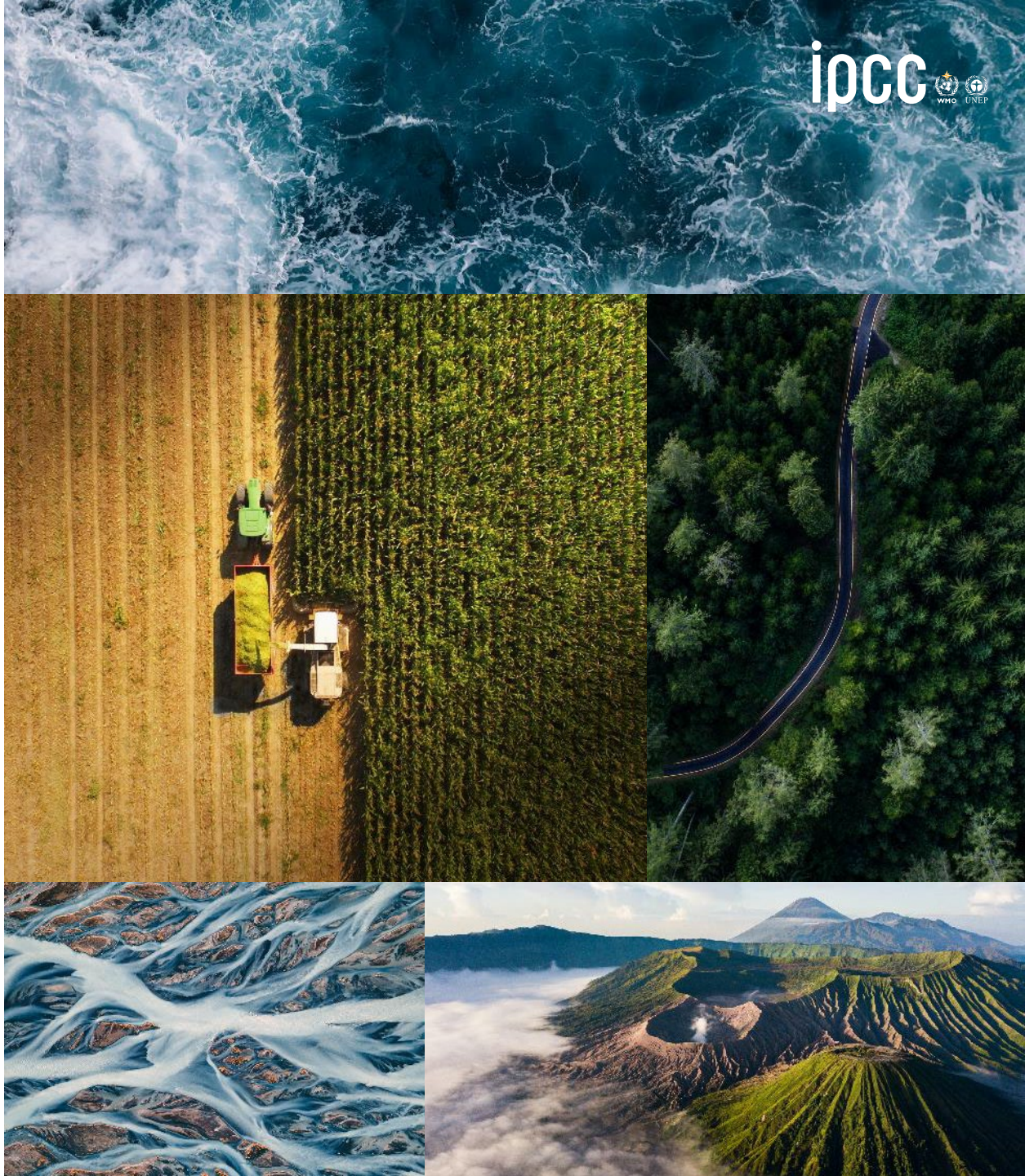
Sixth Assessment Report

WORKING GROUP III — MITIGATION OF CLIMATE CHANGE

AR6 IPCC
Mitigation
Solutions to the climate crisis

Latin America and the Caribbean



Publication of the 6th IPCC Cycle Reports

WG I - A red alert for humanity.

WG II - An atlas of human suffering.

WG III - A litany of broken climate promises.

The jury has reached a verdict. And it is damning. I

t's a file of shame.

We are on the fast track to climate disaster.

Report by numbers

278 Authors

65 Countries

41 % Developing countries
59 % Developed countries

354 Contributing authors

29 % Women / 71 % Men

More than 18,000 scientific papers

59,212 Review comments

What's new?

Updated assessment of global mitigation progress and commitments.

- The report assesses the evolution of emission reduction and mitigation efforts (accepted for publication until October 11, 2021).
- Although policies and actions are assessed over the longer term than major commitments.
- Assessment of the impact of national climate commitments against long-term emissions targets.

What's new?

- **New chapter on the social aspects of mitigation.**
- The "demand side": what drives consumption and greenhouse gas emissions.
- It links to the sectoral chapters of the report, which explore the "supply side" of climate change, i.e., what produces emissions.

- **Mitigation and sustainable development.**
- Climate change mitigation in the context of sustainable development,
- Assessment of risks and co-benefits.

What's new?

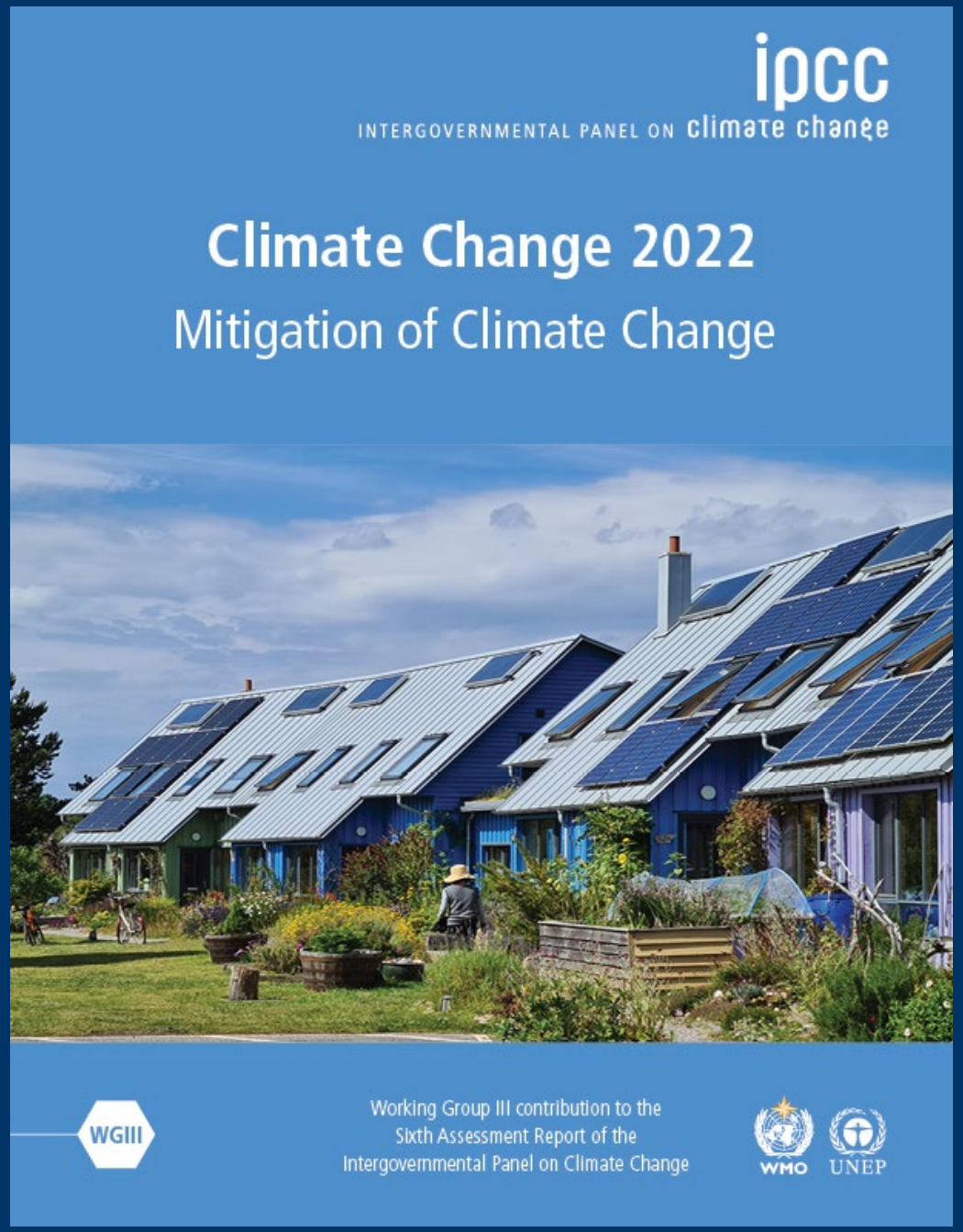
- **Cross-sectoral mitigation opportunities.**
- The report explores mitigation options that span several sectors, including carbon dioxide removal techniques.

- **New chapter on innovation, technology development and transfer.**
- Describes how a well-established innovation system at the national level, guided by well-designed policies, can contribute to:
- mitigation, adaptation and the achievement of sustainable development goals, while avoiding unintended consequences.

What's new?

- **Linkages and trade-offs between mitigation and adaptation.**
- The report highlights synergies and trade-offs between climate change mitigation and adaptation, making links to the WGIII report on adaptation (published in February 2022).
- **New scenarios** exploring the possibility of further reduction of GHG emissions in 2030 and 2040 to reduce the likelihood of temporarily exceeding warming limits.

- **Leading to less reliance on negative net CO_2 emissions** by reversing warming in the second half of the century.



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

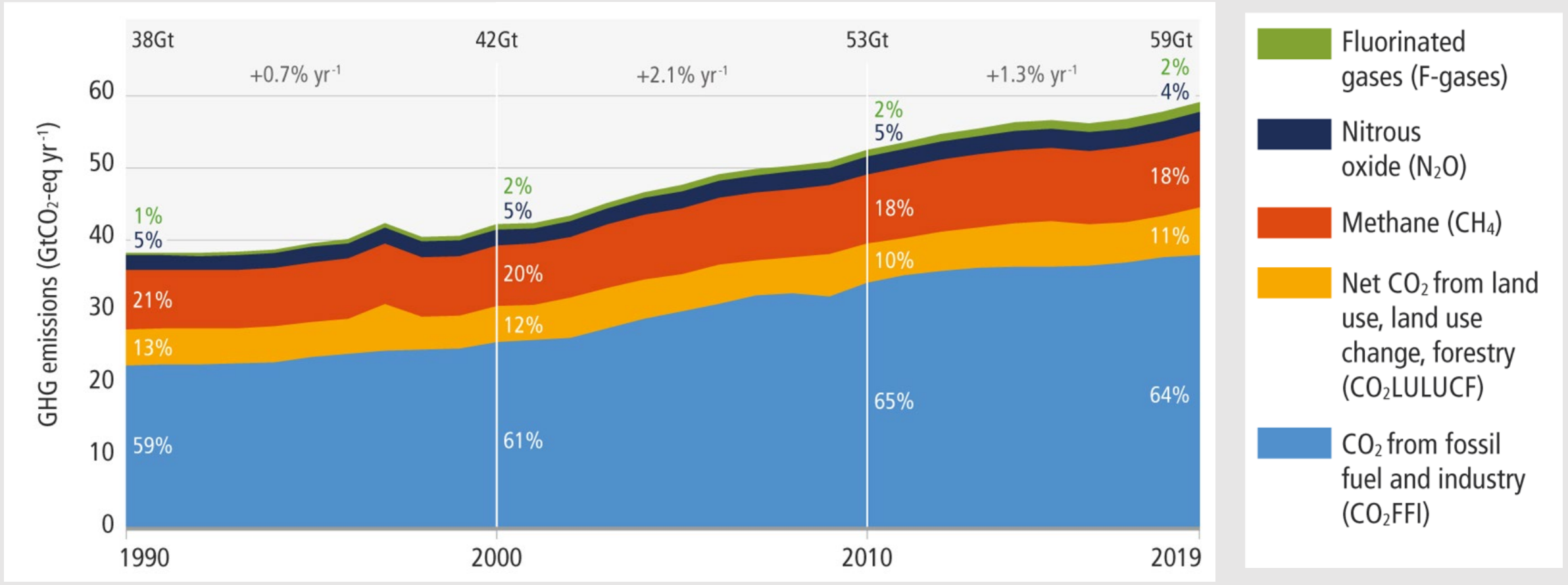
ipcc

2010-2019

Average annual greenhouse gas emissions at highest levels in human history

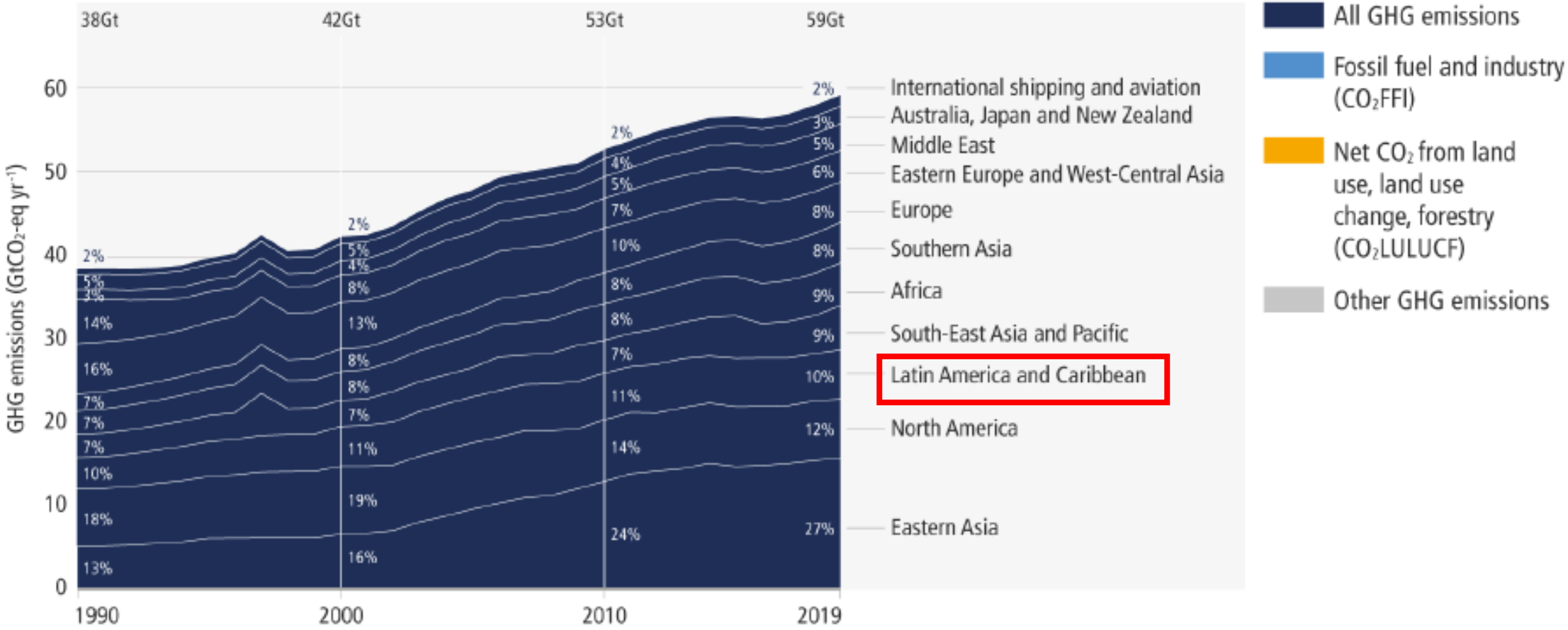
However, the growth rate between 2010 and 2019 was lower than that recorded between 2000 and 2009.

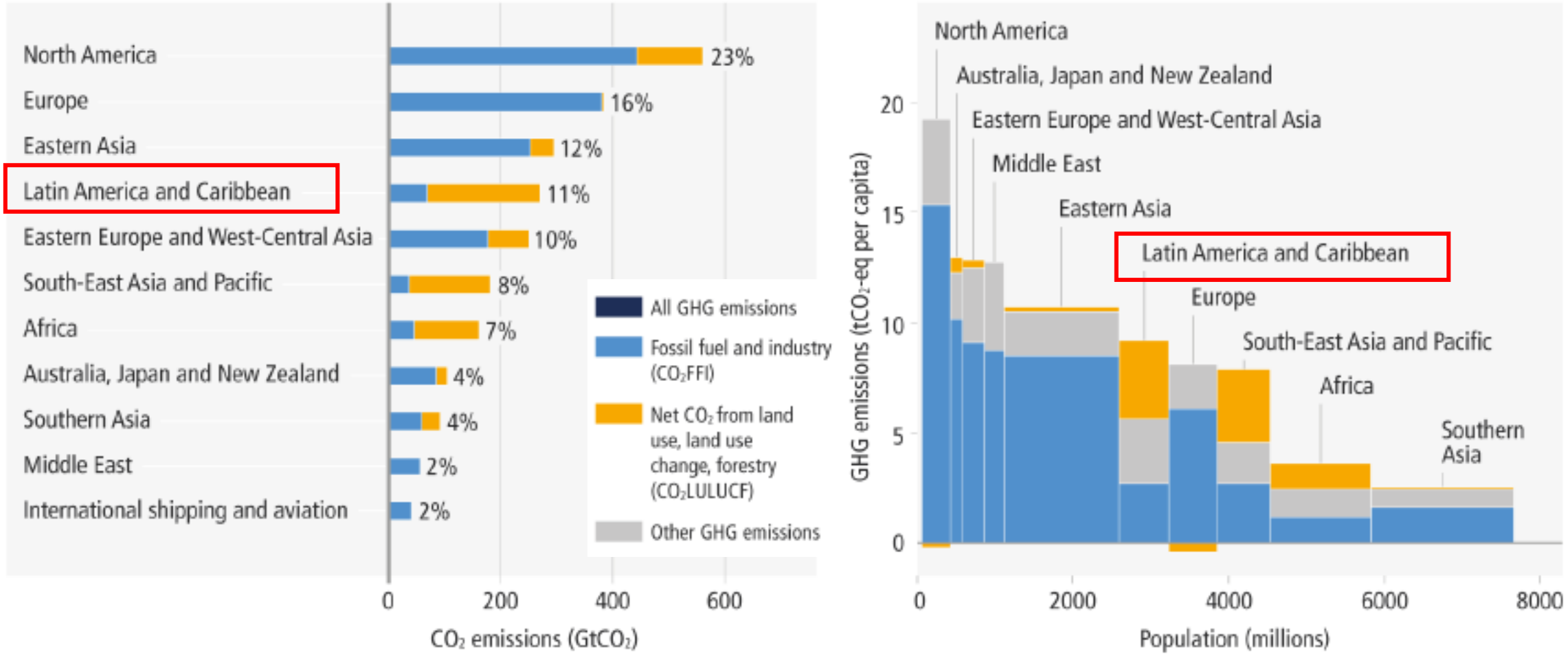
We are not on track to limit warming to 1.5 °C.



Emissions have grown in most regions but are distributed unevenly, both in the present day and cumulatively since 1850.

a. Global net anthropogenic GHG emissions by region (1990–2019)




b. Historical cumulative net anthropogenic CO_2 emissions per region (1850–2019)
North America
Europe
Eastern Asia
Latin America and Caribbean
Eastern Europe and West-Central Asia
South-East Asia and Pacific
Africa
Australia, Japan and New Zealand
Southern Asia
Middle East
International shipping and aviation
23%
16%
12%
11%
10%
8%
7%
4%
4%
2%
2%
All GHG emissions
Fossil fuel and industry (CO_2FFI)
Net CO_2 from land use, land use change, forestry (CO_2LULUCF)
Other GHG emissions
0
200
400
600
CO_2 emissions ($GtCO_2$)
c. Net anthropogenic GHG emissions per capita and for total population, per region (2019)
North America
Australia, Japan and New Zealand
Eastern Europe and West-Central Asia
Middle East
Eastern Asia
Latin America and Caribbean
Europe
South-East Asia and Pacific
Africa
Southern Asia
GHG emissions (tCO_2-eq per capita)
0
5
10
15
20
0
2000
4000
6000
8000
Population (millions)

d. Regional indicators (2019) and regional production vs consumption accounting (2018)

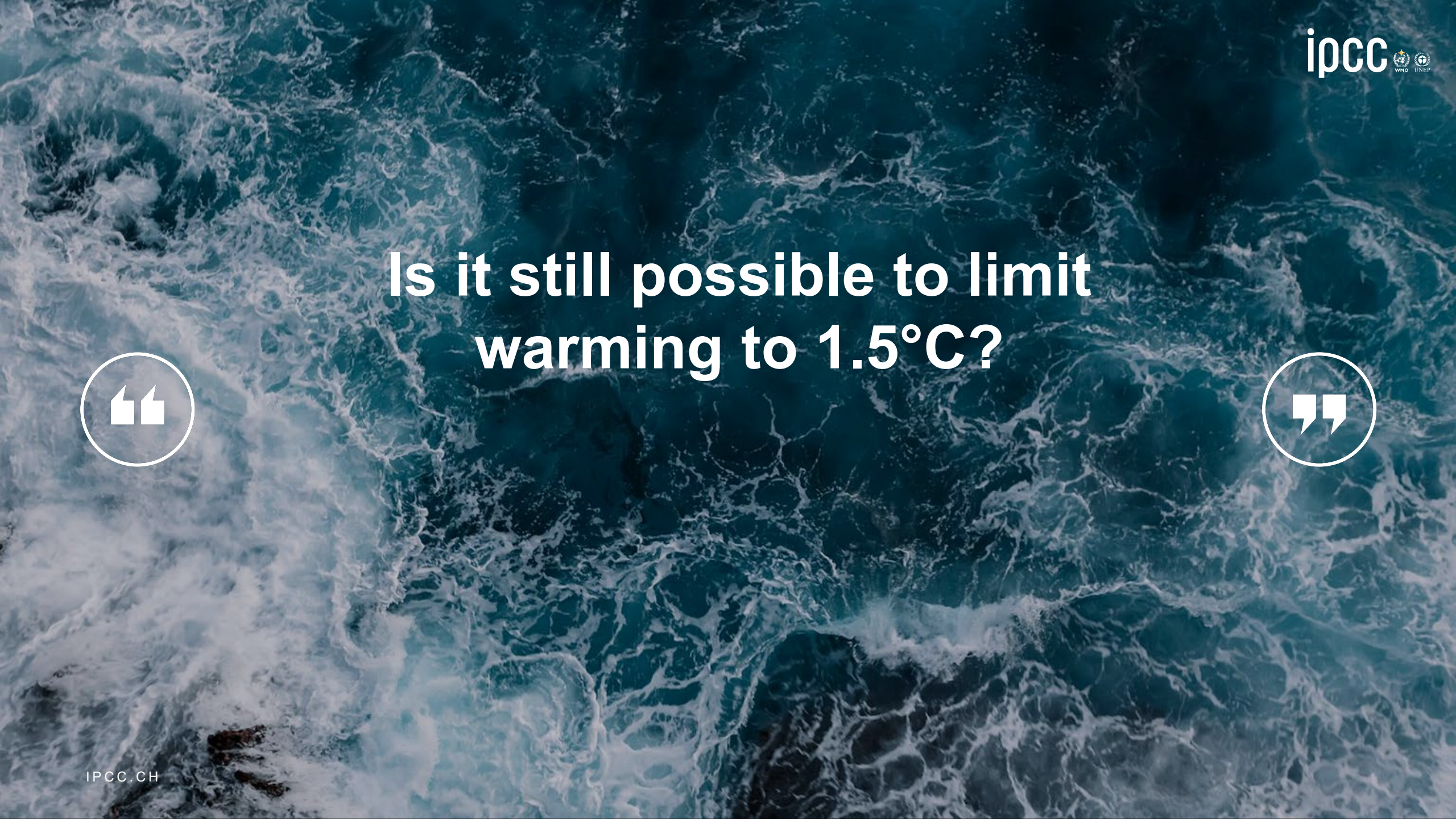
	Africa	Australia, Japan, New Zealand	Eastern Asia	Eastern Europe, West-Central Asia	Europe	Latin America and Caribbean	Middle East	North America	South-East Asia and Pacific	Southern Asia
Population (million persons, 2019)	1292	157	1471	291	620	646	252	366	674	1836
GDP per capita (USD1000$_{ppp}$2017 per person)[1]	5.0	43	17	20	43	15	20	61	12	6.2
Net GHG 2019[2] (production basis)										
% GHG contributions	9%	3%	27%	6%	8%	10%	5%	12%	9%	8%
GHG emissions intensity (tCO_2-eq / USD1000$_{ppp}$ 2017)	0.78	0.30	0.62	0.64	0.18	0.61	0.64	0.31	0.65	0.42
GHG per capita (tCO_2-eq per person)	3.9	13	11	13	7.8	9.2	13	19	7.9	2.6
CO_2FFI, 2018, per person										
Production-based emissions (tCO_2FFI per person, based on 2018 data)	1.2	10	8.4	9.2	6.5	2.8	8.7	16	2.6	1.6
Consumption-based emissions (tCO_2FFI per person, based on 2018 data)	0.84	11	6.7	6.2	7.8	2.8	7.6	17	2.5	1.5

[1] GDP per capita in 2019 in USD2017 currency purchasing power basis.
[2] Includes CO_2FFI, CO_2LULUCF and Other GHGs, excluding international aviation and shipping.

The regional groupings used in this figure are for statistical purposes only and are described in Annex II, Part I.

The message is clear:

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


Is it still possible to limit warming to 1.5°C?

In the meantime,

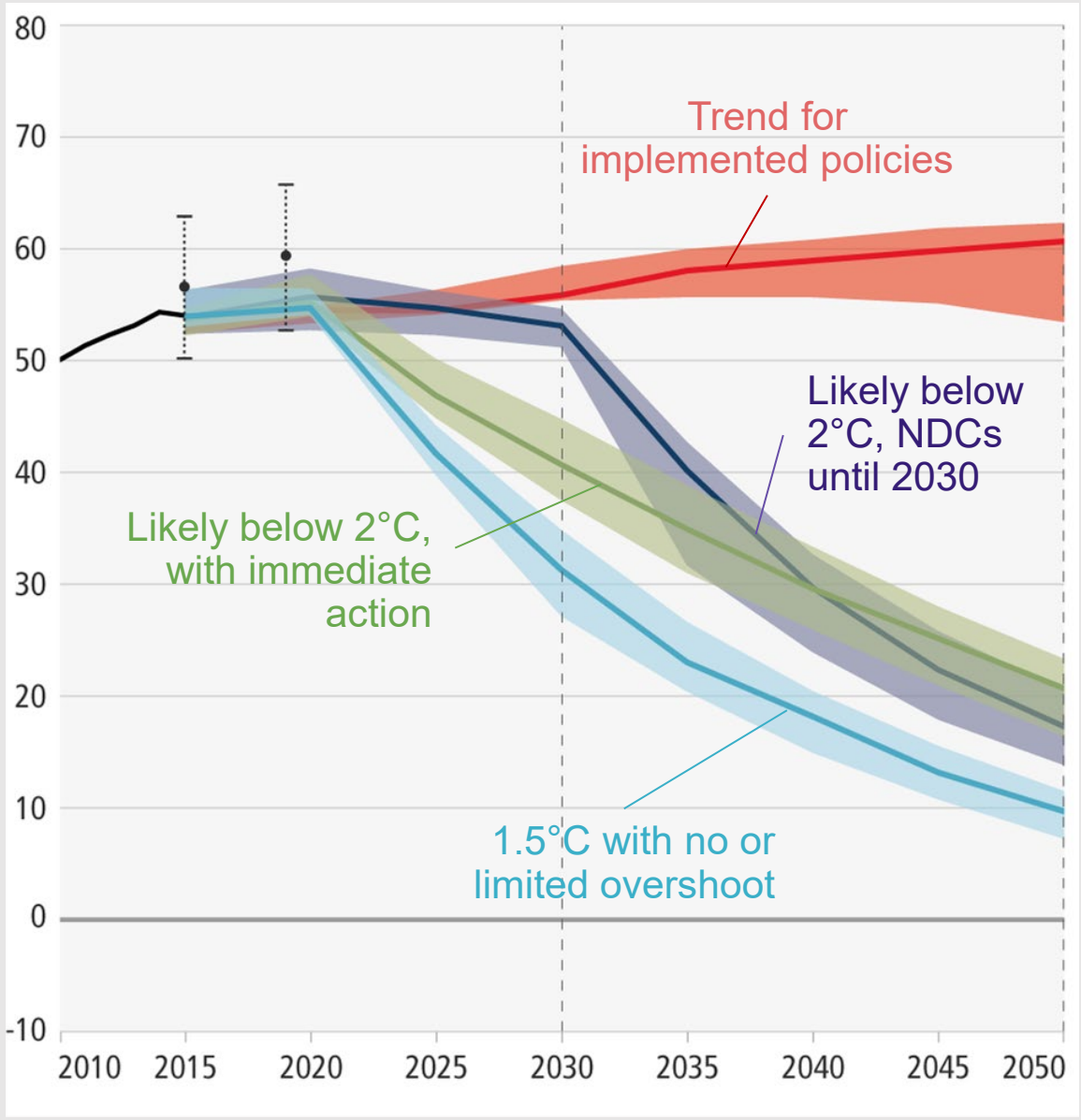
Models show that it is theoretically possible to limit warming to 1.5 °C.

But...

the current scale, scope and pace of the global action pledged for 2030 is not sufficient.

We are not on track!

AR6 WGIII, SPM



Limiting warming to 1.5 °C

- Global GHG emissions peak before 2025, reduced by 43% by 2030.
- Methane reduced by 34% by 2030

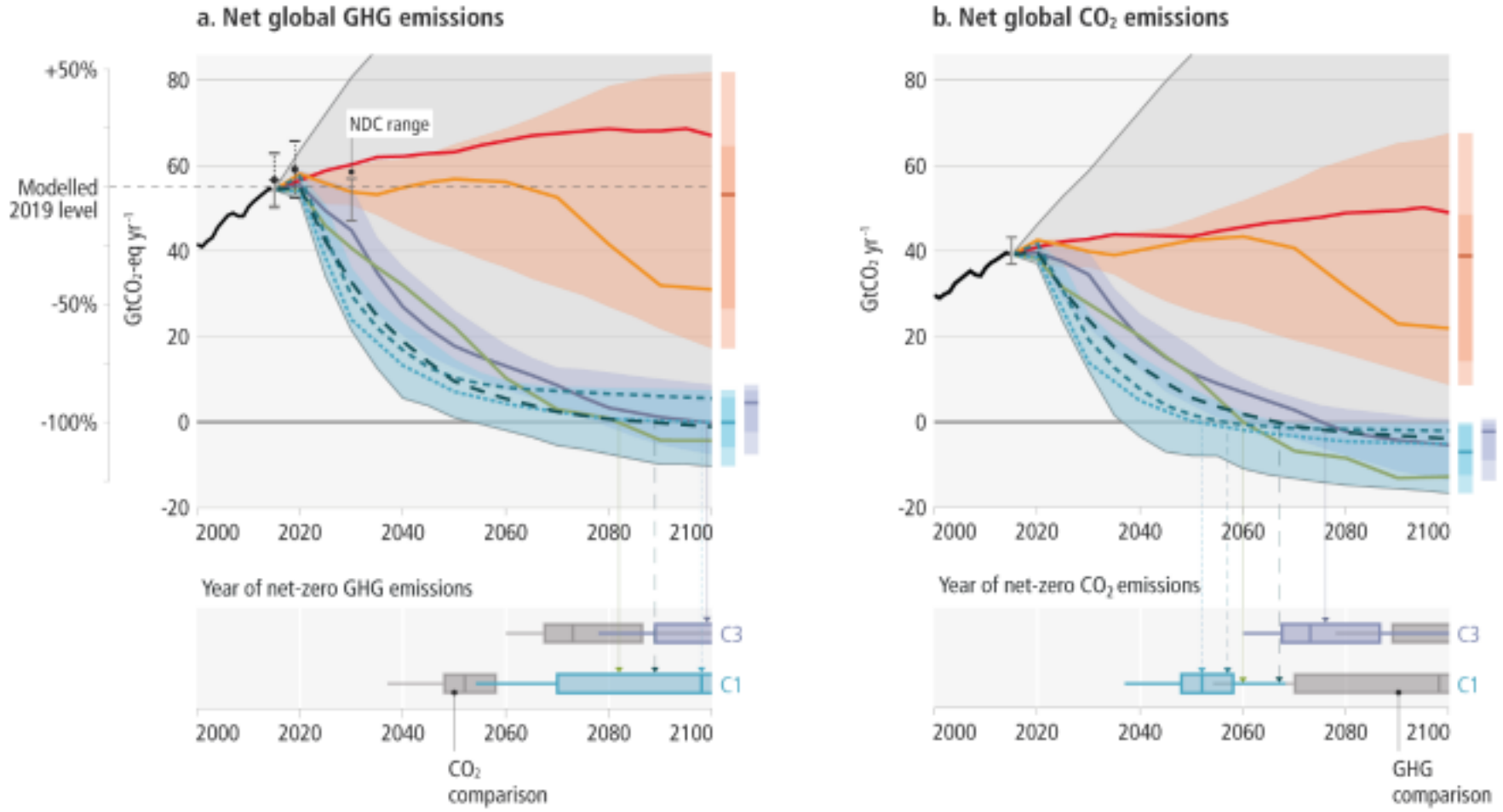
Limiting warming to around 2°C

- Global GHG emissions peak before 2025, reduced by 27% by 2030.

Current emission commitments are not sufficient to avoid a substantial increase of 1.5°C in global average temperature above pre-industrial levels by 2100.

(based on IPCC-assessed scenarios)

Modelled mitigation pathways that limit warming to 1.5°C, and 2°C, involve deep, rapid and sustained emissions reductions.



Overshoot:

a temporary, not permanent, increase in global average temperature above 1.5°C compared to pre-industrial levels.

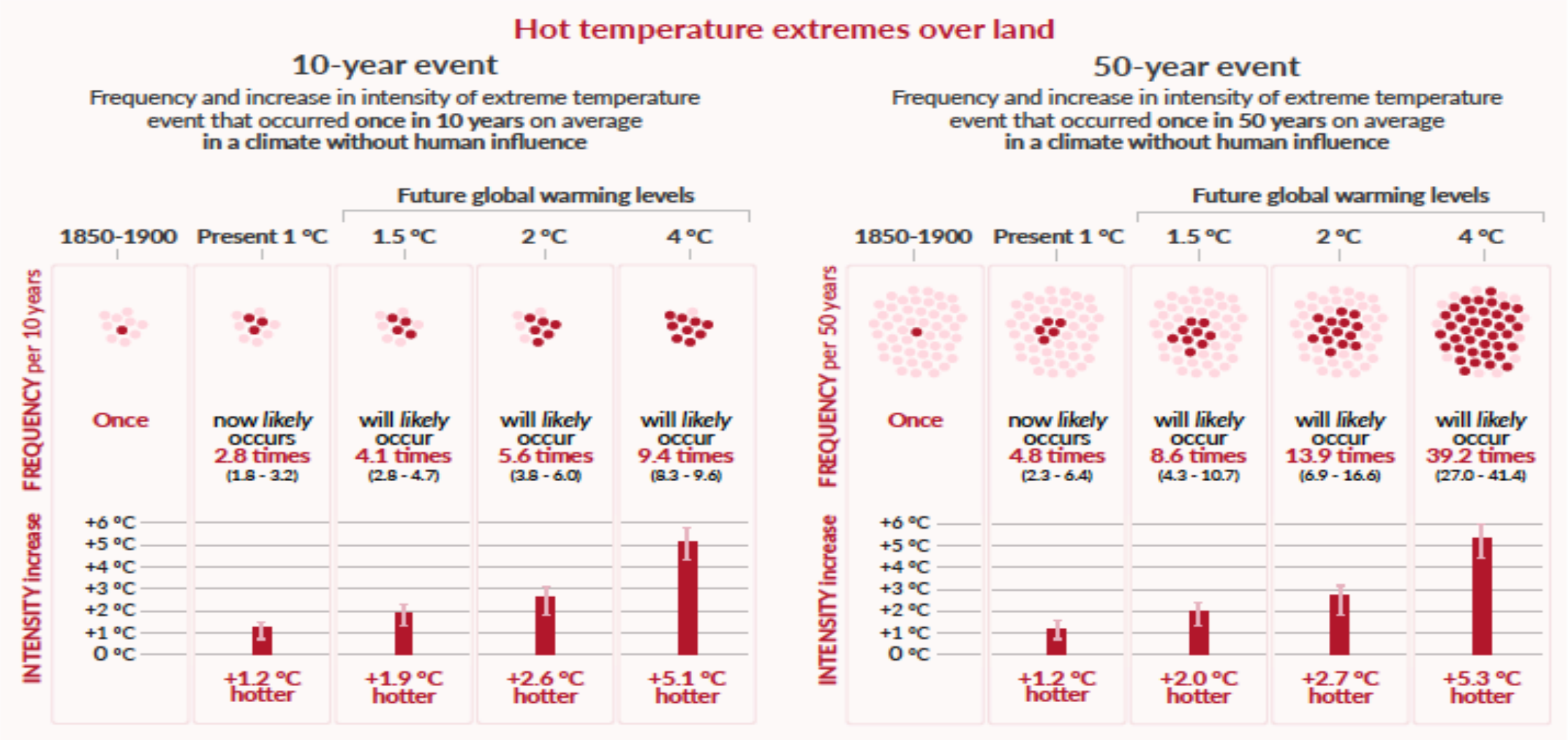
- In this context, 1.5 °C should be considered a long-term goal.
- **This means that 1.5 °C can be exceeded for several decades.**

But...

- This does not necessarily mean that 1.5°C has been exceeded definitively and permanently.

AR6 WGIII, SPM

Projected changes in extremes are larger in frequency and intensity with every additional increment of global warming



IPCC, AR6, WG I

- The report shows that a return to 1.5°C by the end of the century is possible (although extremely difficult).

How much can we exceed and still get back to 1.5°C?

- In fact, only a **sharp acceleration of global emissions reductions after 2030** would give us a good chance of staying below 2°C.

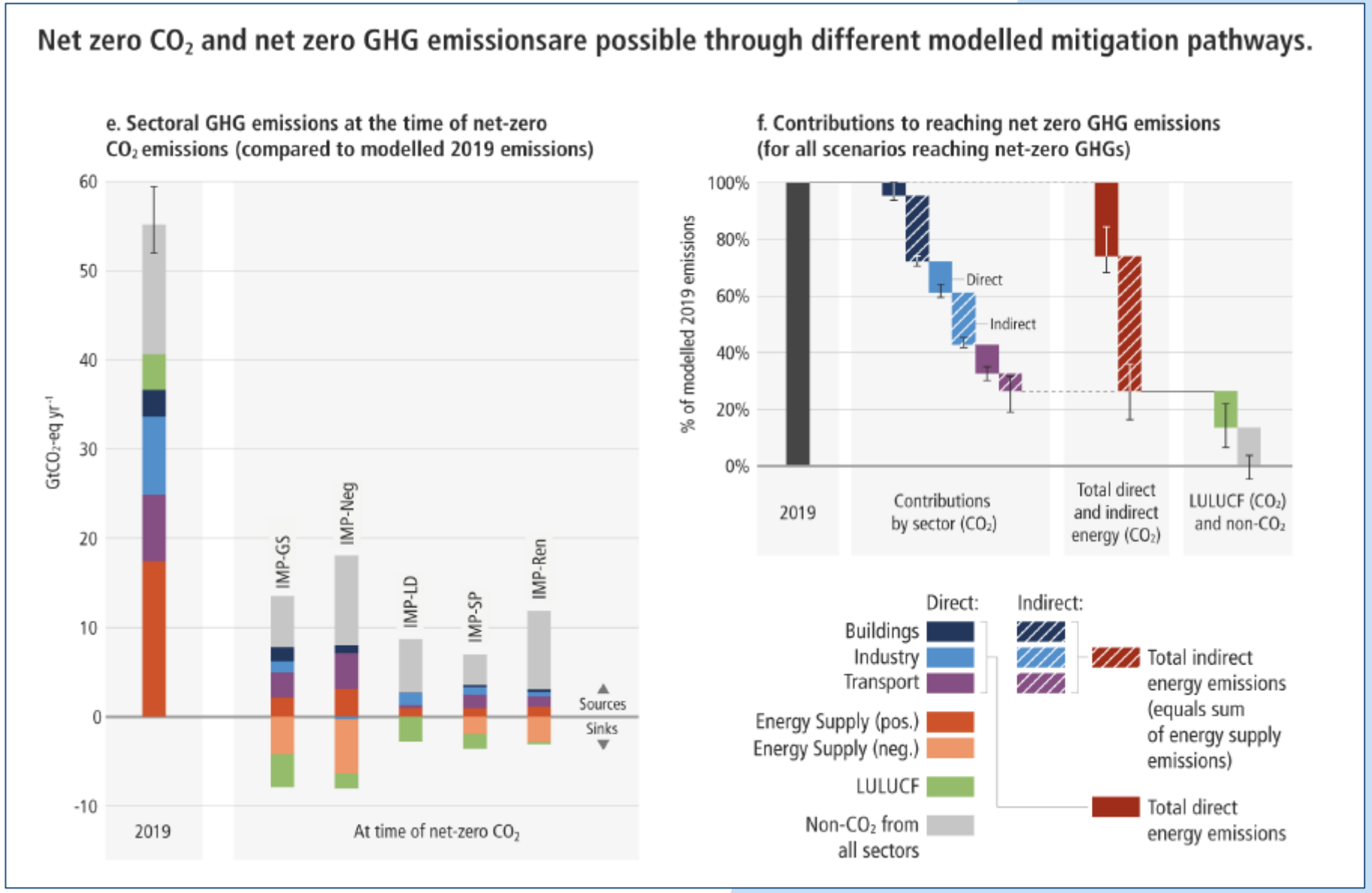


Figure SPM.5: Illustrative Mitigation Emissions Pathways (IMPs) and net zero CO_2 and GHG emissions strategies

Increased evidence of climate action

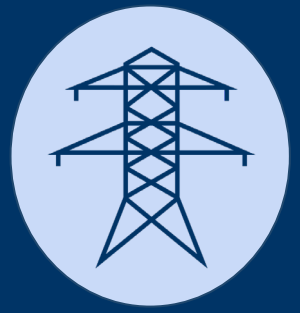
Some countries have achieved a **steady decrease** in emissions **consistent** with limiting warming to **2°C.**

Zero emissions targets have been adopted by at least **826 cities and 103 regions**

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

ipcc
INTERGOVERNMENTAL PANEL ON climate change
WMO UNEP

Demand and services



Energy

Land use

Industry

Urban

Buildings

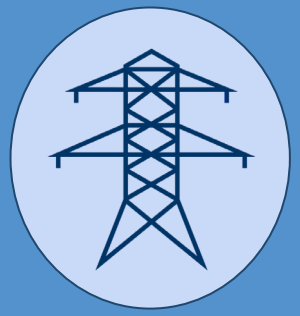
Transport

- **Options exist to reduce GHG emissions by about half of the 2019 level by 2030 at a cost of less than 100 USD tCO2-eq.**

- **Options costing less than 20 USD tCO2-eq constitute more than half of the potential by 2030.**

- **The monetary benefits of some options outweigh their costs.**

Demand and services



Energy

Land use

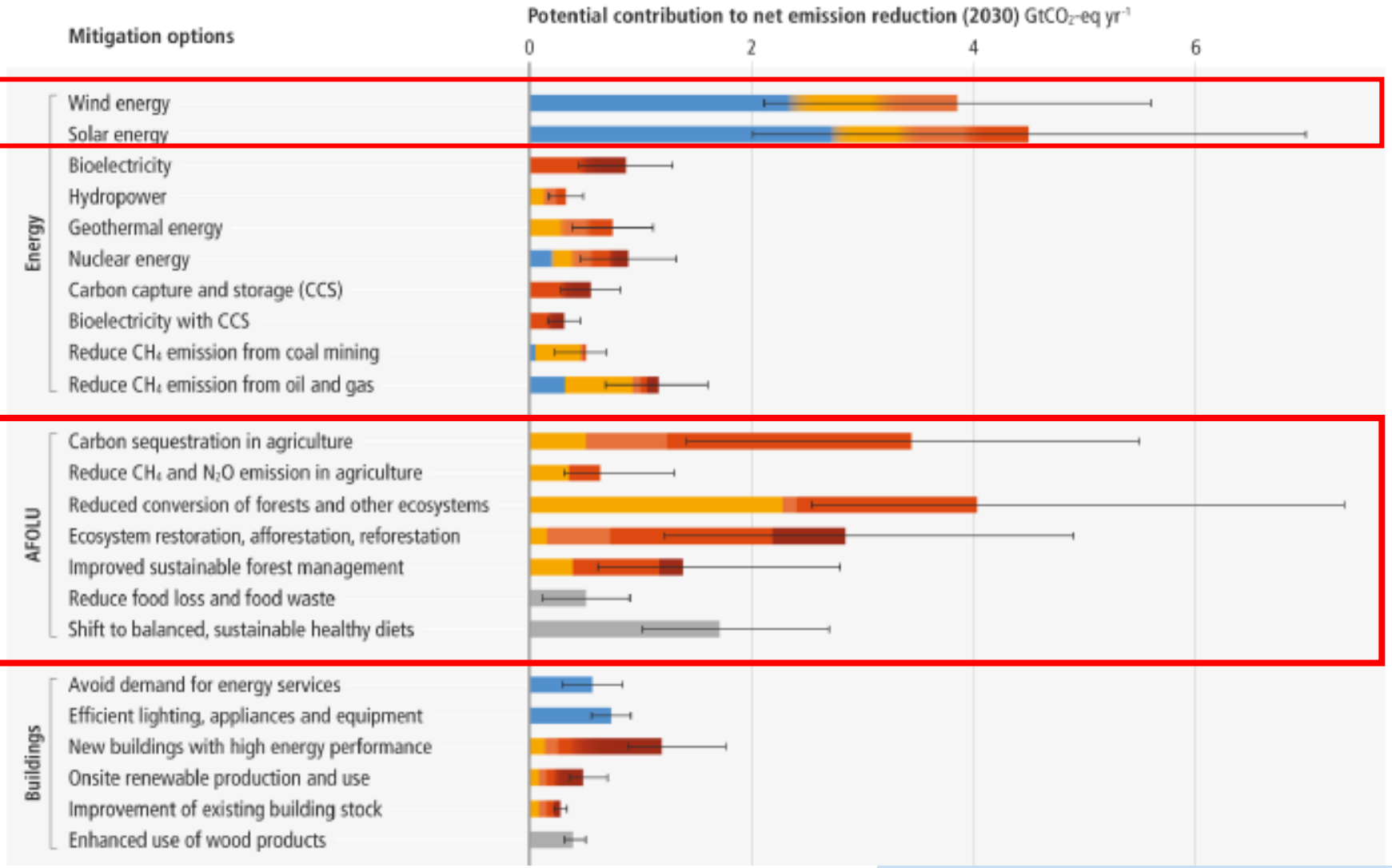
Industry

Urban

Buildings

Transport

Many options available now in all sectors are estimated to offer substantial potential to reduce net emissions by 2030. Relative potentials and costs will vary across countries and in the longer term compared to 2030.



Many options available now in all sectors are estimated to offer substantial potential to reduce net emissions by 2030. Relative potentials and costs will vary across countries and in the longer term compared to 2030.

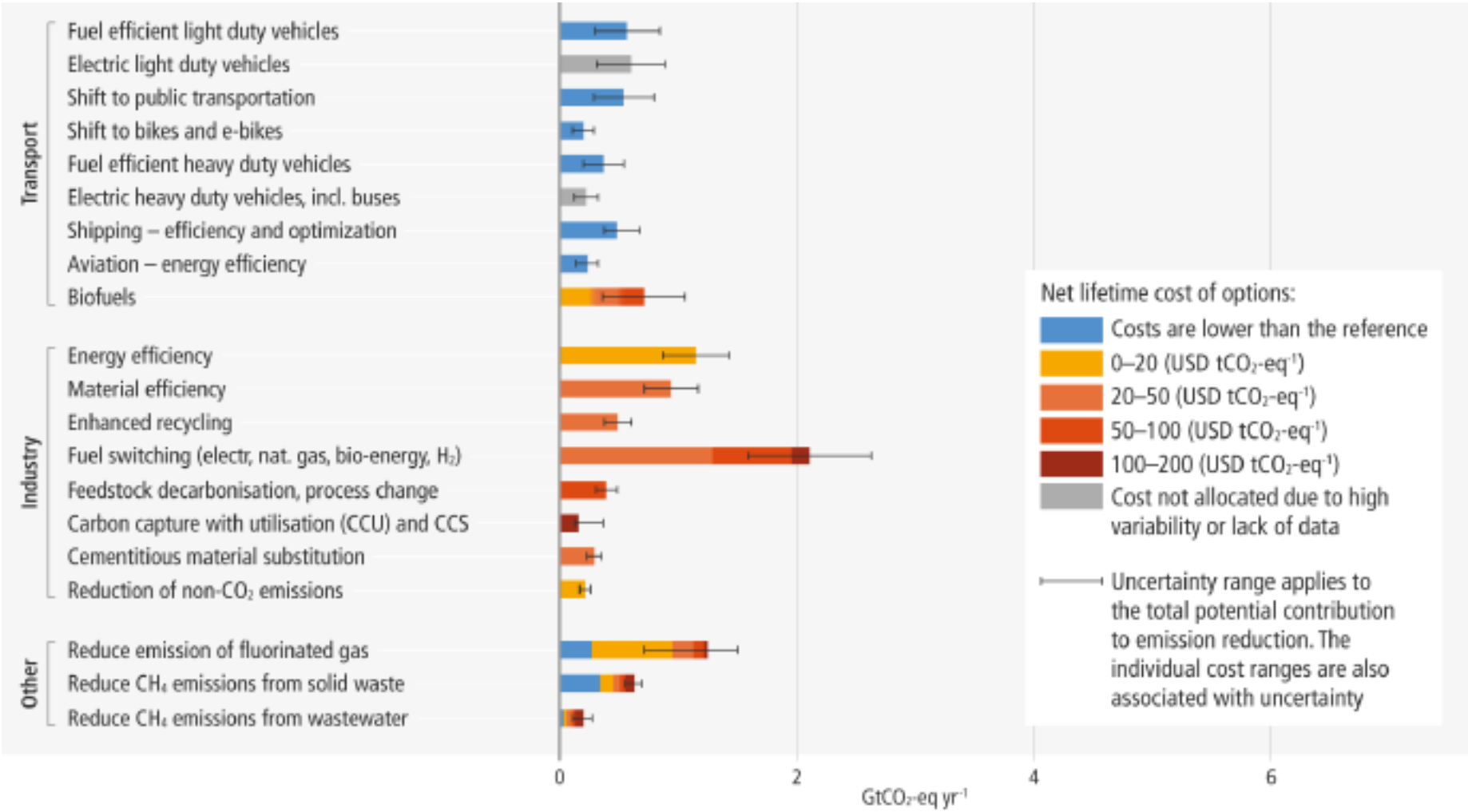
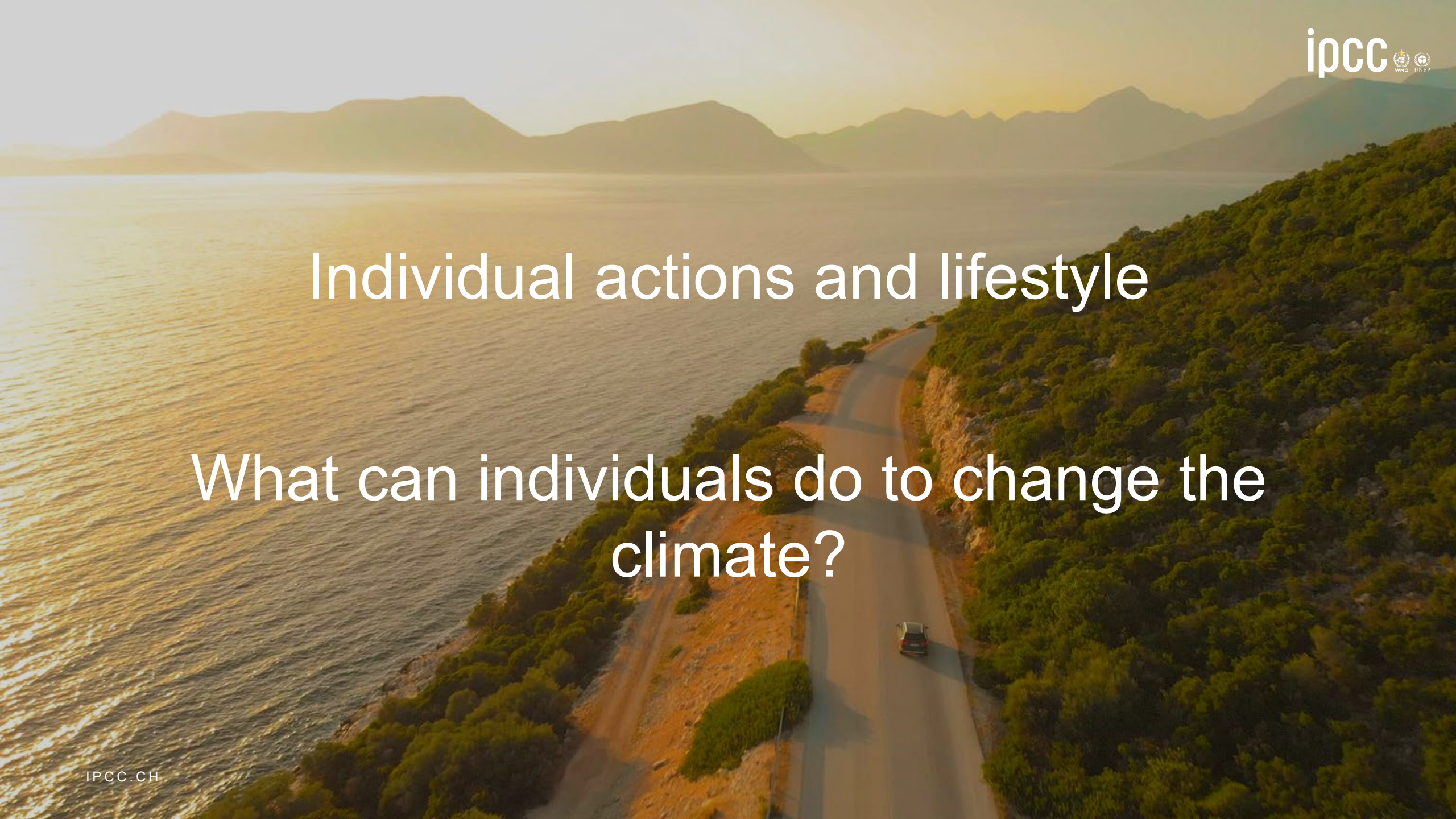


Figure SPM.7: Overview of mitigation options and their estimated ranges of costs and potentials in 2030.



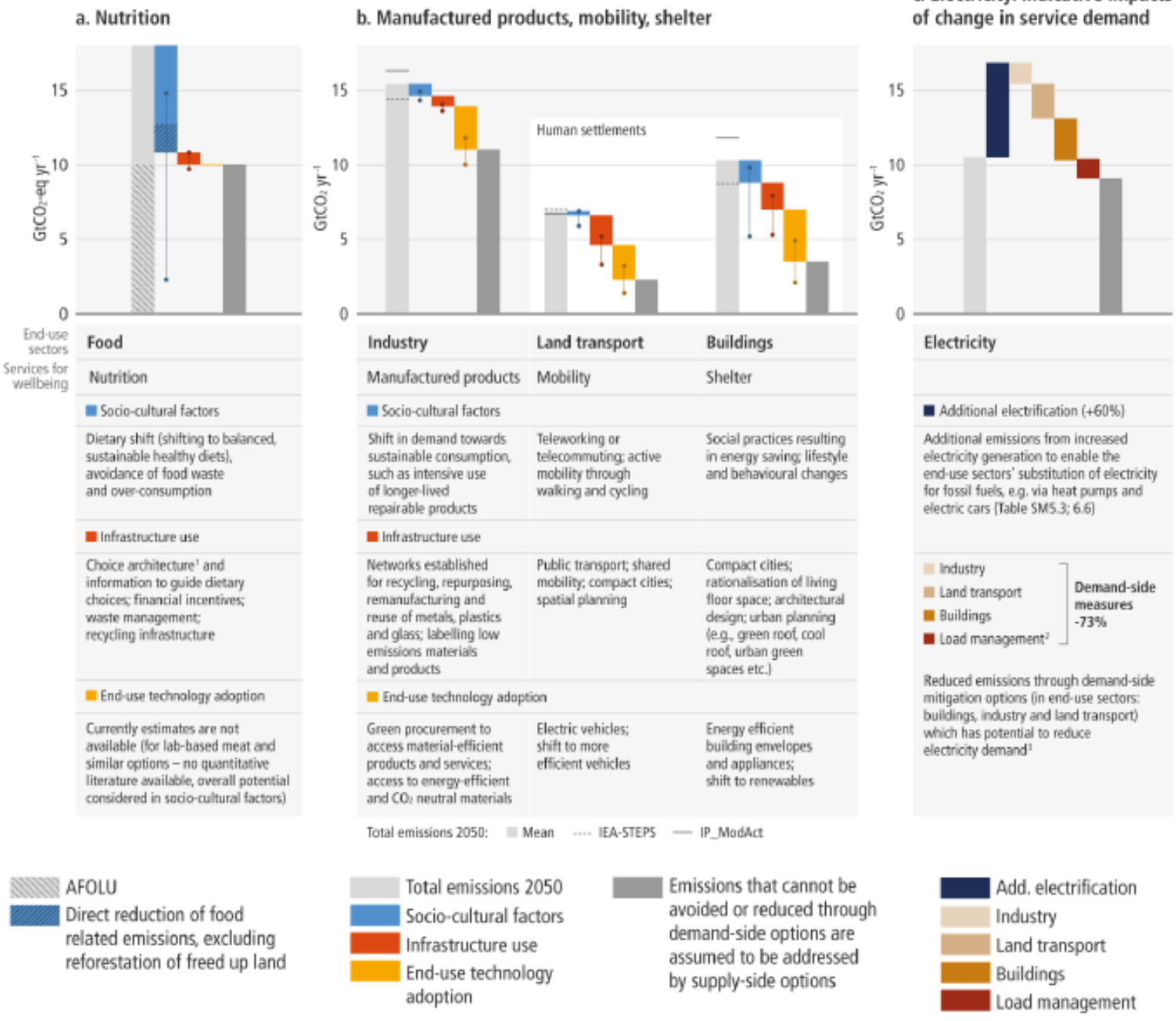
Individual actions and lifestyle

What can individuals do to change the climate?

Individual actions alone are not enough to address climate change, but they **can accelerate action**.

Changes in our lifestyle and behavior can reduce energy demand and our carbon **footprint if the infrastructure is already in place to encourage these changes.**

Demand-side mitigation can be achieved through changes in socio-cultural factors, infrastructure design and use, and end-use technology adoption by 2050.



- **Demand potential can be partially tapped in the short term**, making it an important category for immediate action when energy prices are high.

- **There is enormous untapped potential in the short term**:
- changes in transportation, industry, buildings and food that will make it easier for people to lead a **low-carbon lifestyle while improving their well-being.**

- Overall, socio-cultural factors supported by access to infrastructure and adoption of technologies have the **potential to enable GHG emission reductions of 40-70%.**

Strengthening the response

Financial flows

- Financial flows remain below the levels needed to meet mitigation targets in all sectors and regions.

- Scaling up mitigation finance flows can be supported by clear policy choices and signals from governments and the international community.

Financial flows: **3-6x lower** than levels needed **by 2030** to limit warming to below 1.5°C or 2°C

- there is **sufficient global capital** and liquidity to close investment gaps
- challenge of closing gaps is widest for **developing countries**

Strengthening the response
Financial flows

- Accelerating international financial cooperation is a key enabler of just and low greenhouse gas emission transitions,
- and can address inequalities in access to finance and costs and vulnerability to climate change impacts.

How to address climate change in a fair and equitable manner?

- Explicit attention to equity is essential for policies that address climate change to be effective and socially acceptable.
- In turn, social equity strengthens the ability to reduce emissions.

Global emissions are unequal

- Households with incomes in the top 10% contribute 36-45% of GHG emissions,
- while households with incomes in the bottom 50% contribute 13-15%.

Justice and Equity


ipcc
WMO
UNEP
JUST TRANSITIONS
Is it possible to reach net zero without destroying livelihoods?

Just Transition

Refers to:

- Processes and practices aimed at ensuring that no person, worker, place, sector, country or region is left behind as societies decarbonize,
- High-quality jobs in sufficient quantity in low-emission sectors.
- It implies respect and dignity for vulnerable groups, decent job creation, social protection, labor rights, equity in energy access and use, and democratic consultation.

Just Transition

The transformations needed to achieve net zero would mean:

- shifting employment from high-carbon to low-carbon sectors, on a global scale and
- even at the local level in carbon-intensive regions.
- While some jobs may be lost, a low-carbon response may also create more durable jobs.

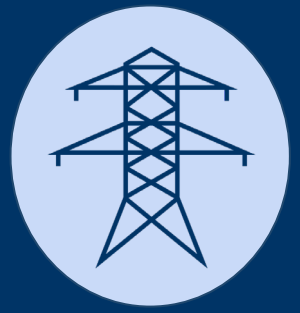
Just Transition in the context of land



Agriculture, Forests and Other Land Uses (AFOLU):

The sector contributes 22% of global emissions, but can provide large-scale emissions reductions and remove and store CO_2 at scale

Demand and services



Energy

Land use

Industry

Urban

Buildings

Transport

AFOLU mitigation - Between 2020 and 2050:

- Economic mitigation potential of AFOLU options - **8-14 GtCO2-eq yr-1.**
- **30-50% of this potential is available at less than USD20/tCO2-eq**.
- Largest share of the economic AFOLU mitigation measures **in forests and other natural ecosystems**,
- followed by **agriculture and demand-side** measures

Mitigation investment gaps are widest for the AFOLU sector in relative terms and for developing countries.

Synergies of Mitigation and Adaptation - AFOLU

Diversification of production systems

- Crop diversification
- Multi-species plantation forestry
- Regeneration of native species

Integration of production systems

- Crop/livestock
- Agroforestry
- Promotion of legumes in crop rotations
- Adoption of short-rotation commercial species

Management practices and technologies

- Soil, nutrient and water conservation practices
- High quality seeds,
- avoiding burning of crop residues

Ecosystem conservation and restoration

- Forest Conservation
- Protected Area Management
- Afforestation and reforestation
- Control of wildfires




Carbon Dioxide Removal

- required to **counterbalance hard-to-eliminate** emissions
- through **biological** methods: reforestation, and soil carbon sequestration
- **new technologies** require more **research**, up-front **investment**, and proof of concept at **larger scales**
- **essential** to **achieve net zero**
- **agreed methods** for measuring, reporting and verification required

[Forest Service Northern Region CC BY 2.0, Fiston Wasanga/CIFOR CC BY-NC-ND 2.0, Climeworks]



Agriculture, Forestry and Other Land Use is a unique sector

- The world depends on land for providing food, timber and many other ecosystem services – so there is competition for land for climate mitigation
- Competing demands have to be **carefully managed.**
  - Land use decisions are often spread across a wide range of landowners in diverse contexts.
  - Importance of governance that emphasizes integrated land use planning and management, framed by the **Sustainable Development Goals**.

Large land transitions pose profound challenges for sustainable development

Ecosystem services

Food and water security

Biodiversity

Livelihoods

Land cover
Land use change

Sustainable Development

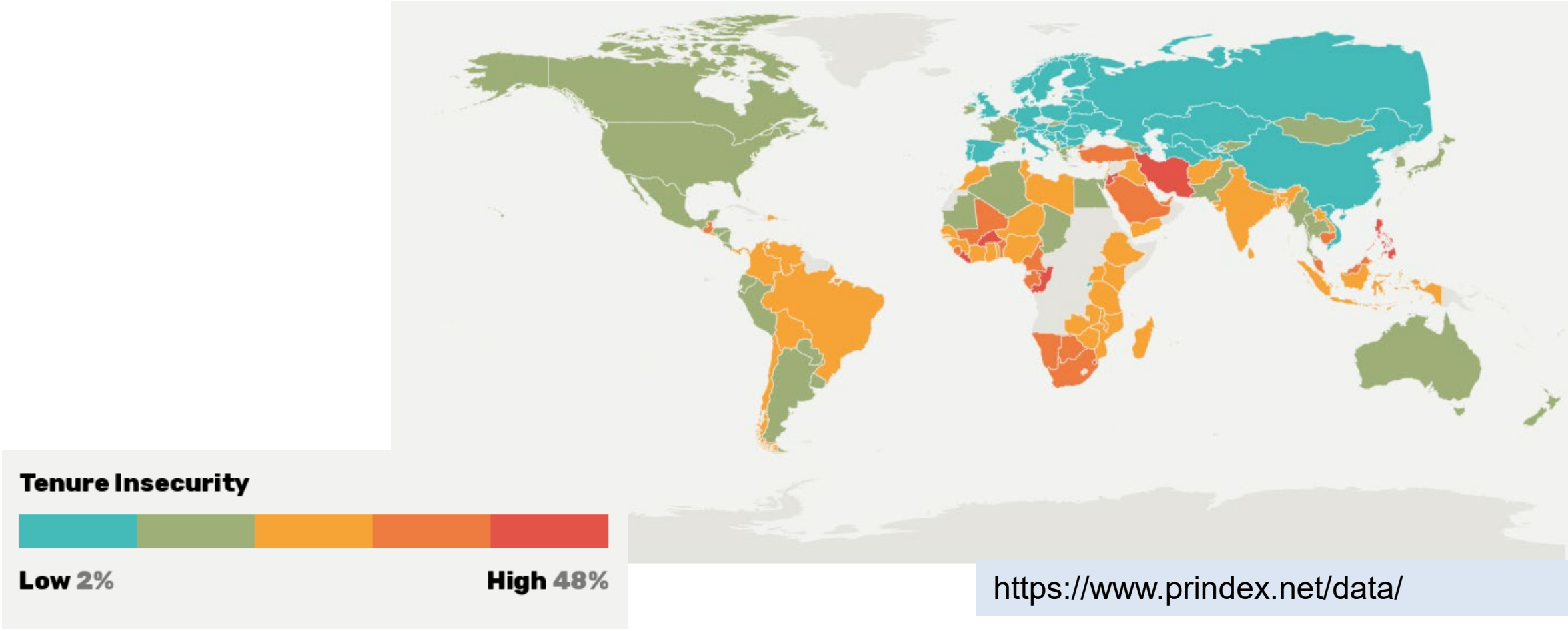
Tenure security and SDGs

The need for strengthened tenure security features prominently in the Sustainable Development Goals (SDGs).

SDG Indicator 1.4.2

Tenure security is partly a matter of perception and experience as much as a legal issue.

Tenure insecurity - Almost 1 billion people fear eviction worldwide



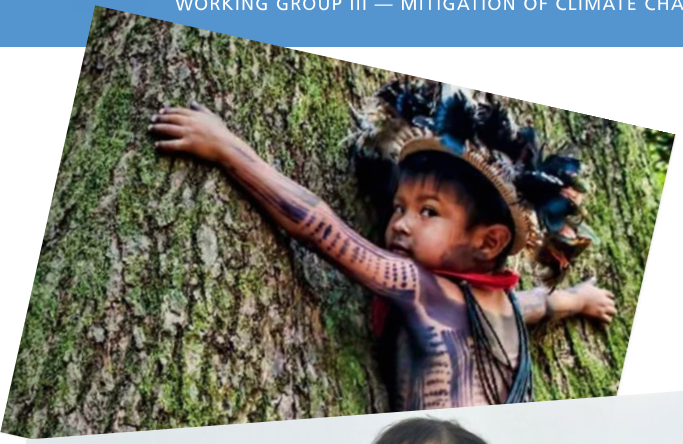
https://www.prindex.net/data/

Men and women experience different causes of tenure insecurity

- Women's tenure insecurity often originates from within the home or community.
- Men are more likely to worry about external threats like government expropriation or land grabbing.

https://www.prindex.net/data/

Photograph: Redux / Hollandse Hoogte / Arie Kievit



Realizing the potential of the sector

Knowledge, experience, and respect for the rights of **Indigenous Peoples and local communities** are crucial for land-based mitigation.

Globally, indigenous peoples account for only 5% of the population, but they protect and care for:

~ 22% of the Earth's surface,
80% of the remaining biodiversity
90% of the planet's cultural diversity

They are also among the poorest and most socially excluded in the world.

Latin America and Caribbean

Forests cover more than 80% of the area occupied by indigenous peoples (330 million hectares) which points to their critical role for forest governance.

Photo by gustavofrazao/ iStock / Getty Images Plus

Land is more than a commodity.
It is tied to cultural heritage and identity.

It is key to the sense of dignity and wellbeing.

Realizing the potential of the sector

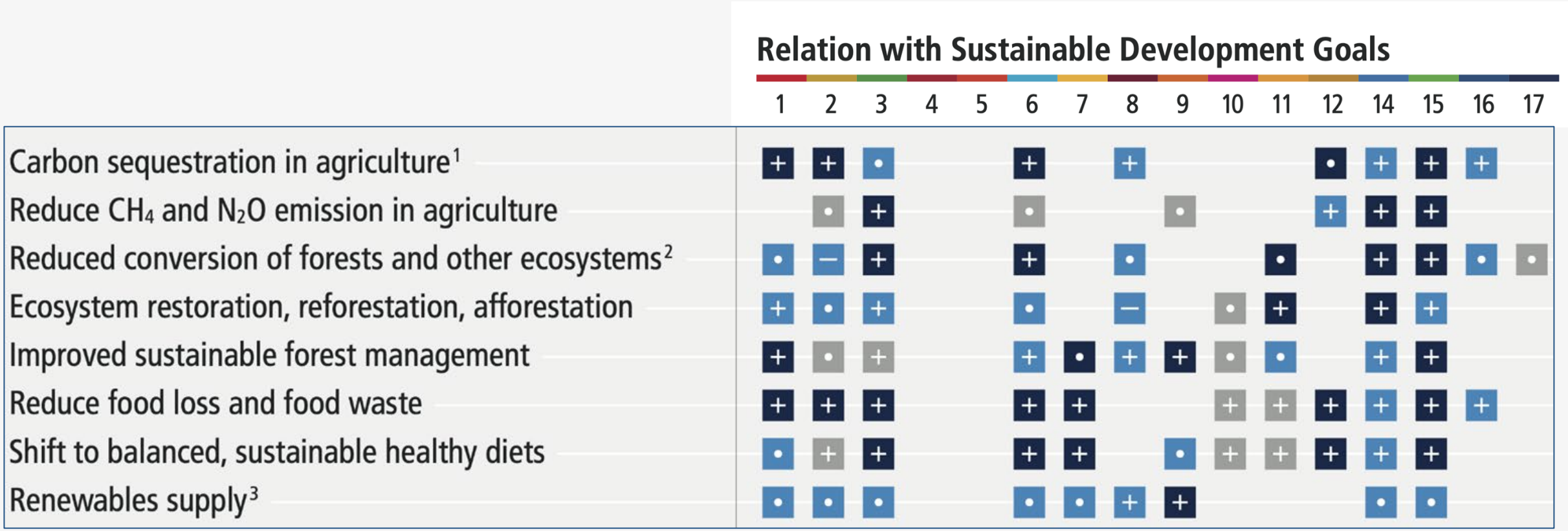
For mitigation strategies in the land sector, the consideration of rural poverty and food insecurity is central.

Two-thirds of people who are hungry live in rural areas.

Among around 570 million farms in the world, more than 475 million are smaller than 2 hectares.

Mitigation options in agriculture and forestry

Without ambitious climate action, sustainable development cannot be achieved.



Just transition: Land, climate and biodiversity

Delivering decent work, social inclusion and the eradication of poverty in the shift to a net zero and climate-resilient economy, as well as strengthening the conservation of land- and ocean-based biodiversity.

- **Ending deforestation**
- **Delivering sustainable agriculture and food systems**
- **Scaling up nature climate solutions**
- **Restoring land and ocean ecosystems**

- **Strengthening human rights and labor standards**
- **Making land tenure more inclusive**
- **Advancing the rights of Indigenous Peoples**
- **Empowering women**
- **Bringing social dialogue and stakeholder engagement**

Lessons from the Covid-19 pandemic

- CO_2 emissions temporarily decreased by about 5.8% in 2020 compared to 2019 due to COVID-19 pandemic.
- Emissions recovered globally by the end of 2020.
- **However, there are important lessons:**
- value of prospective risk management,
- role of scientific assessment,
- preparatory action, and the importance of
- effective and efficient international institutions and processes.

Thank you!

Mercedes Bustamante

LA Chapter 7
mercedes@unb.br

@IPCC

@IPCC_CH
#IPCReport

@IPCC

linkedin.com/
company/ipcc

For more information:

IPCC Secretariat: ipcc-sec@wmo.int

IPCC Press Office: ipcc-media@wmo.int

Visit ipcc.ch

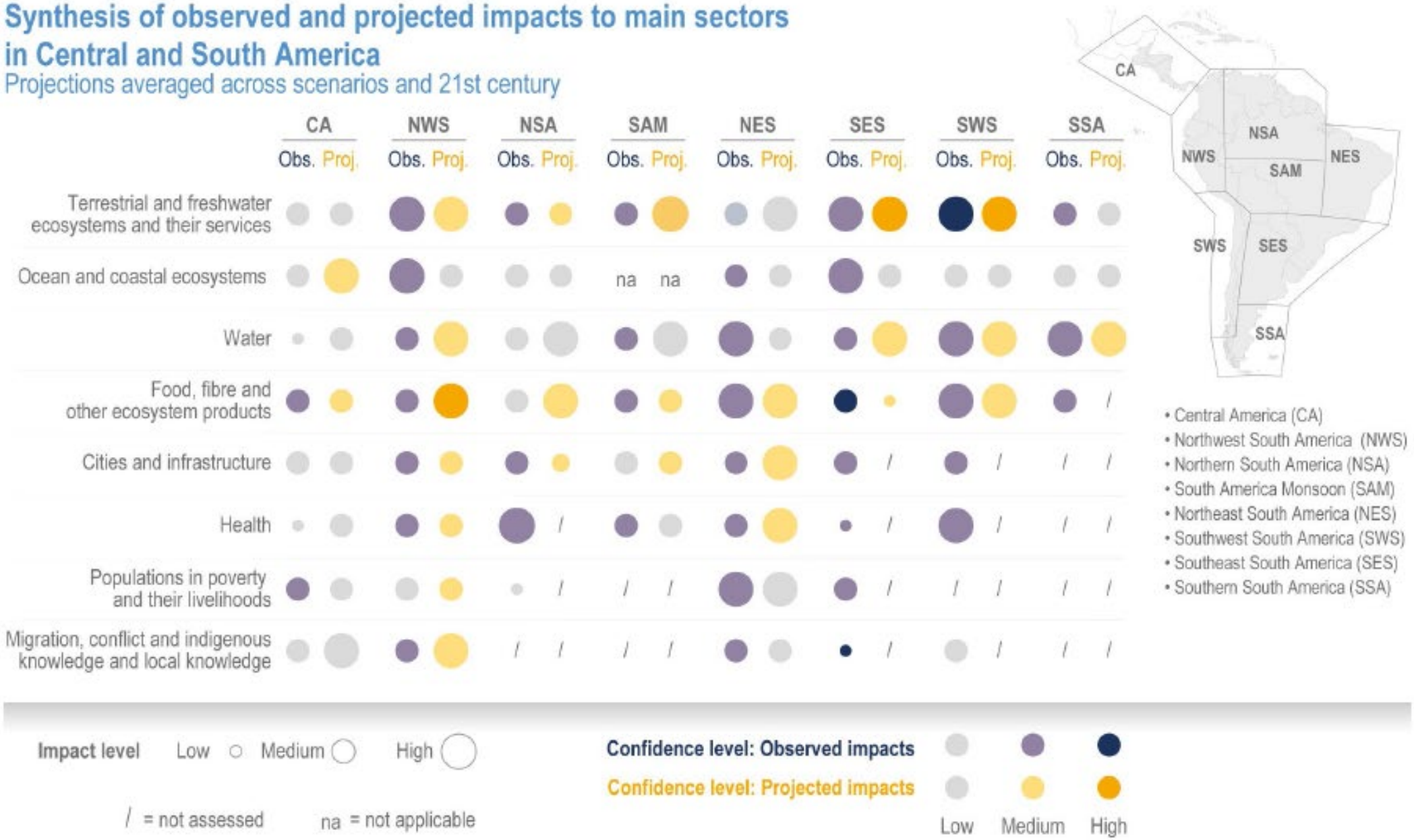


Figure 1: Synthesis of observed and projected impacts, distinguished for different sectors and each subregion of Central and South America. Observed impacts refer to a time-period of the last several decades. Projected impacts represent a synthesis across several emission and warming scenarios, indicative of a time-period from mid- to end of the 21st century. {Figure 12.10}

IPCC AR6 WGII

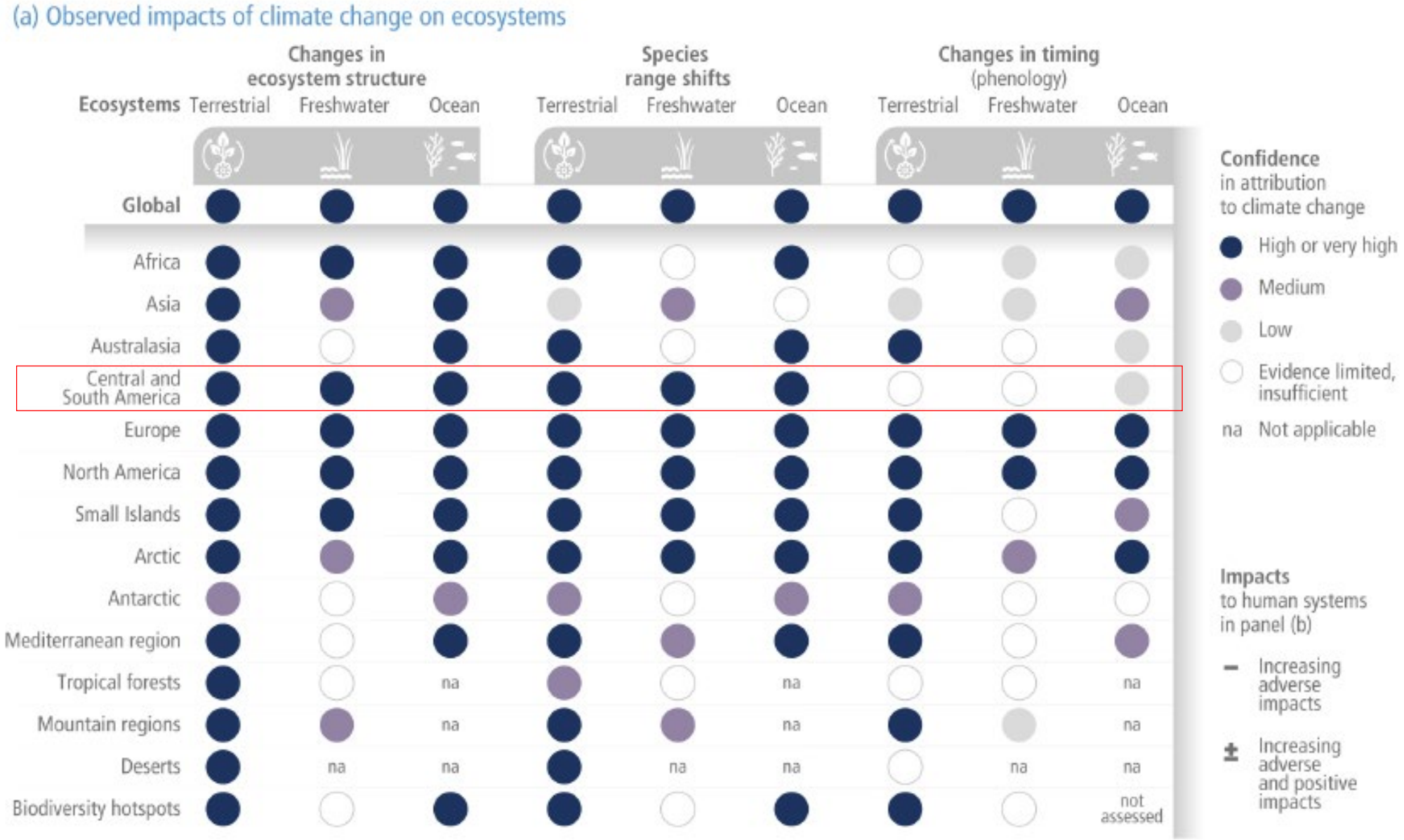
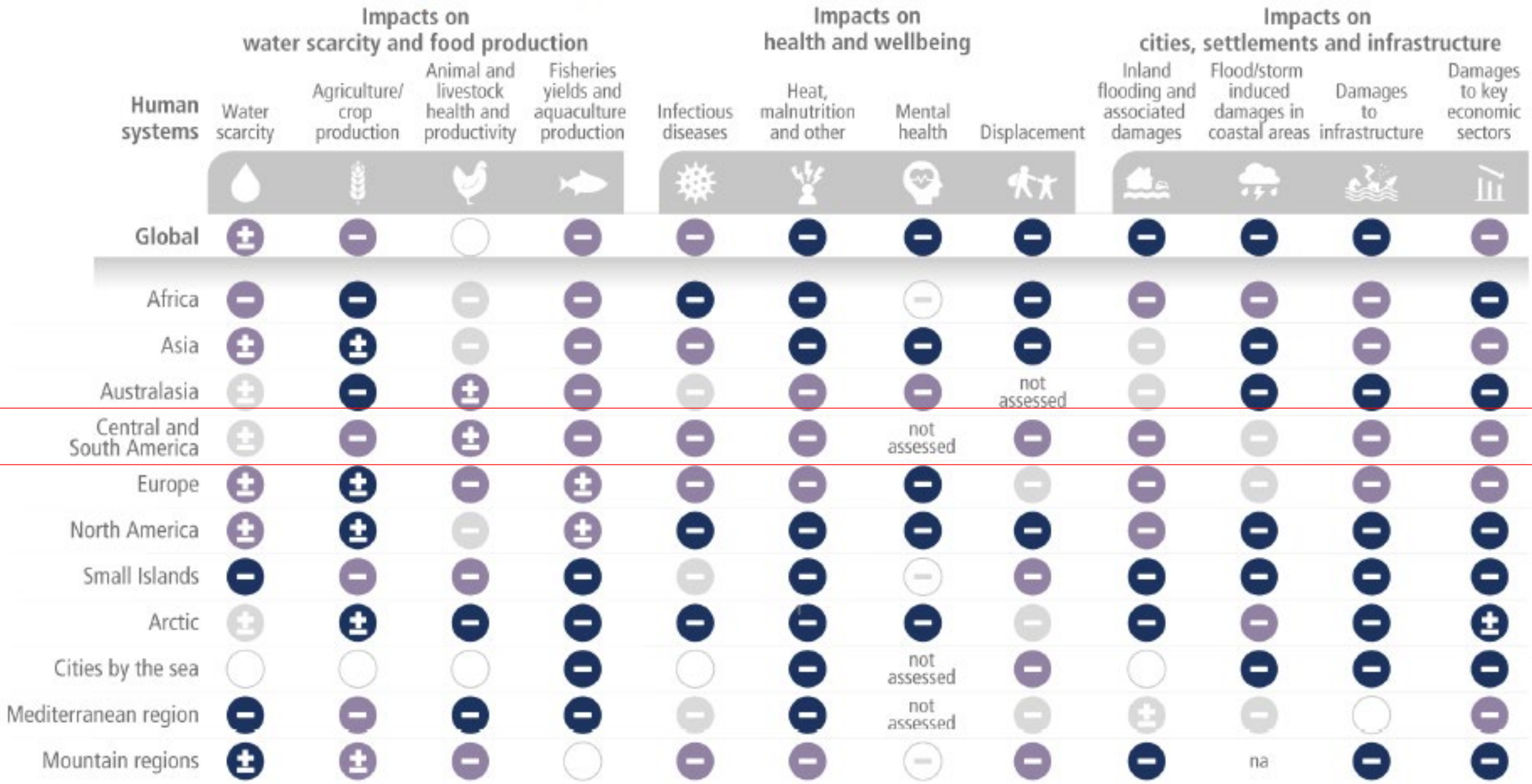


Figure 1: Observed global and regional impacts on ecosystems attributed to climate change. (a) Climate change has already altered terrestrial, freshwater and ocean ecosystems at global scale, with multiple impacts evident at regional and local scales where there is sufficient literature to make an assessment. Impacts are evident on ecosystem structure, species geographic ranges and timing of seasonal life cycles (phenology) (for methodology and detailed references to chapters and cross-chapter papers see SMTS.1 and SMTS.1.1). {Figure TS.3, panel (a)}

(b) Observed impacts of climate change on human systems



IPCC AR6 WGII