Climate Change: Insights from the latest IPCC Report, and challenges for the next assessment cycle

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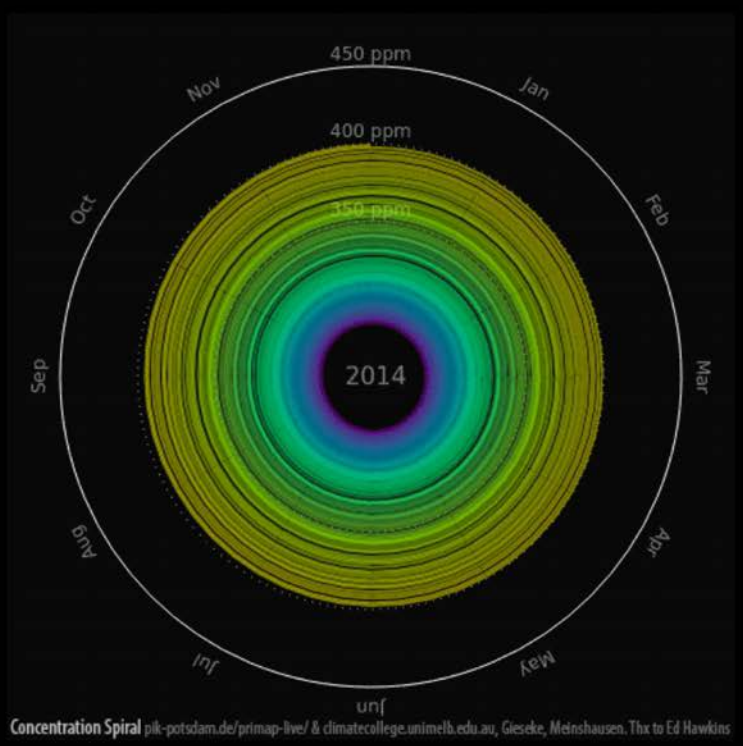
Twitter: @JPvanYpersele

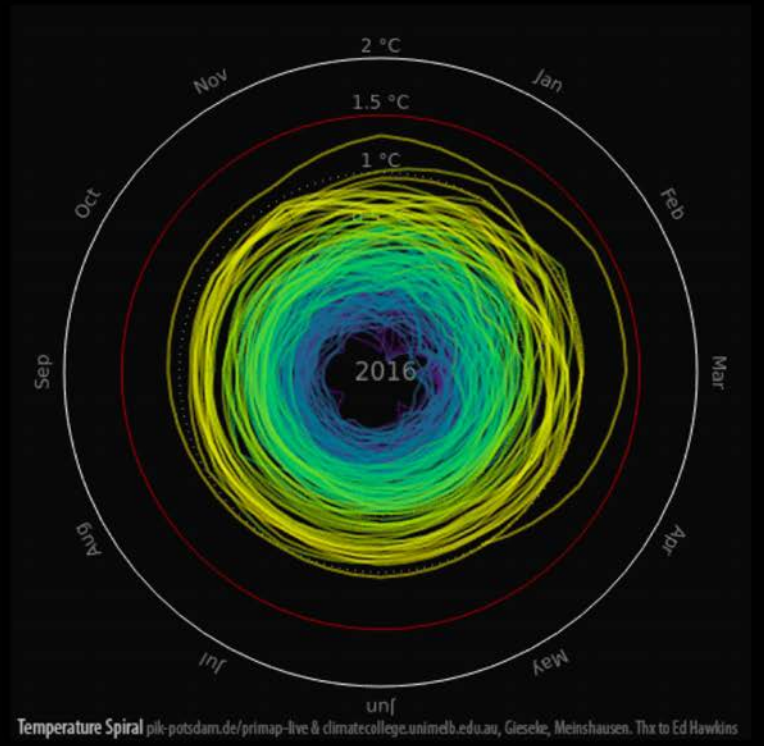
Seminar jointly organised by the Chinese Academy of Social Sciences and Beijing University of Technology, Beijing, 27 April 2023

Thanks to the Federal Government and the Walloon Government (funding the Walloon Platform for IPCC) and to my team at UCLouvain for their support

Source: @JohnfoCook

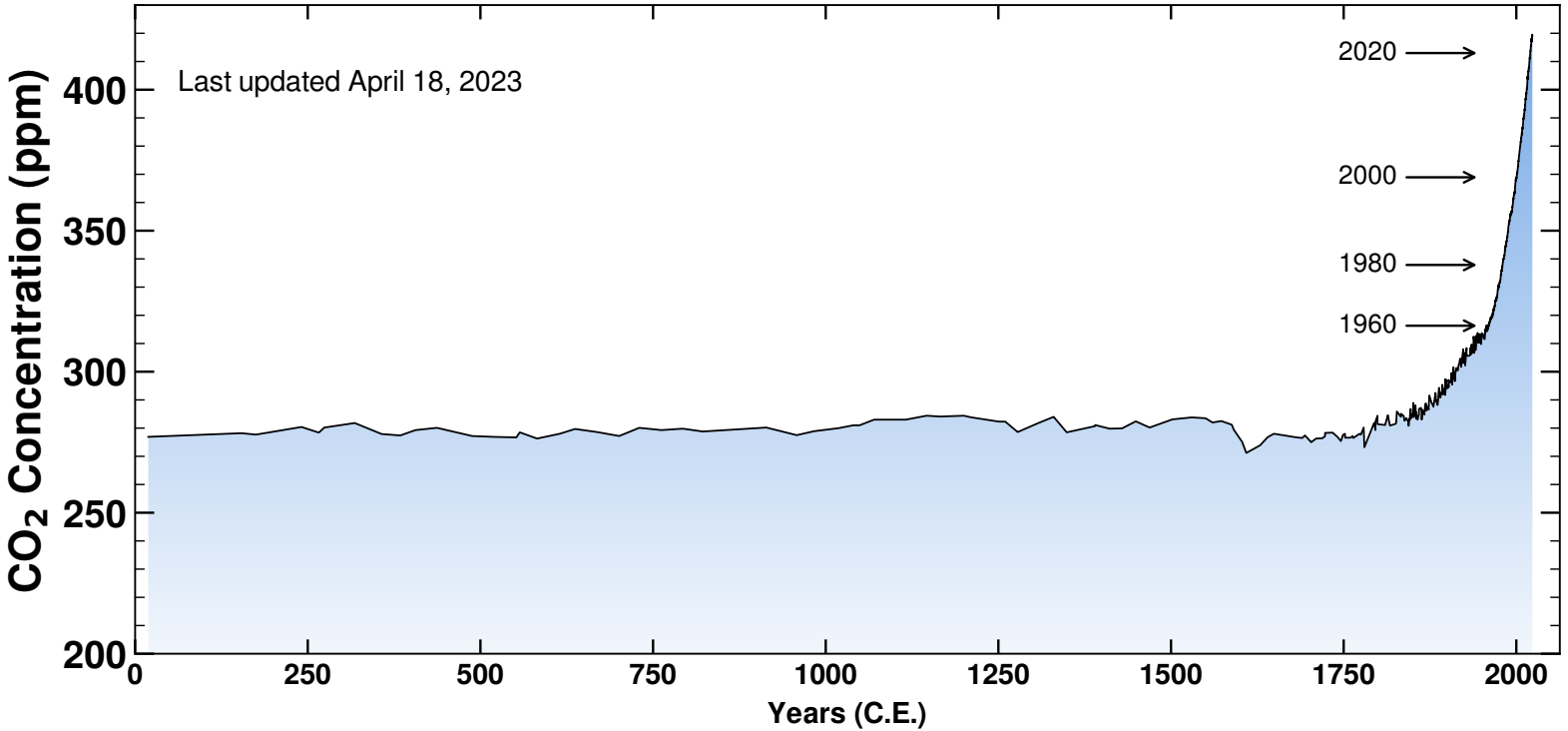
CO_2 Concentration and Temperature spirals





CO_2 Concentration since 1850 and Global Mean Temperature in °C relative to 1850 – 1900
Graph: Ed Hawkins (Climate Lab Book) – Data: HadCRUT4 global temperature dataset
Animation available on http://openclimatedata.net/climate-spirals/concentration-temperature/

CO_2 Concentration 18 April 2023: 424,03 ppm (Keeling curve + last 10000 years)



Source: scripps.ucsd.edu/programs/keelingcurve/

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

Human-induced climate change is already affecting many weather and climate extremes in every region across the globe

Extreme heat

More frequent

More intense

Heavy rainfall

More frequent

More intense

Drought

Increase in some regions

Fire weather

More frequent

Ocean

Warming

Acidifying

Losing oxygen

Photo Credits from left: 1. Luiz Guimaraes 2. Jonathan Ford 3. Peter Burdon 4. Ben Kuo 5. NOAA

A.3 Human-induced climate change is already affecting many weather and climate extremes in every region across the globe

It is virtually certain that **hot extremes** (including heatwaves) have become more frequent and more intense across most land regions since the 1950s

The frequency and intensity of **heavy precipitation** events have increased since the 1950s over most land area (…) (high confidence), and human-induced climate change is likely the main driver.

Heat waves kill, particularly if it's humid

A man helps move a heat wave victim to a Karachi hospital on 22 June 2015.
ASIF HASSAN/AFP/Getty Images https://edition.cnn.com/2015/06/22/asia/gallery/pakistan-heat-wave/index.html

Wallonia Floods, July 2021

Source:
VRT Nieuws

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WMO UNEP

Global warming has caused dangerous and widespread disruption in nature…

[Pacific Southwest Forest Service, USDA CC BY 2.0]

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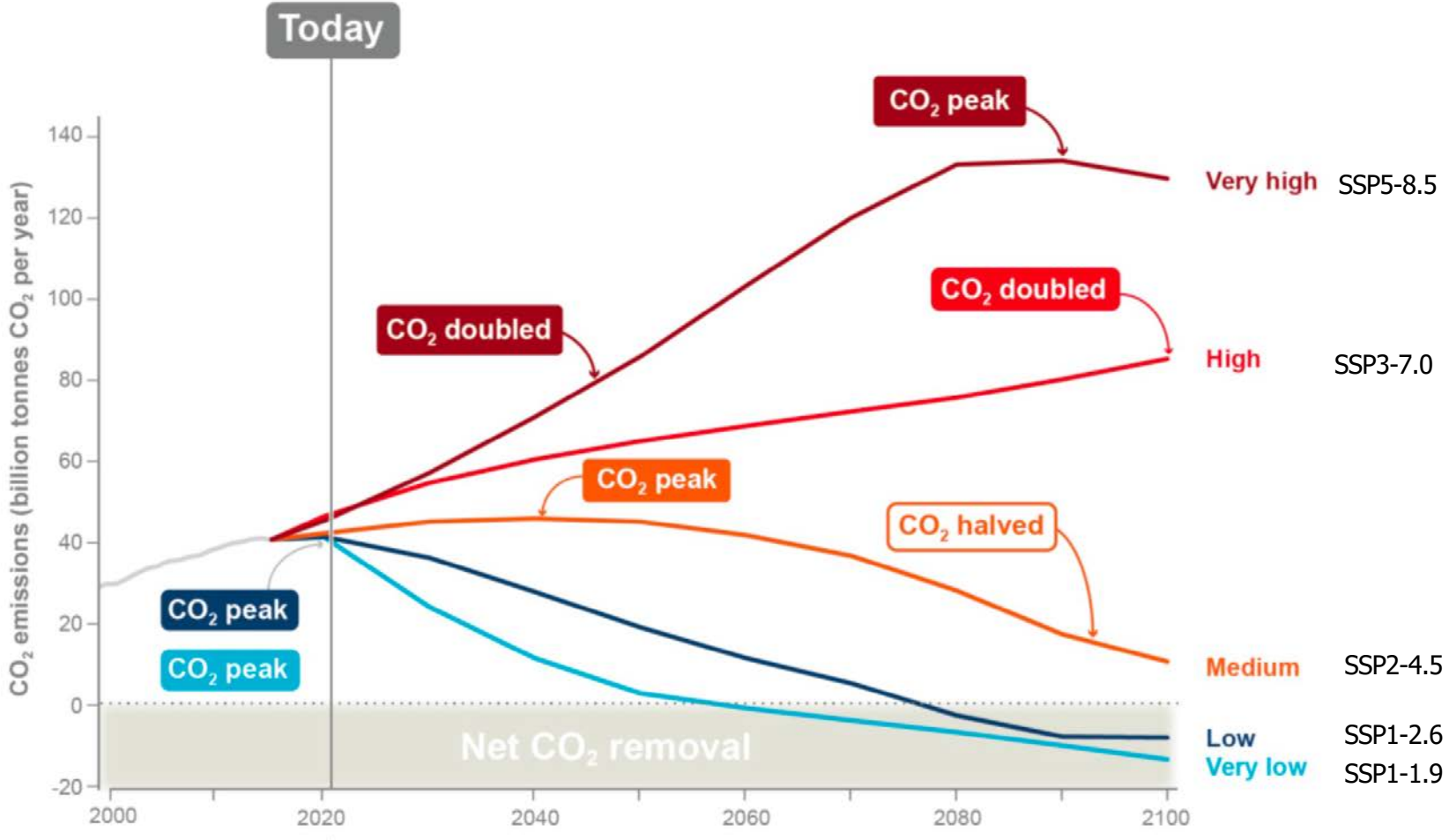
WMO UNEP

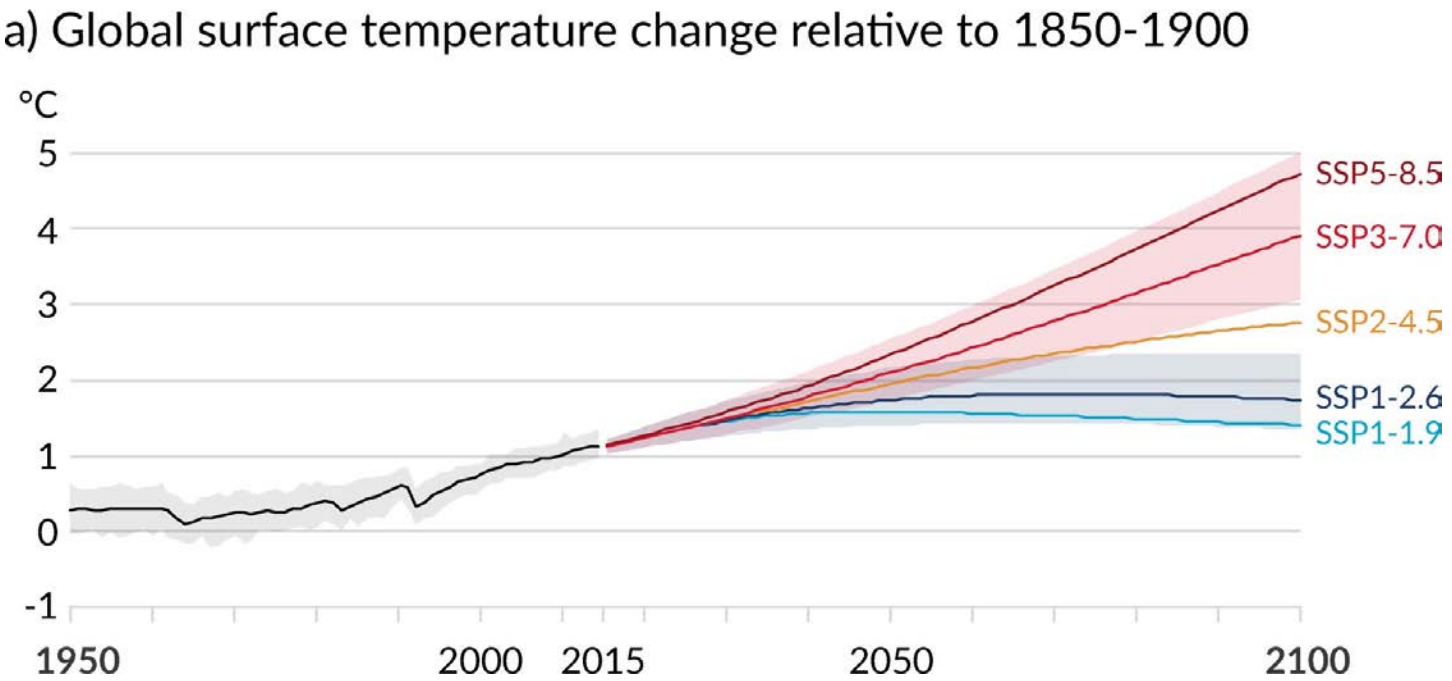
…and climate change is affecting the lives of billions of people, despite efforts to adapt.

[NLRC via IFRC CC BY-NC 2.0]


Today
CO_2 peak
CO_2 doubled
CO_2 doubled
CO_2 peak
CO_2 halved
CO_2 peak
CO_2 peak
Net CO_2 removal
CO_2 emissions (billion tonnes CO_2 per year)
140
120
100
80
60
40
20
0
-20
2000
2020
2040
2060
2080
2100
Very high
SSP5-8.5
High
SSP3-7.0
Medium
SSP2-4.5
Low
SSP1-2.6
Very low
SSP1-1.9

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

Figure SPM.8

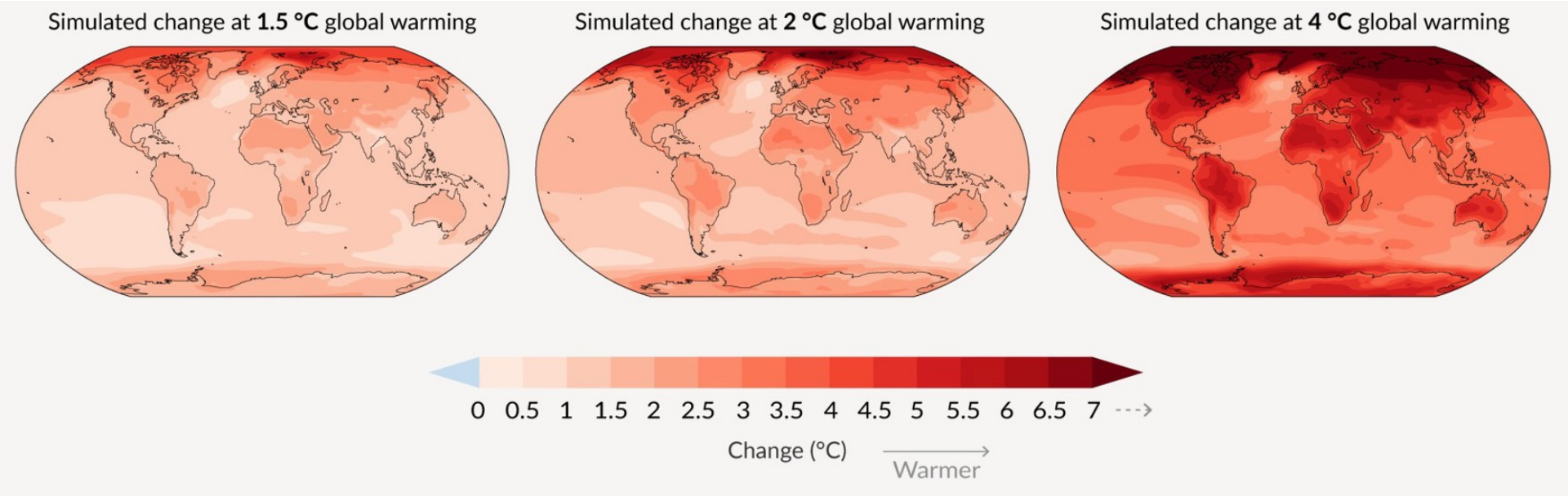


Across warming levels, land areas warm more than oceans, and the Arctic and Antarctica warm more than the tropics

+1.5° C

+2° C

+4° C



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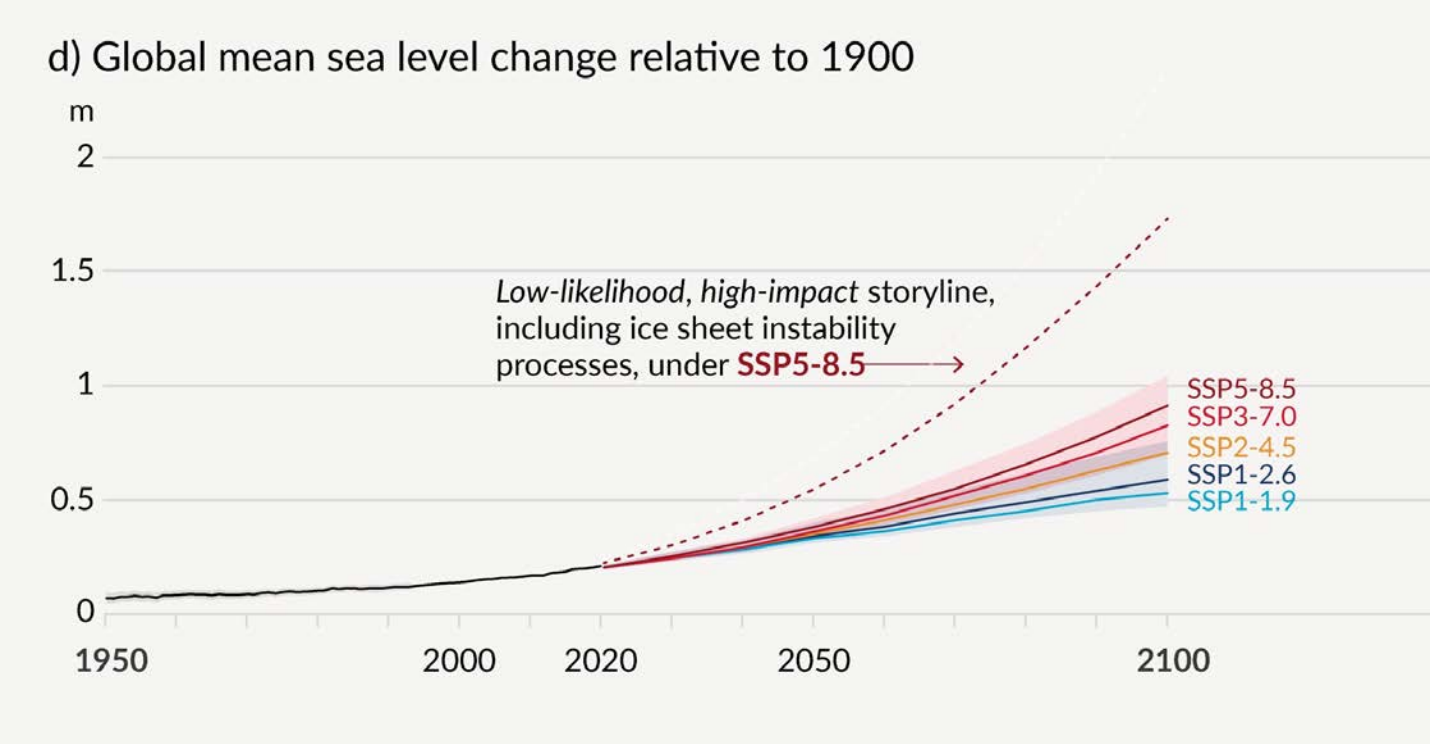
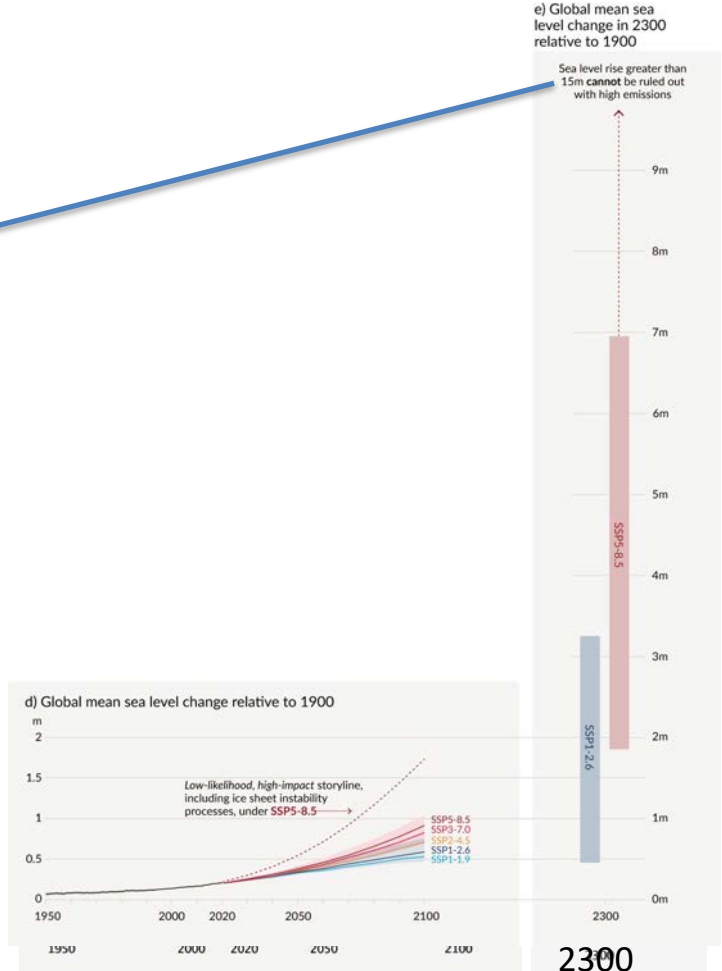


« Sea level rise **greater than 15 m** cannot be ruled out with high emissions »



7 m

2 m

2300

Future global climate risks

Heat stress

Exposure to heat waves will continue to increase with additional warming.

Water scarcity

At 2° C, regions relying on snowmelt could experience 20% decline in water availability for agriculture after 2050.

Food security

Climate change will increasingly undermine food security.

Flood risk

About a billion people in low-lying cities by the sea and on Small Islands at risk from sea level rise by mid-century.

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3.3 – 3.6 billion people live in hotspots of high vulnerability to climate change.

[Denis Onyodi / KRCS CC BY-NC 2.0]

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Action on adaptation has increased but progress is uneven and we are not adapting fast enough.

[Boskalis / Rijkswaterstaat]

[Axel Fassio/CIFOR CC BY-NC-ND 2.0]

Accelerating adaptation

- Political commitment and follow-through across all levels of government
- Institutional framework: clear goals, priorities that define responsibilities
- Enhancing knowledge of impacts and risks improves responses
- Monitoring and evaluation of adaptation measures are essential to track progress
- Inclusive governance that prioritises equity and justice – direct participation

There are limits to adaptation

- Even effective adaptation cannot prevent all losses and damages
- Above 1.5° C some natural solutions may no longer work.
- Above 1.5° C, lack of fresh water could mean that people living on small islands and those dependent on glaciers and snowmelt can no longer adapt.
- By 2° C it will be challenging to farm multiple staple crops in many current growing areas.

The wider benefits of adaptation

For more than 3.4 billion people in rural areas: improved roads, reliable energy, clean water, food security

SDG 1: No poverty

Green buildings, green spaces, clean water, renewable energy, sustainable transport – in cities

SDG 3: Good health and wellbeing

Policies that increase youth access to land, credit, knowledge and skills can support agri-food employment

SDG 10: Reduced inequality

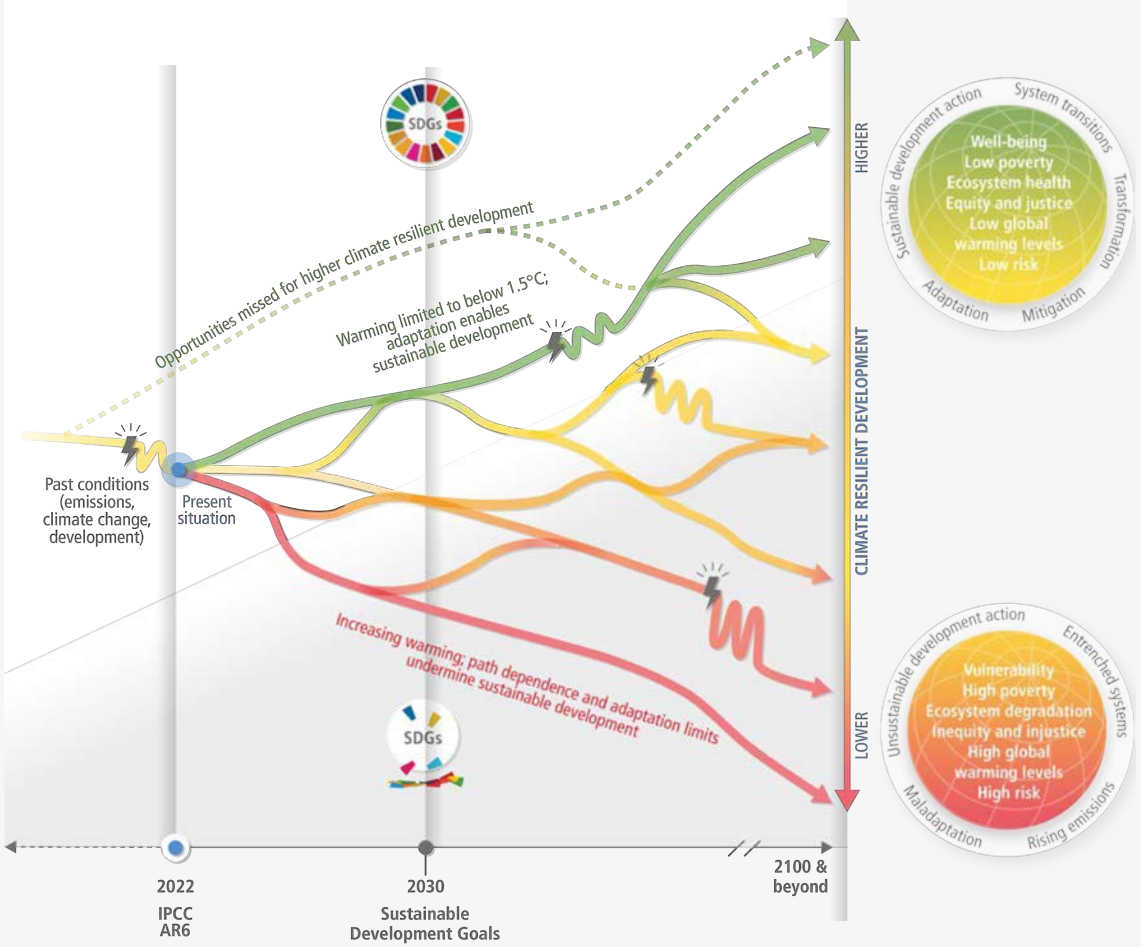
Restored and connected habitats can provide corridors for vulnerable species

SDG 14/15: Life on land & below water

Increasing urgency

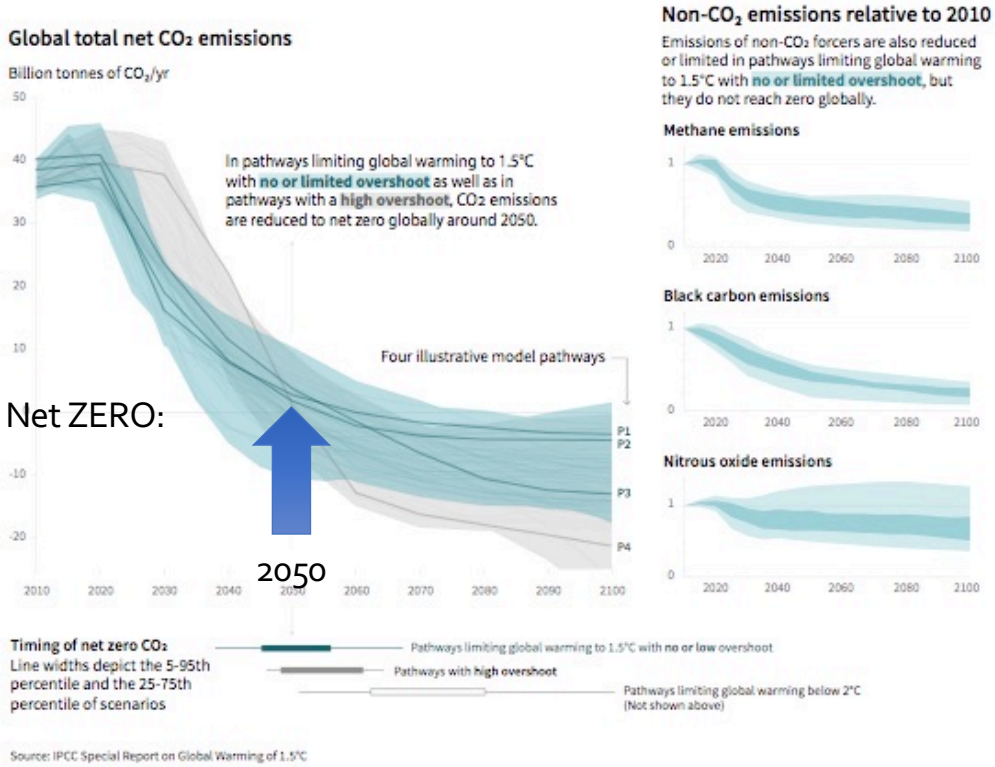
Starting today, every action, every decision matters.

Worldwide action is more urgent than previously assessed.



Global emissions pathway characteristics

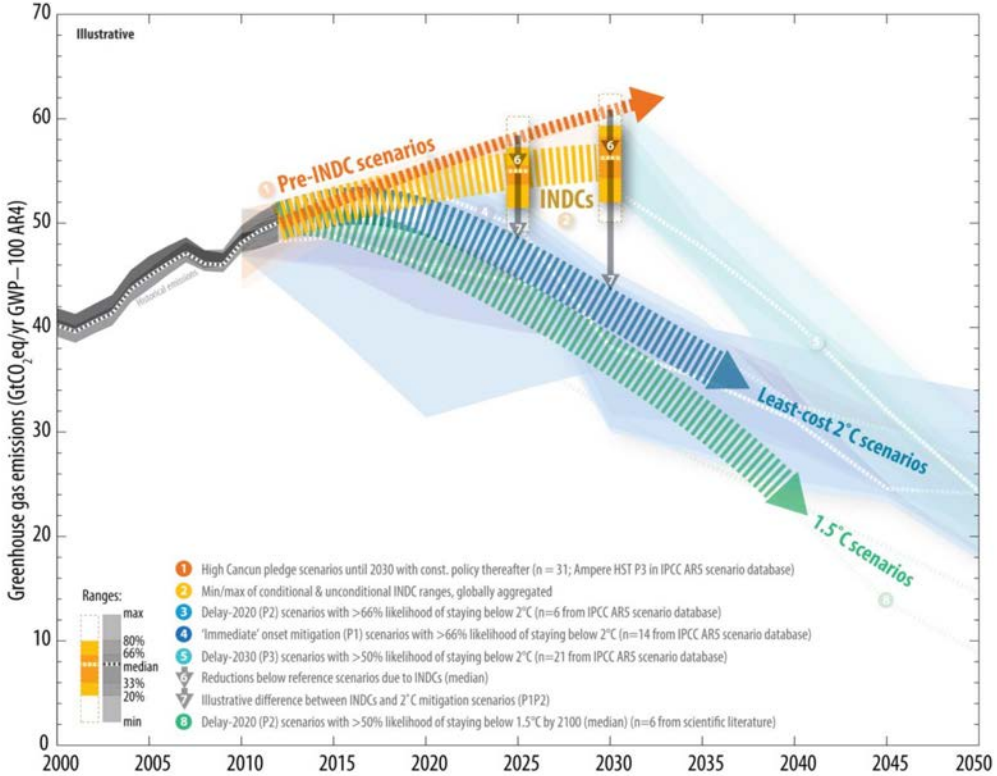
General characteristics of the evolution of anthropogenic net emissions of CO_2, and total emissions of methane, black carbon, and nitrous oxide in model pathways that limit global warming to 1.5°C with no or limited overshoot. Net emissions are defined as anthropogenic emissions reduced by anthropogenic removals. Reductions in net emissions can be achieved through different portfolios of mitigation measures illustrated in Figure SPM3B.



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


Nations Unies
onférence sur les Changements Climatiques
COP21/CMP11
Paris, France
SECRETAIRE EXECUTIVE CCNUCC
PRESIDENT

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

Sixth Assessment Report
WORKING GROUP III – MITIGATION OF CLIMATE CHANGE

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Climate Change 2022

Mitigation of Climate Change

[Matt Bridgestock, Director and Architect at John Gilbert Architects]

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> **Unless there are immediate and deep emissions reductions across all sectors, 1.5°C is beyond reach.**

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There are options available **now** in every sector that can at least **halve** emissions by 2030

Demand and services

Energy

Land use

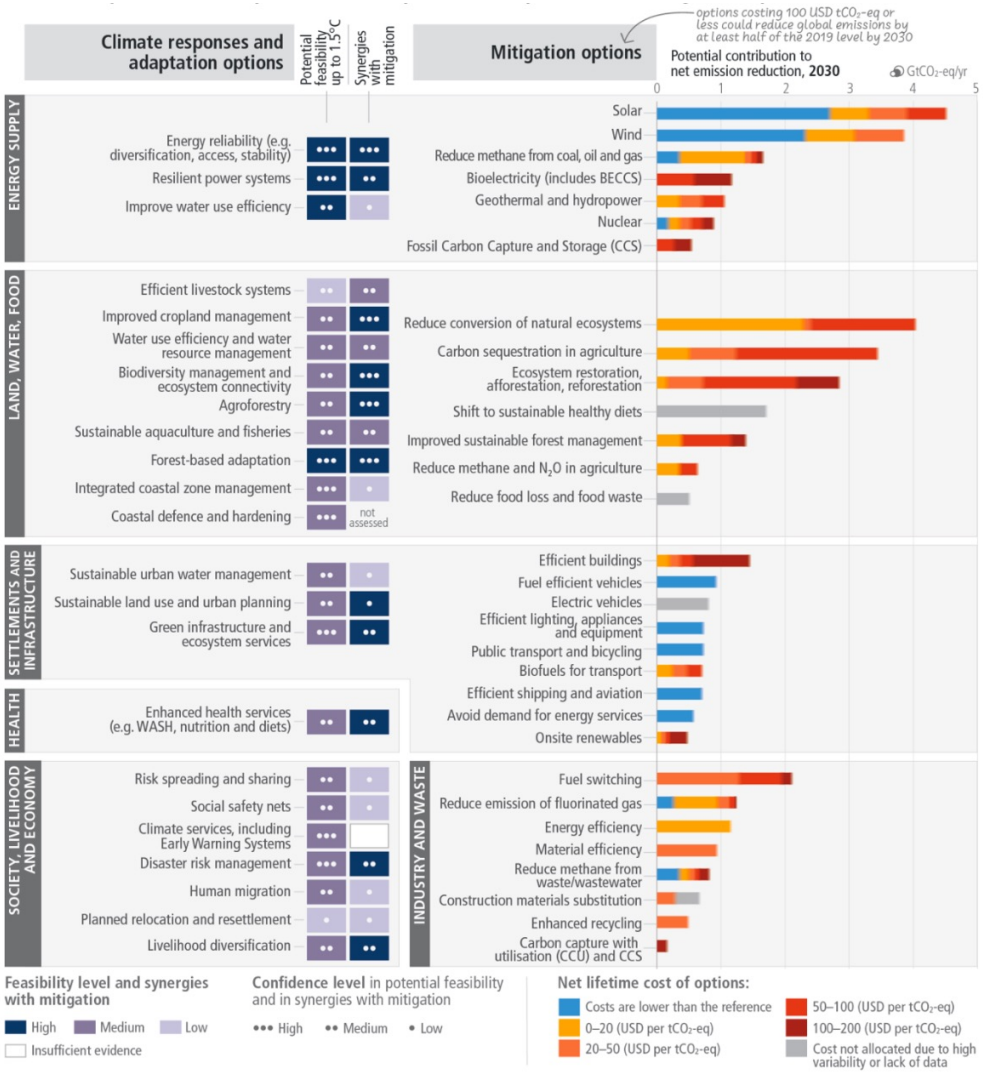
Industry

Urban

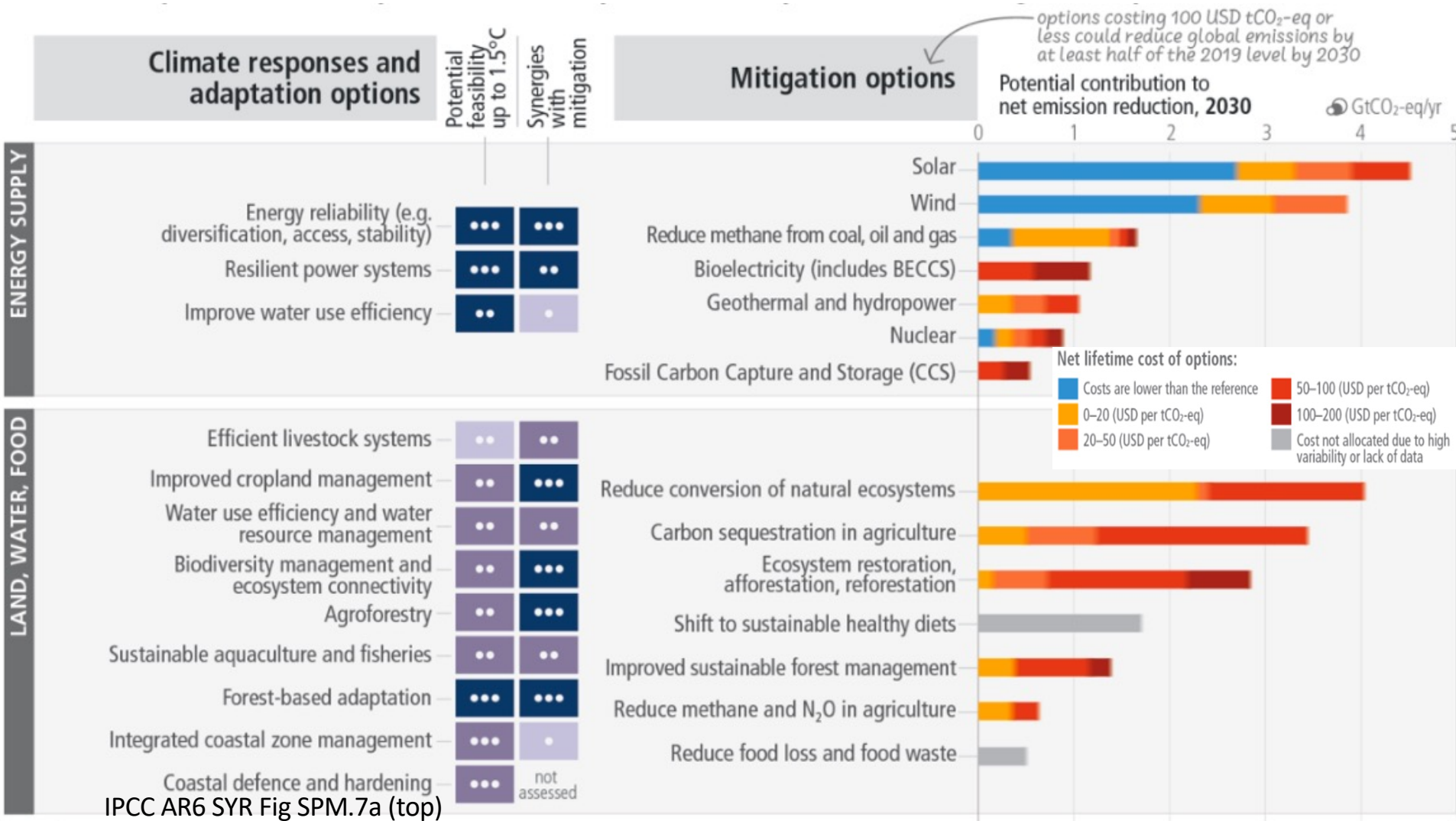
Buildings

Transport

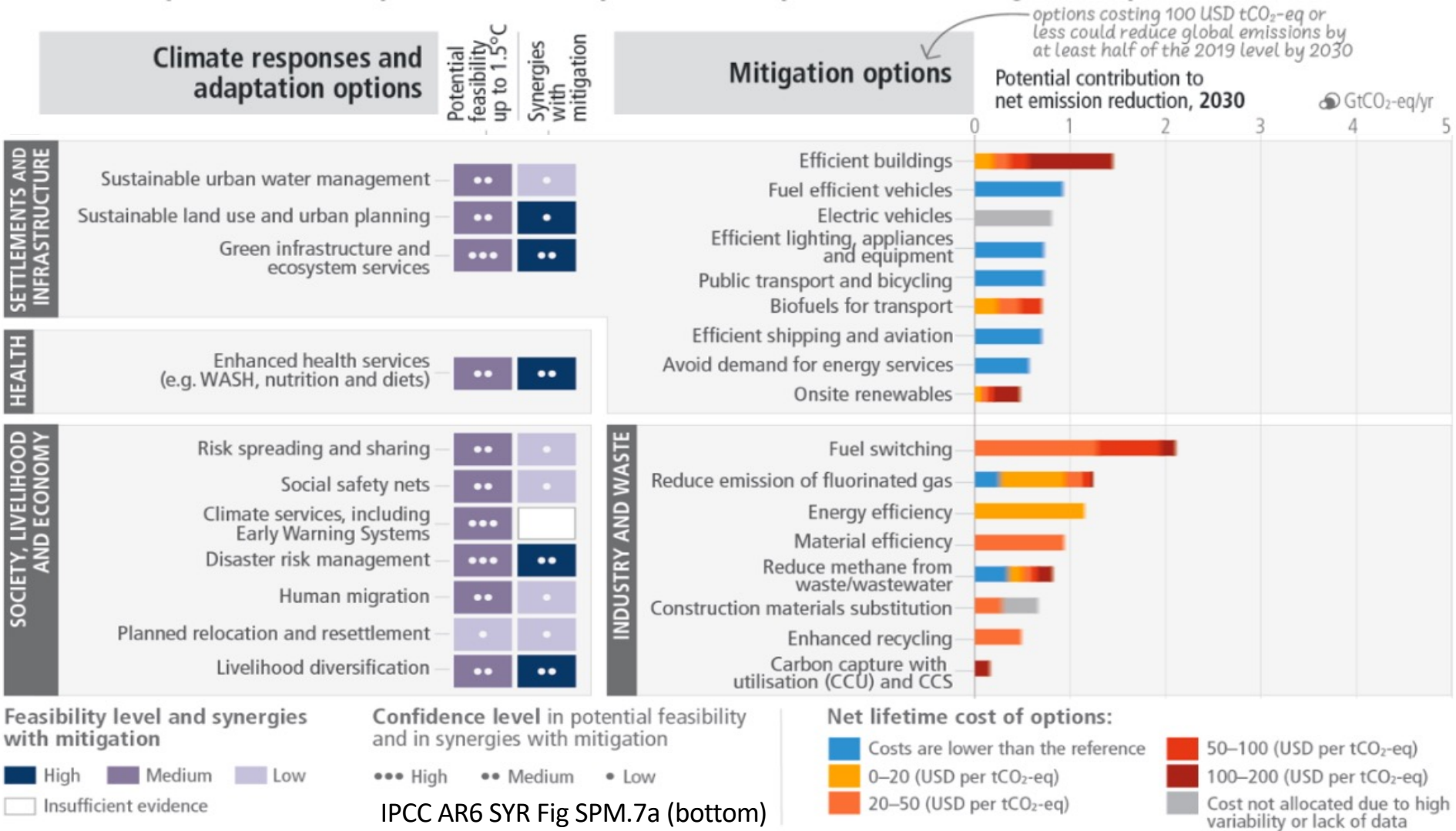
Feasibility of climate responses and adaptation, and potential of mitigation in the near-term



IPCC AR6 SYR Fig SPM.7a



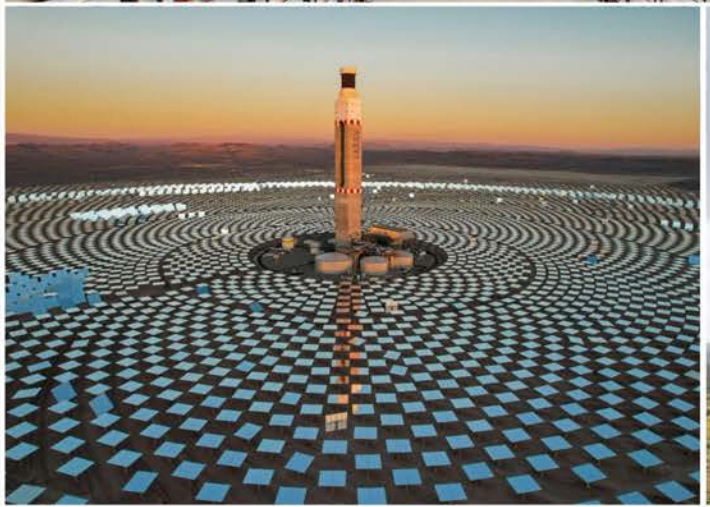
IPCC AR6 SYR Fig SPM.7a (top)



IPCC AR6 SYR Fig SPM.7a (bottom)

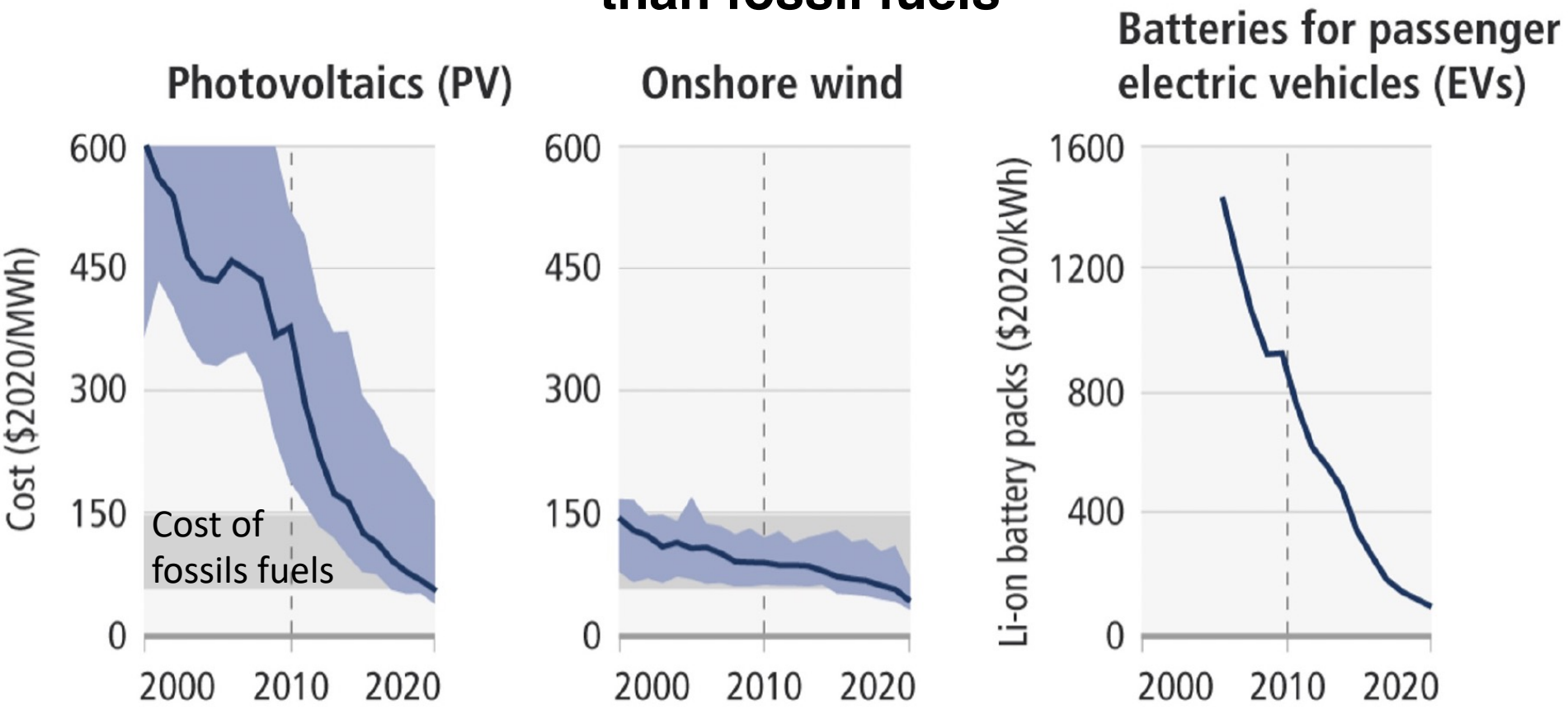
Energy

- **major transitions** are required to limit global warming
- reduction in fossil fuel use and use of carbon capture and storage
- low- or **no-carbon** energy systems
- widespread **electrification** and improved energy **efficiency**
- **alternative fuels**: e.g. hydrogen and sustainable biofuels



[Portland General Electric CC BY-ND 2.0, Harry Cunningham/Unsplash, Stéphane Bellerose/UNDP in Mauritius and Seychelles CC BY-NC 2.0, IMF Photo/Lisa Marie David, Tamara Merino CC BY-NC-ND 2.0]

Good news: solar & wind energy become cheaper than fossil fuels



IPCC WG3 (2022)

Demand and services

- potential to **bring down** global **emissions** by **40-70%** by 2050
- walking and cycling, electrified transport, reducing air travel, and adapting houses make large contributions
- **lifestyle changes** require **systemic changes** across all of society
- **some** people require additional **housing**, **energy** and **resources** for human wellbeing

[Bosch, Unsplash/Yoav Aziz, Adam Bartoszewicz, Victor Hernandez]

Buildings

- buildings: possible to reach net zero emissions in 2050
- action in this decade is critical to fully capture this potential
- involves retrofitting existing buildings and effective mitigation techniques in new buildings
- requires ambitious policy packages
- zero energy and **zero-carbon** buildings exist in new builds **and retrofits**

[Pelargoniums for Europe/Unsplash, City of St Pete CC BY-ND 2.0, Victor/Unsplash, EThekwini Municipality, Arne Müseler/arne-mueseler.com, CC BY-SA 3.0 de]

Industry

- using materials more **efficiently**, **reusing**, **recycling**, **minimising waste**; currently **under-used** in policies and practice
- **basic materials**: low- to zero-greenhouse gas production processes at **pilot** to **near-commercial** stage
- achieving **net zero** is challenging



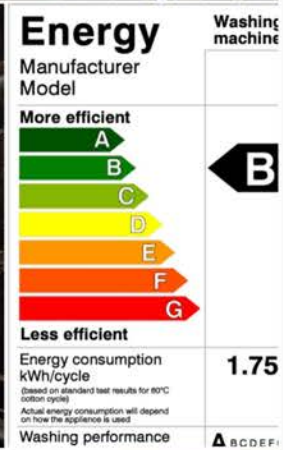


[Ahsanization/Unsplash, IMF Focus | Industry and Manufacturing CC BY-NC-ND 2.0, Rwanda Green Fund CC BY-ND 2.0, ILO/M. Fossat CC BY-NC-ND 2.0, Stephen Cornwell Pxhere.com]

Technology and Innovation

- investment and policies **push forward low emissions** technological **innovation**
- **effective decision making** requires assessing potential benefits, barriers and risks
- **some options** are technically **viable**, rapidly becoming **cost-effective**, and have relatively **high public support**. Other options face barriers

Adoption of low-emission technologies is slower in most developing countries, particularly the least developed ones.



Policies, regulatory and economic instruments

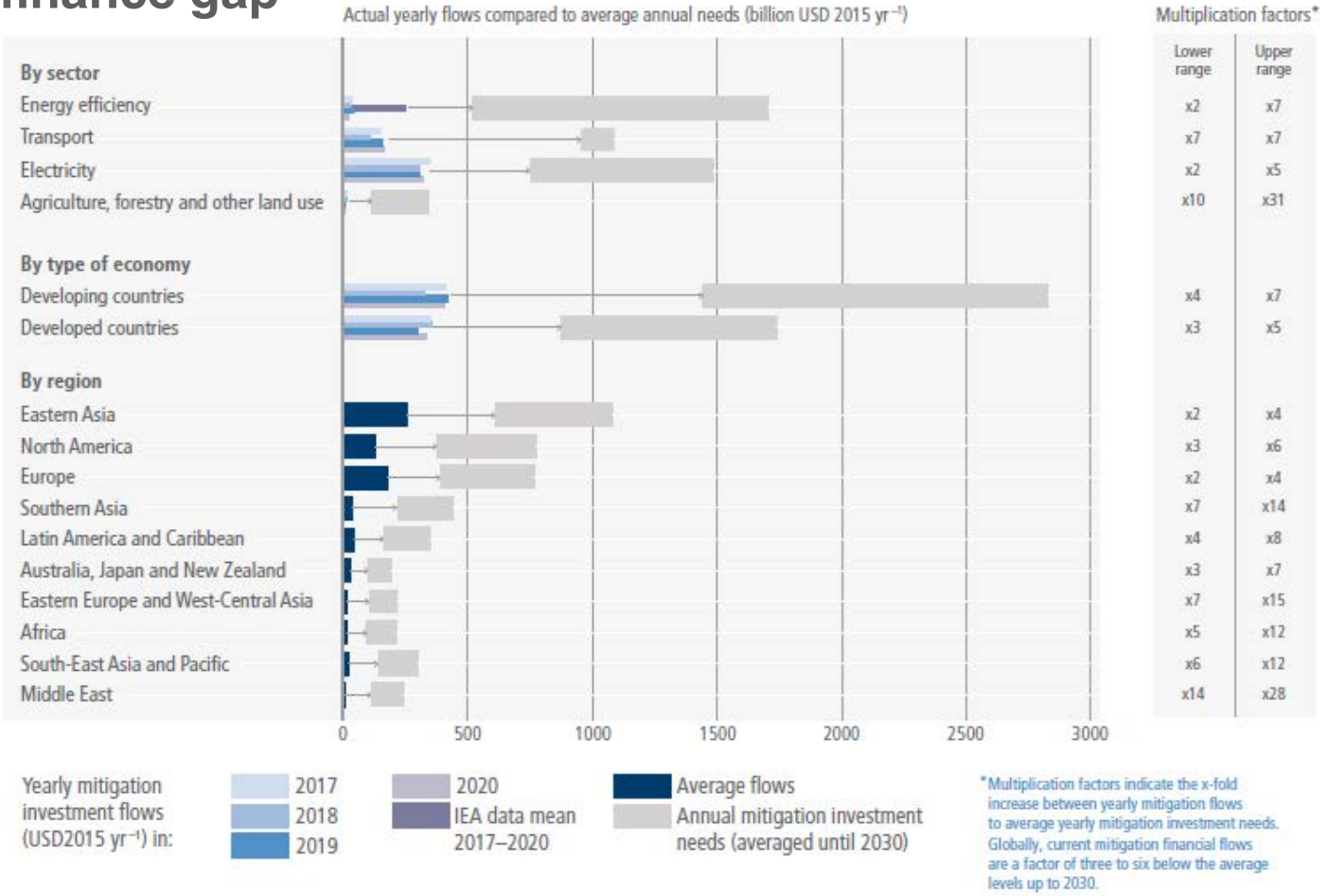
- regulatory and economic instruments have **already proven effective** in reducing emissions
- **policy packages** and **economy-wide packages** are able to achieve **systemic change**
- ambitious and effective mitigation requires **coordination across government** and society

[World Bank/Simone D. McCourtie, Dominic Chavez CC BY-NC-ND 2.0, Trent Reeves/MTA Construction & Development CC BY 2.0, IMF Photo/Tamara Merino CC BY-NC-ND 2.0, Olga Delawrence/Unsplash.]

Mitigation, adaptation and finance

« Accelerated financial support for developing countries from developed countries and other sources is a critical enabler to enhance mitigation action and address inequities in access to finance, including its costs, terms and conditions, and economic vulnerability to climate change for developing countries (*high confidence*). Scaled-up public grants for mitigation and adaptation funding for vulnerable regions, especially in Sub-Saharan Africa, would be cost-effective and have high social returns in terms of access to basic energy » (WG2, SPM, E.5.3)

Climate finance gap



Source: AR6 WG3 Fig TS.25

SUSTAINABLE DEVELOPMENT GOALS

Low emission scenario

High emission scenario

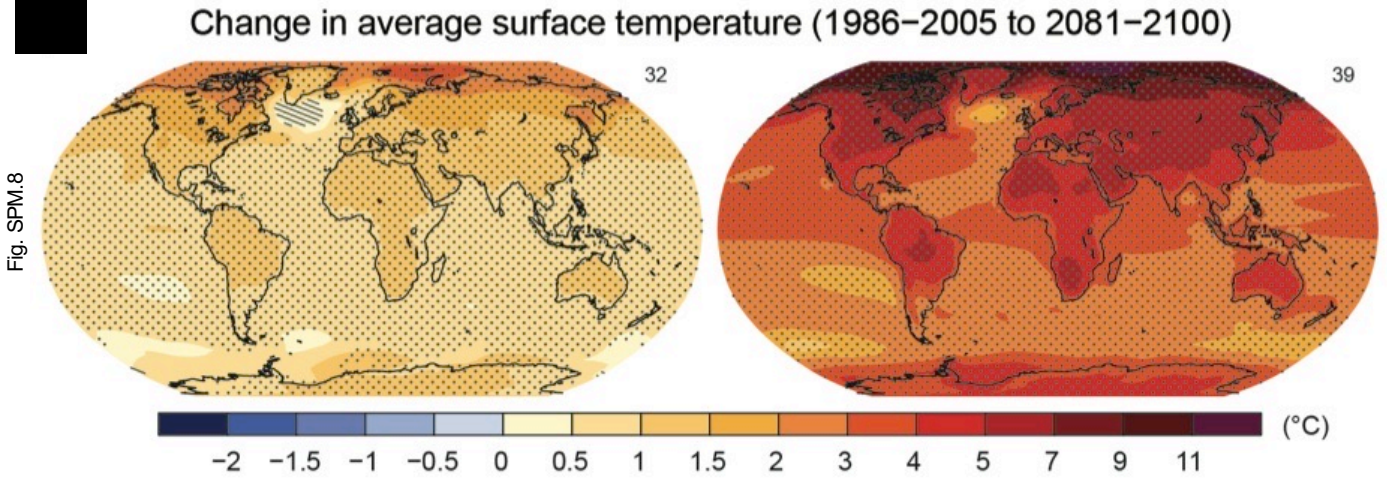
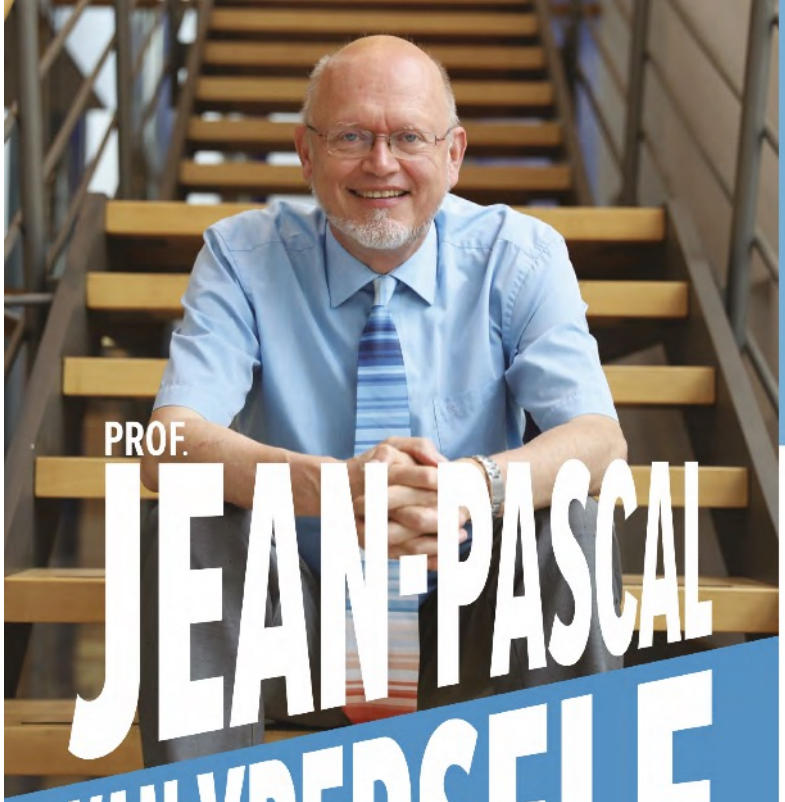


Fig. SPM.8

Humanity has the choice



PROF.

JEAN-PASCAL VAN YPERSELE

CANDIDATE FOR IPCC CHAIR

STANDING FOR

- IPCC as the global VOICE of climate
- Connecting solid science and the world's policy makers
- Delivering a more inclusive, dynamic, and relevant IPCC

UN SDGs
CLIMATE JUSTICE
A FAIR TRANSITION

With the official support of the Belgian Government

EXPERIENCE & ENERGY

- IPCC Vice-Chair (2008–2015) and active in IPCC since 1995
- 40 years experience in climate science and diplomacy
- Full professor of climate and sustainable development (UCLouvain)
- Global Sustainable Development Report 2019 co-author
- Lead Author for the Third Assessment Report
- High profile media commentator and spokesperson
- Strong track record of advocacy, chairing, and partnerships
- An award-winning science communicator

READY TO REPRESENT

- Global North AND South
- Interdisciplinary science AND policy making
- People, science, AND decisive action

Image on reverse © Kiara Worth

Highly experienced global player from the first Rio Summit in '92 through to the latest COP via a wide range of working groups, task forces, and scientific conferences.

More information www.climate.be/vanyp @JPvanYpersele

#IPCCvoiceOfClimate

旨在

- 让IPCC成为关注气候的全球倡议方
- 为全球政策制定者提供可靠的科学知识
- 让IPCC更具包容性，不断发展，目标更为明确

联合国可持续发展目标

气候正义

合理过渡

得到比利时政府的官方支持

经验和成就

- IPCC副主席（2008-2015年），自1995年一直从事相关工作
- 在气候科学和外交方面有40年的经验
- 气候和可持续发展的全职教授（鲁汶天主教大学）
- 《2019年全球可持续发展报告》共同作者
- 《第三次评估报告》的主要作者
- 知名媒体评论员和发言人
- 在倡议、主持工作和伙伴关系方面拥有丰富经验
- 屡获殊荣的科学交流人员

愿在如下领域开展工作

- 代表全球北方和南方
- 跨学科的科学和政策制定
- 人员、科学和决定性的行动

自92年的首次里约峰会到最近召开的联合国气候变化大会，参加各个工作组、工作团队和科学会议，在全球范围内发挥了重要作用，拥有丰富的经验。

更多信息请前往： www.climate.be/vanyp @JPvanYpersele

#IPCCvoiceOfClimate

Key aspects of my IPCC Chair candidacy

1. The IPCC must be the most scientifically solid « Voice of Climate » at the international level

2. The IPCC must become even more useful for policy- and decision-makers, while staying policy-neutral

Key aspects of my IPCC Chair candidacy

3. The IPCC must be inclusive (gender balance, developing countries participation…), respectful of all people and cultures, open to more disciplines and more interdisciplinarity, and help train more young scientists into the IPCC process

4. IPCC procedures & products need to be updated to respond better to the new needs of UNFCCC and others

To go further :

- www.climate.be/vanyp : my slides (under « conferences »)
- www.ipcc.ch : IPCC
- www.realclimate.org : answers to the merchants of doubt arguments
- www.skepticalscience.com : same
- www.plateforme-wallonne-giec.be : IPCC-related in French, Newsletter, latest on climate, basic climate science
- **Twitter: @JPvanYpersele & @IPCC_CH**