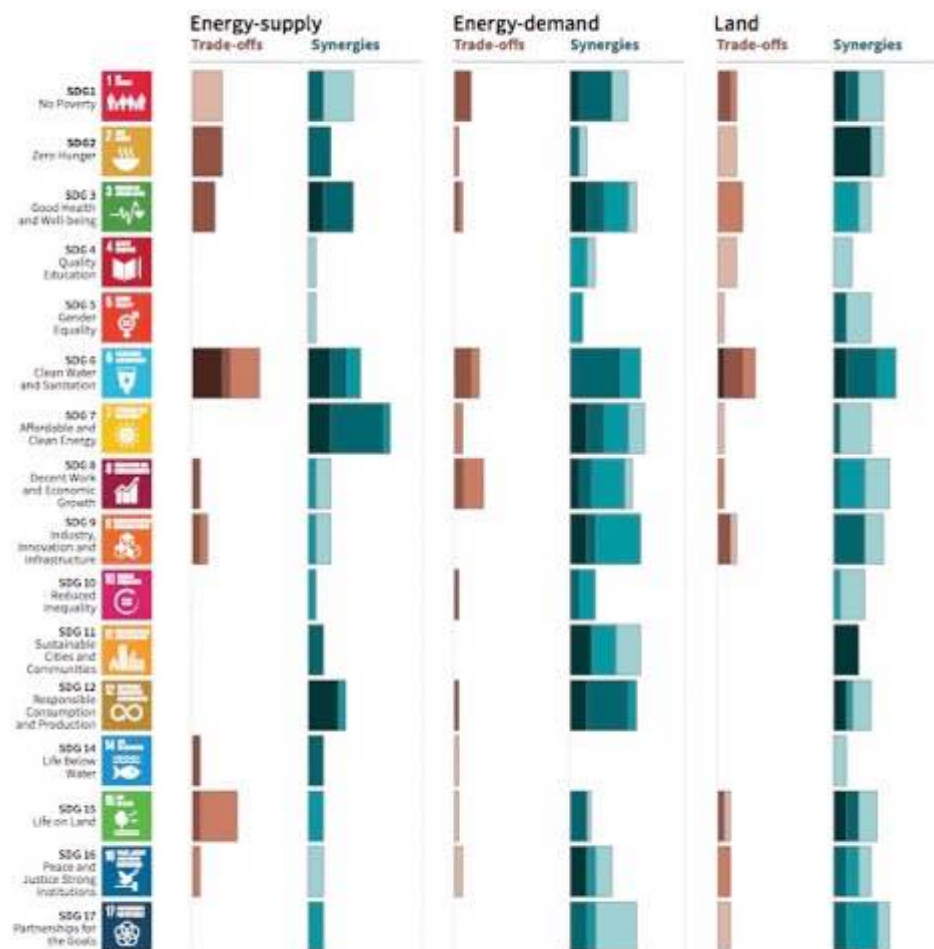


The overall size of the coloured bars depict the relative for synergies and trade-offs between the sectoral mitigation options and the SDGs.

Shades show level of confidence



The shades depict the level of confidence of the assessed potential for Trade-offs/Synergies.



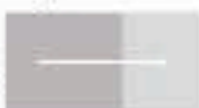
IPCC SR15  
Fig SPM 4

# Indicative linkages between mitigation options and sustainable development using SDGs

(The linkages do not show costs and benefits)

Mitigation options deployed in each sector can be associated with potential positive effects (synergies) or negative effects (trade-offs) with the Sustainable Development Goals (SDGs). The degree to which this potential is realized will depend on the selected portfolio of mitigation options, mitigation policy design, and local circumstances and context. Particularly in the energy-demand sector, the potential for synergies is larger than for trade-offs. The bars group individually assessed options by level of confidence and take into account the relative strength of the assessed mitigation-SDG connections.

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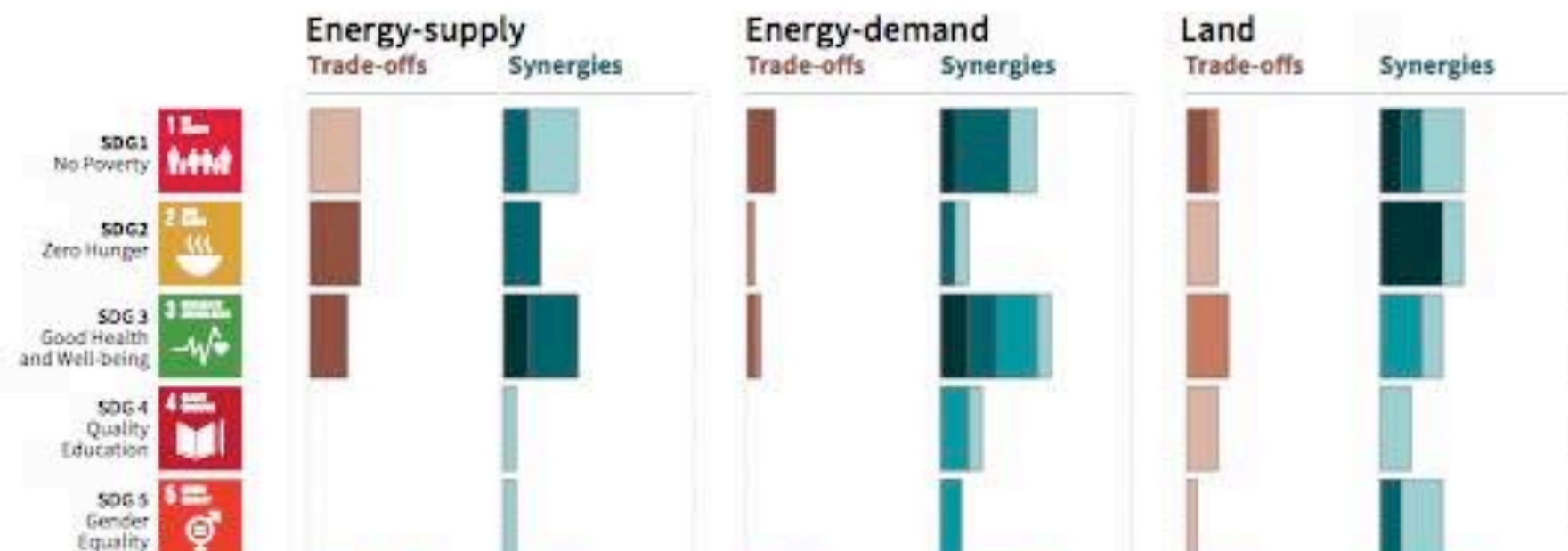


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# Maximizing synergies, minimizing trade-offs: Role of agricultural research

Twitter: @JPvanYpersele

# Possible steps for CGIAR and this Forum

- ***Identify sticking points and trade-offs***
- ***Identify win-win opportunities and trade-offs***
- ***Understand them (interdisciplinary research, with no prejudices)***
- ***Learn from other fields and from critics***
- ***Search how to overcome the gulf between the urgency to act and the insufficient political will***

From SR15:

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- C2.5 Model pathways that limit global warming to 1.5°C with no or limited overshoot project the **conversion of 0.5–8 million km<sup>2</sup> of pasture and 0–5 million km<sup>2</sup> of non-pasture agricultural land for food and feed crops into 1–7 million km<sup>2</sup> for energy crops** and a 1 million km<sup>2</sup> reduction to 10 million km<sup>2</sup> increase in forests **by 2050 relative to 2010** (medium confidence).

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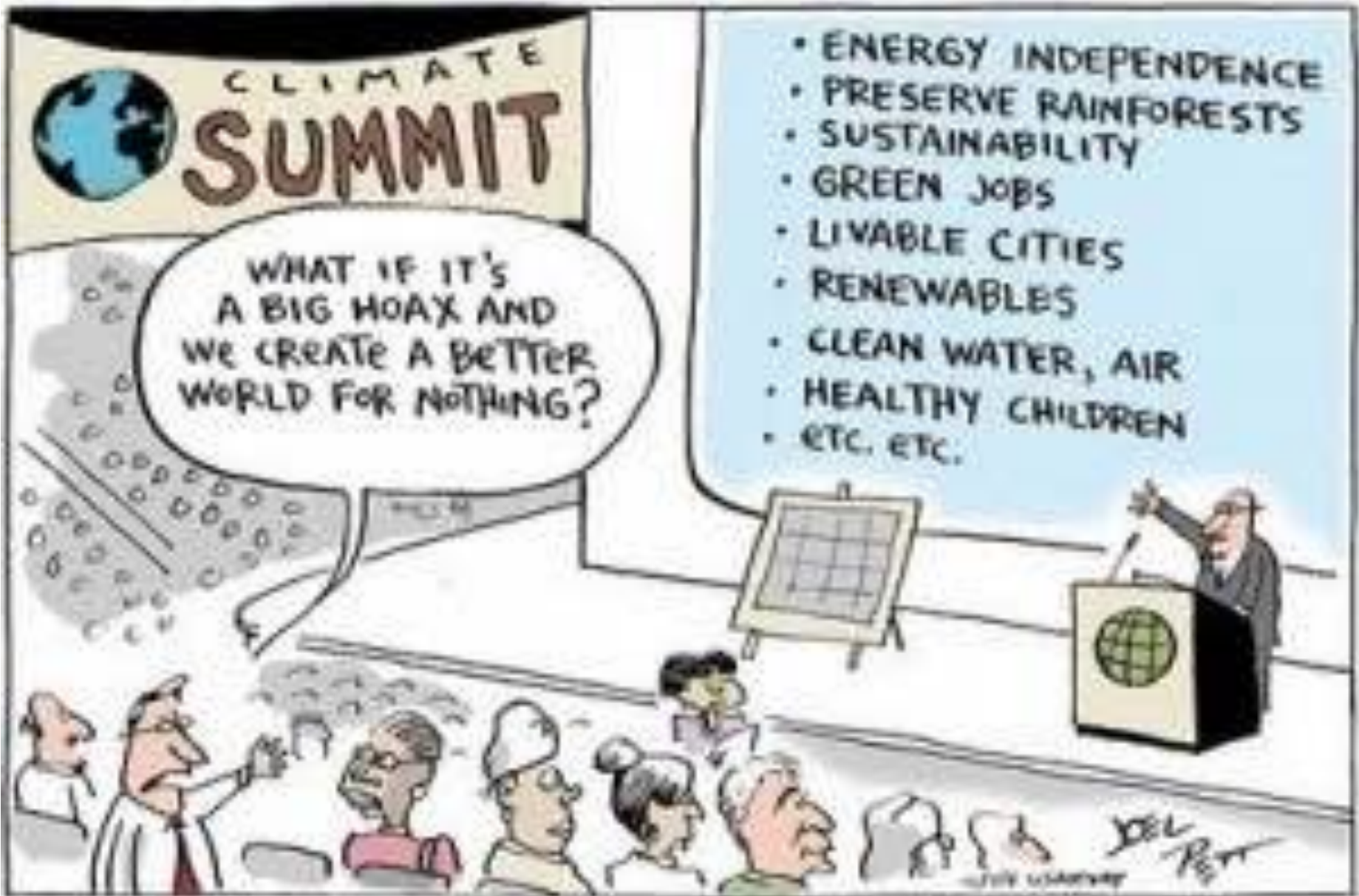
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# Conclusions

Twitter: @JPvanYpersele

# Conclusions (1/2)

- **The challenge is huge: transform the world in a few decades so that the whole world activities are decarbonized, while poverty and hunger are eliminated**
- **It opens many economic opportunities, and opportunities to address in a synergistic manner other societal goals (see the 17 Sustainable Development Goals).**



Joel Pett, USA Today

# Conclusions (2/2)

- **(Inter- & trans-disciplinary) Science has very important role**
- **Last but not least, addressing this challenge, together, will allow us to look our children and grand children into their eyes when they will ask us how we contributed to avoiding the announced environmental collapse.**

# COP23, Bonn (Fiji Presidency):

Timoci, 12, speaks to Heads of State and Governments about the threats of climate change



Twitter: @JPvanYpersele



# Useful links:

- [www.ipcc.ch](http://www.ipcc.ch) : IPCC (reports and videos)
- [www.climate.be/vanyp](http://www.climate.be/vanyp) : my slides and other documents
- [www.skepticalscience.com](http://www.skepticalscience.com): excellent responses to contrarians arguments
- **On Twitter: @JPvanYpersele  
and @IPCC\_CH**