The Limits to Climate Change Adaptation

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Source: @JohnfoCook

IPCC AR6 definition

Limit to adaptation:

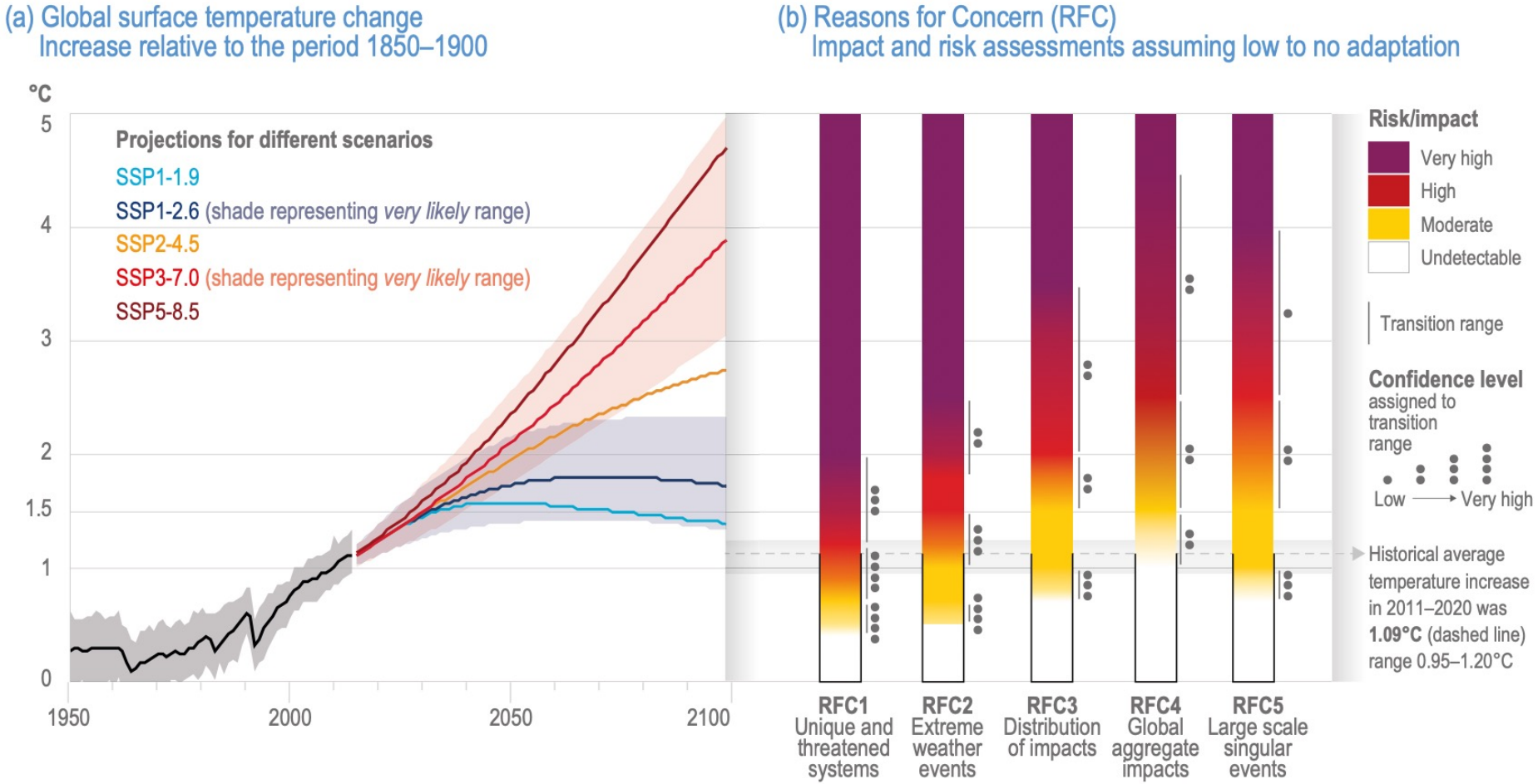
The point at which an actor's objectives (or system needs) cannot be secured from intolerable risks through adaptive actions.

IPCC AR6 definitions

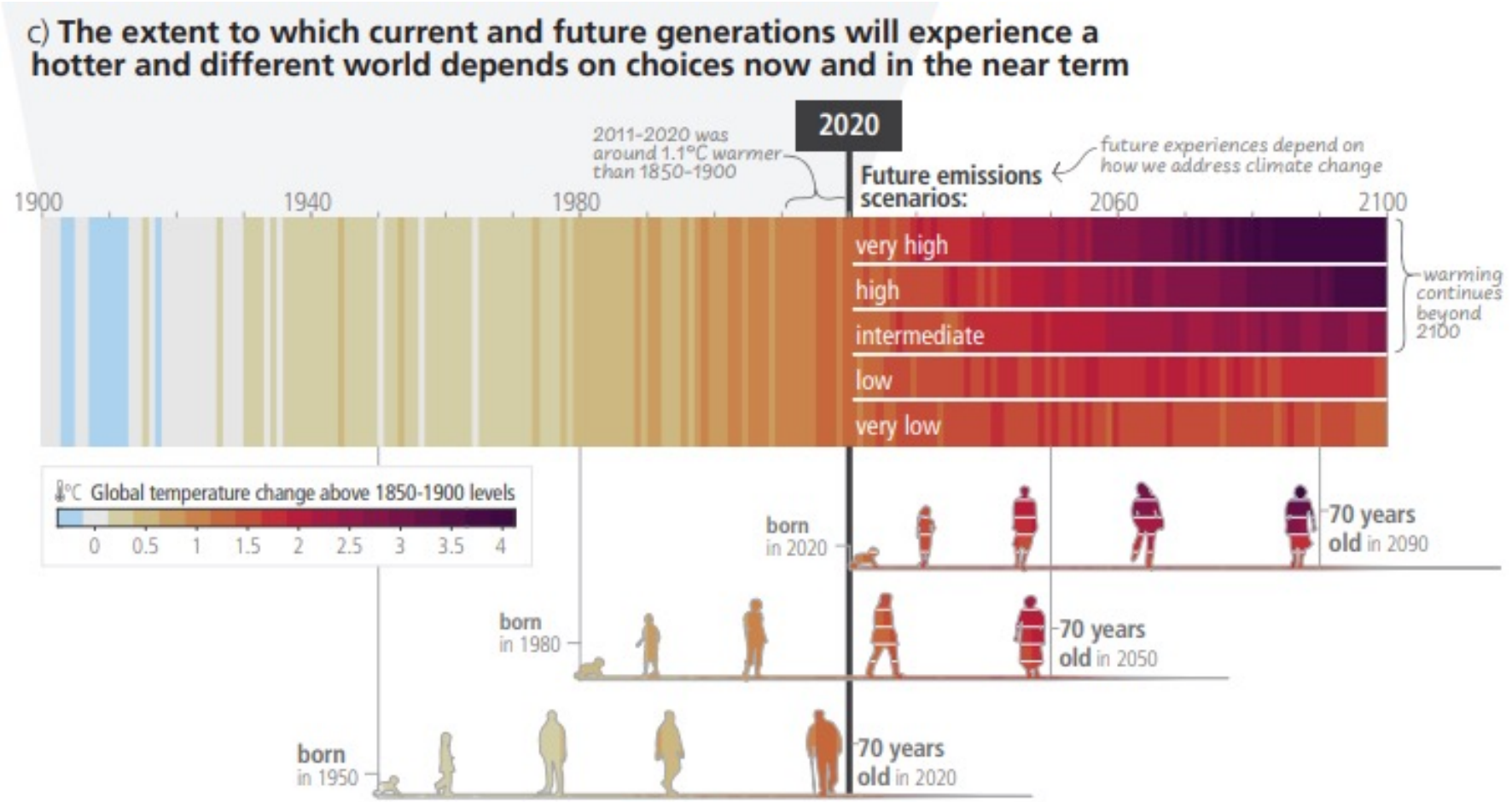
- **Hard** adaptation limit – No adaptive actions are possible to avoid intolerable risks.
- **Soft** adaptation limit – Options may exist but are currently not available to avoid intolerable risks through adaptive action.

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.



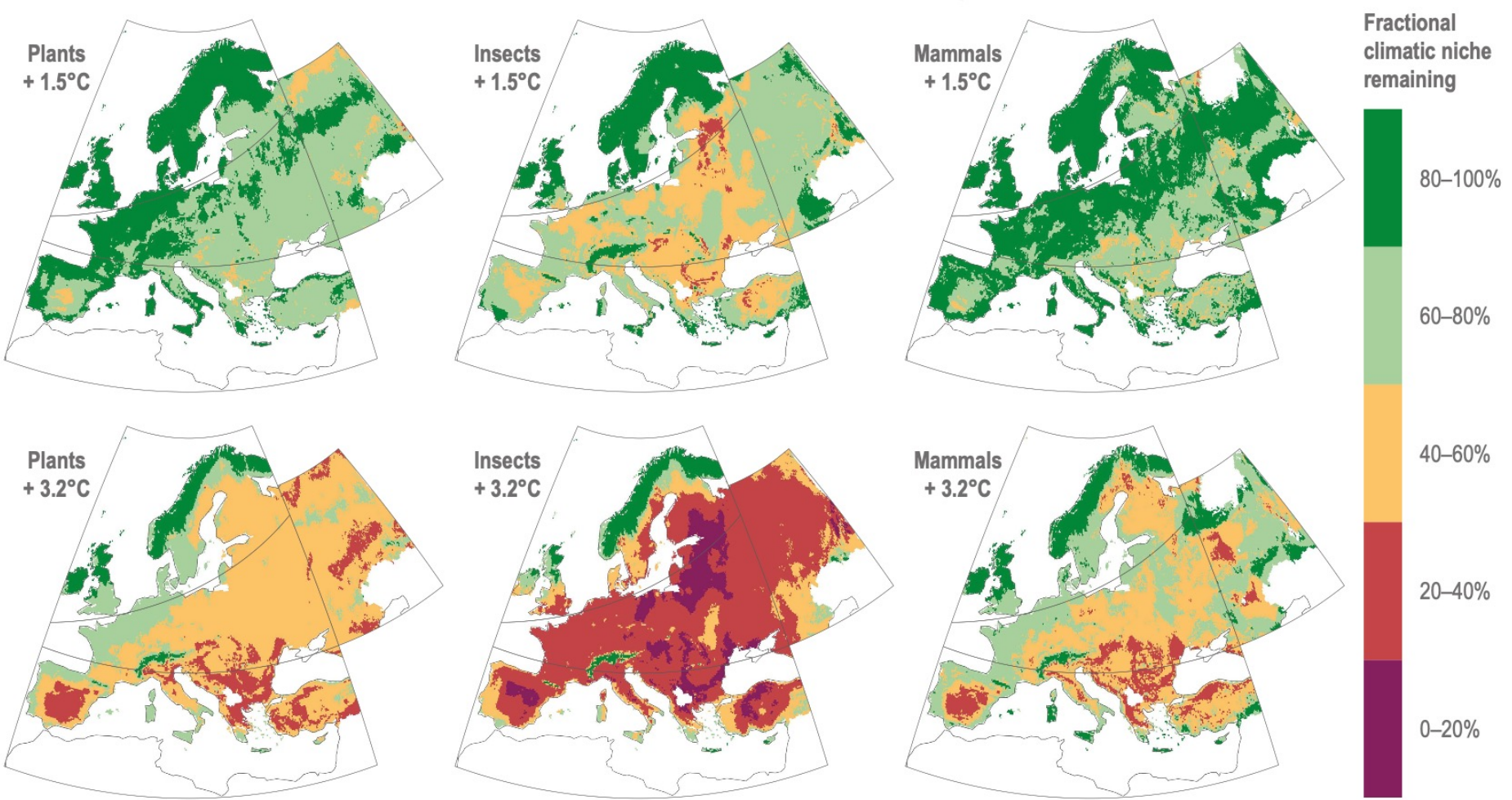
Source: IPCC AR6 WGII SPM, Fig. SPM.3



Source: IPCC AR6 SYR SPM

Species projected to remain in suitable climate conditions in Europe

Source: IPCC AR6 WGII, Chap 13



Indicative adaptation limits in cities, settlements and key infrastructure in Europe

Economic activities and leisure	Supply of energy & water	City / town	Household / Building
Technical limits Limited resources for implementing adaptation Technological limits	**Technical limits** Technical/ management measures not possible due to plant characteristics	**Technical limits** Limited efficacy of measures under high/ rapidly changing climate hazards	**Technical limits** Physical characteristics of building stock
Socio-economic limits High investments needed Small size of enterprises	**Socio-economic limits** High installation costs for large-scale adaptation Too risky investments when in highly vulnerable locations	**Socio-economic limits** High investments to upgrade municipal facilities High installation cost for new infrastructure	**Socio-economic limits** Low probability hazards prohibit adaptation payoff Poverty Comfort and safety
Environmental & regulatory limits Limited water resources Shift to other locations is prohibited Limited areas for expansion	**Environmental & regulatory limits** Limited water resources Competitive water uses	**Environmental & regulatory limits** Space constraints for expanding green infrastructure	**Environmental & regulatory limits** Legislation on buildings and appliances

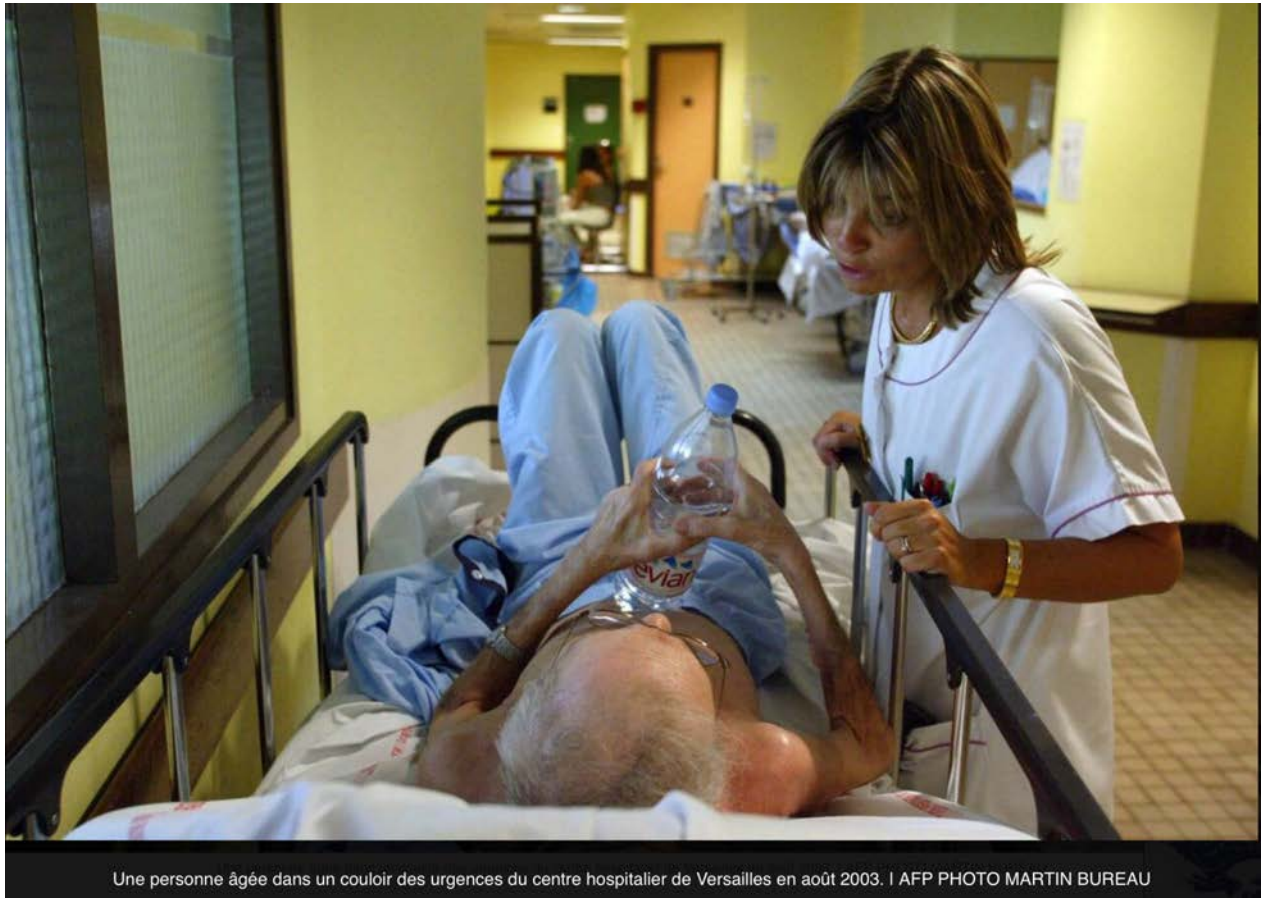
Source: IPCC AR6 WGII, Chap 13

Figure 13.21 | Indicative adaptation limits in cities, settlements and key infrastructures in Europe (Table SM13.16)

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

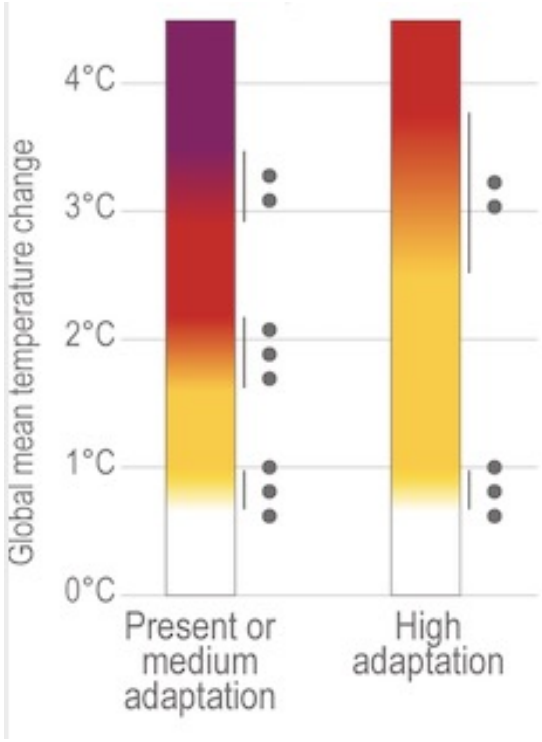
There is evidence that anthropogenic influences, including increasing atmospheric greenhouse gas concentrations, have changed these extremes

Heat waves kill

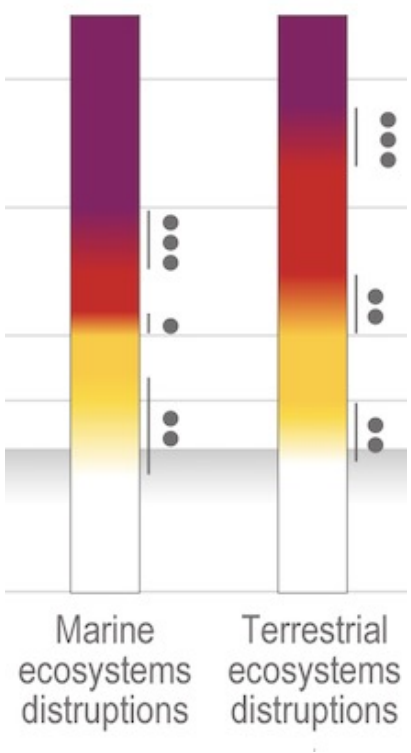


Une personne âgée dans un couloir des urgences du centre hospitalier de Versailles en août 2003. I AFP PHOTO MARTIN BUREAU

Heat stress, mortality and morbidity

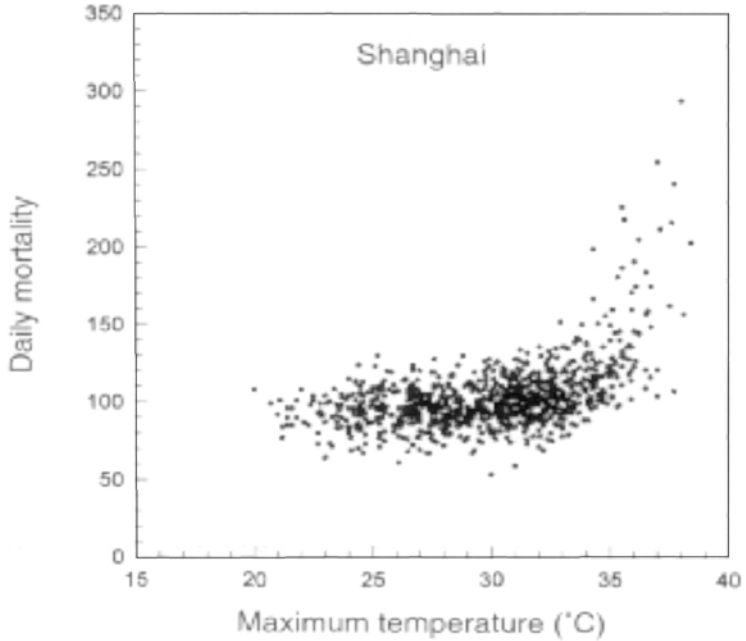


Ecosystems



Source: IPCC AR6 WGII, Chap 13

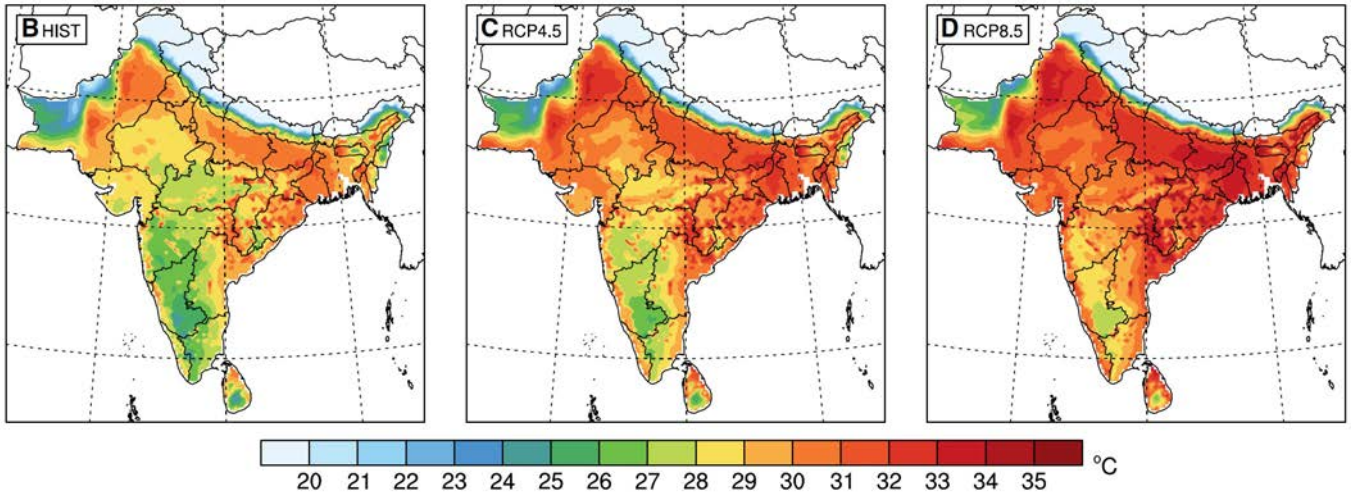
Relationship between maximum temperature and mortality in Shanghai, China, 1980-89



Référence : CILIMATE CHANGE AND HUMAN HEALTH, 1996

Jean-Pascal van Ypersele (vanyp@climate.be)

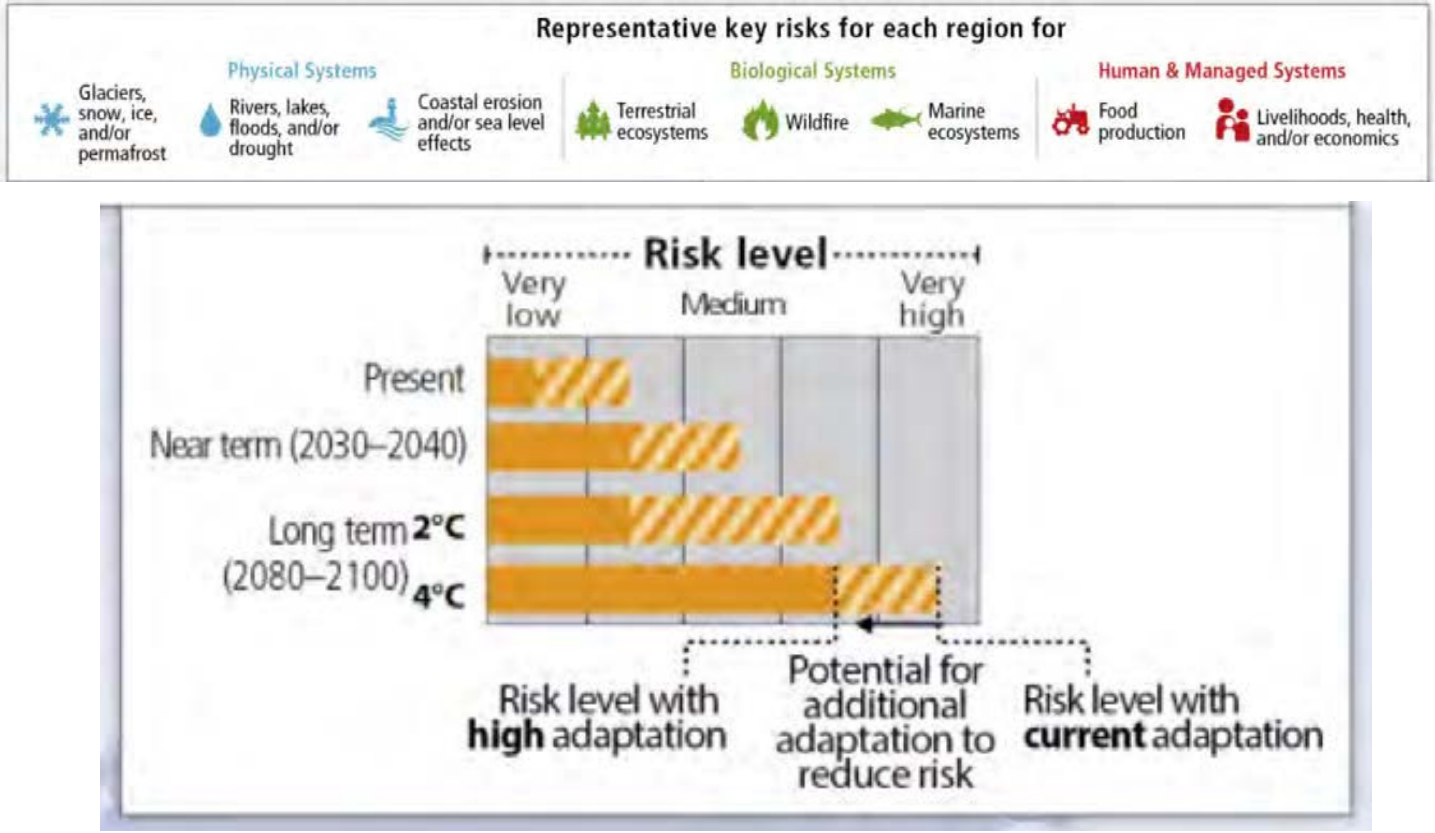
Maximum wet bulb temperature in South Asia (°C) (35°C during 6 hours is considered deadly)



Spatial distributions of bias-corrected ensemble averaged 30-year TWmax for each GHG scenario: HIST (1976–2005) (B), RCP4.5 (2071–2100) (C), and RCP8.5 (2071–2100) (D).

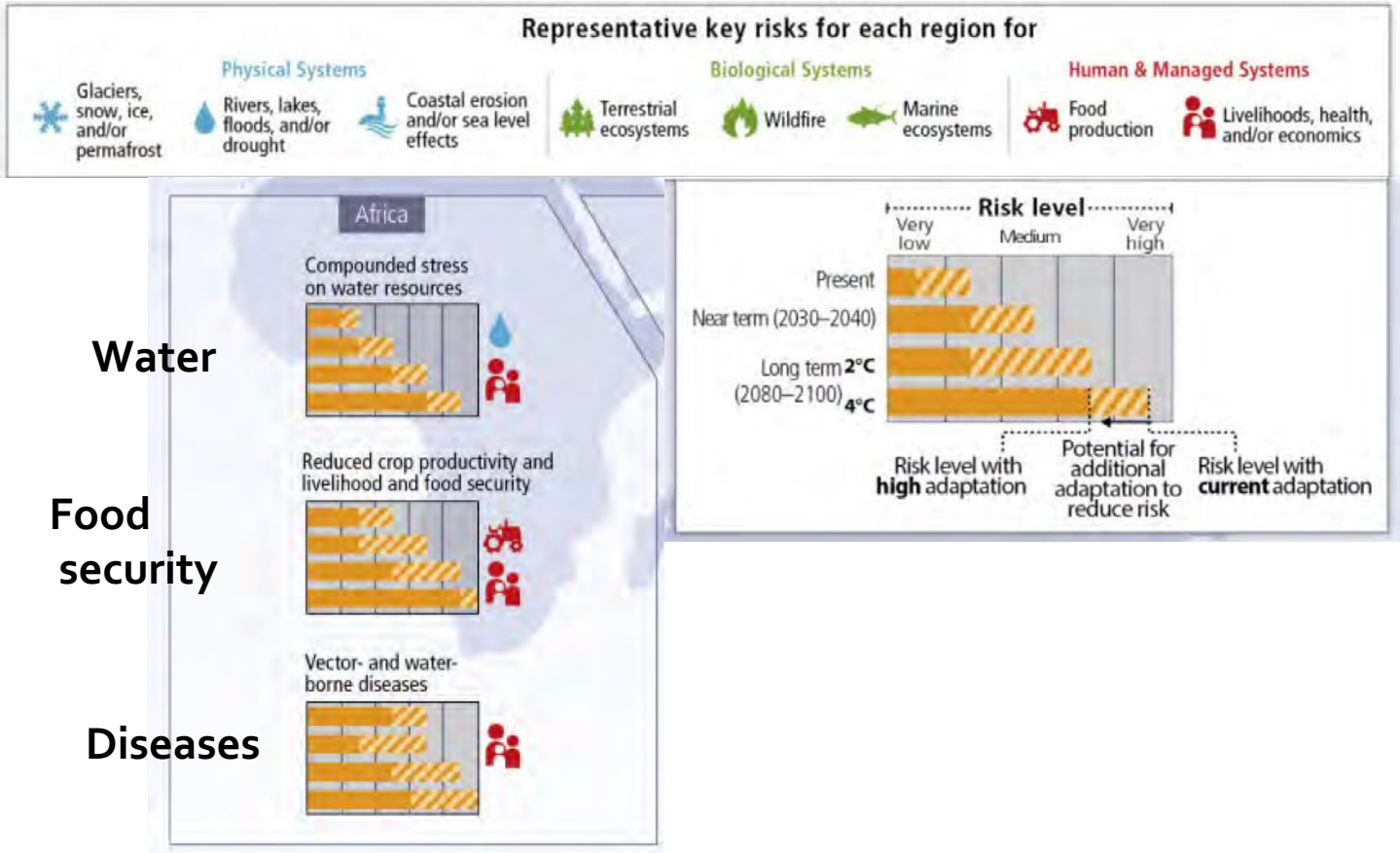
Source: Im et al., 2017 « Deadly heat waves projected in the densely populated agricultural regions of South Asia », Science advances.

Regional key risks and potential for risk reduction through adaptation

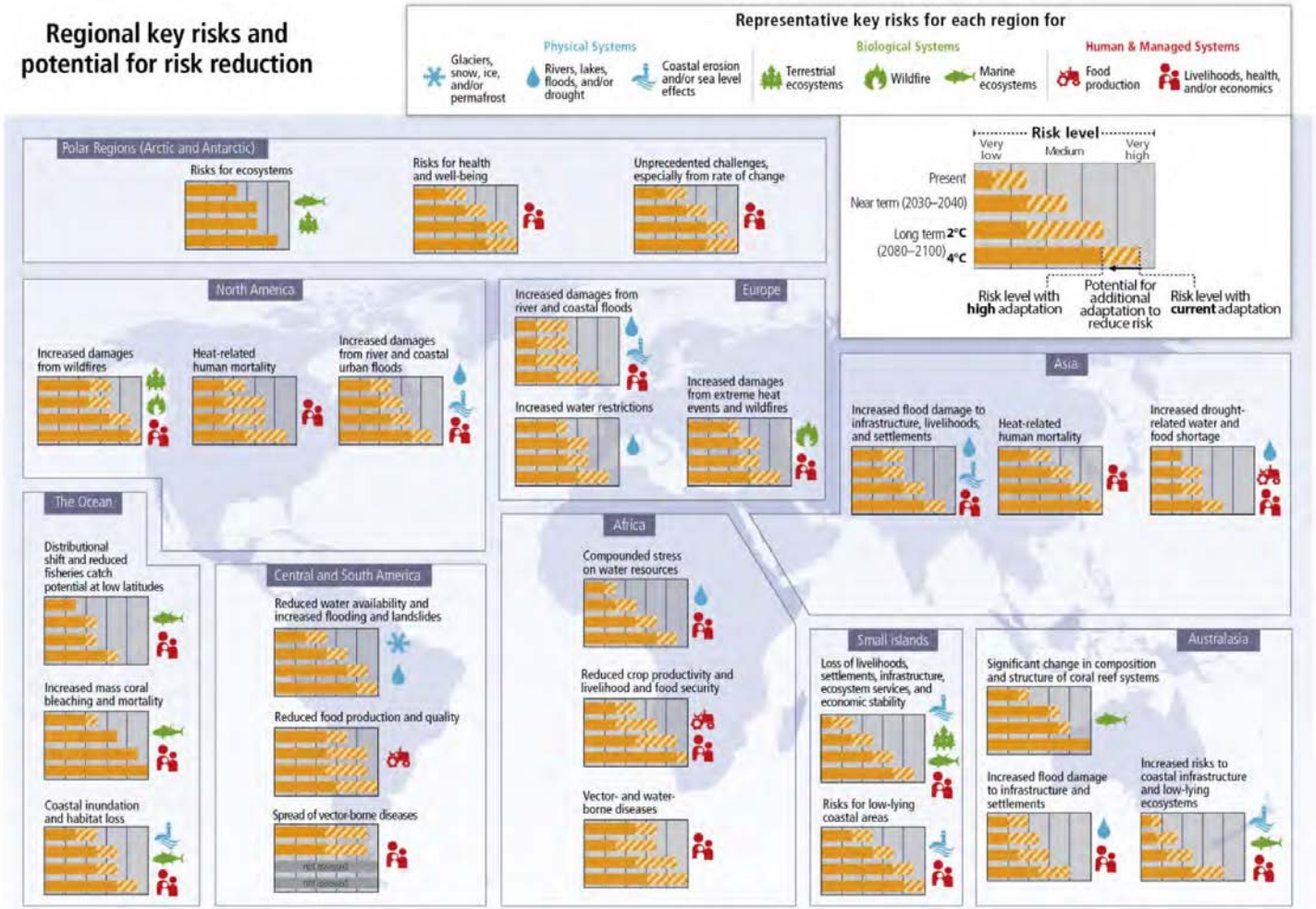


IPCC, AR5, SPM, Figure SPM.8

Regional key risks and risk reduction through adaptation: Africa

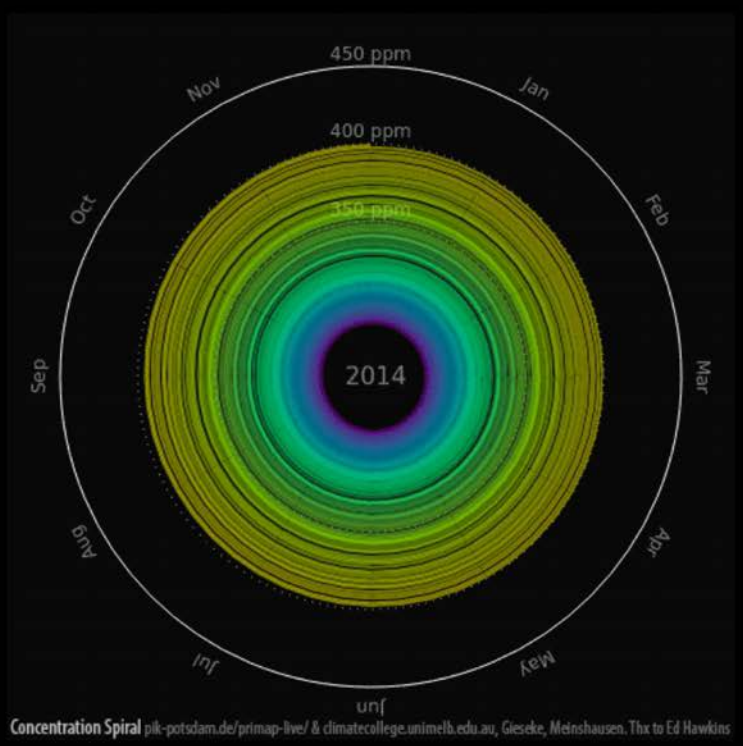


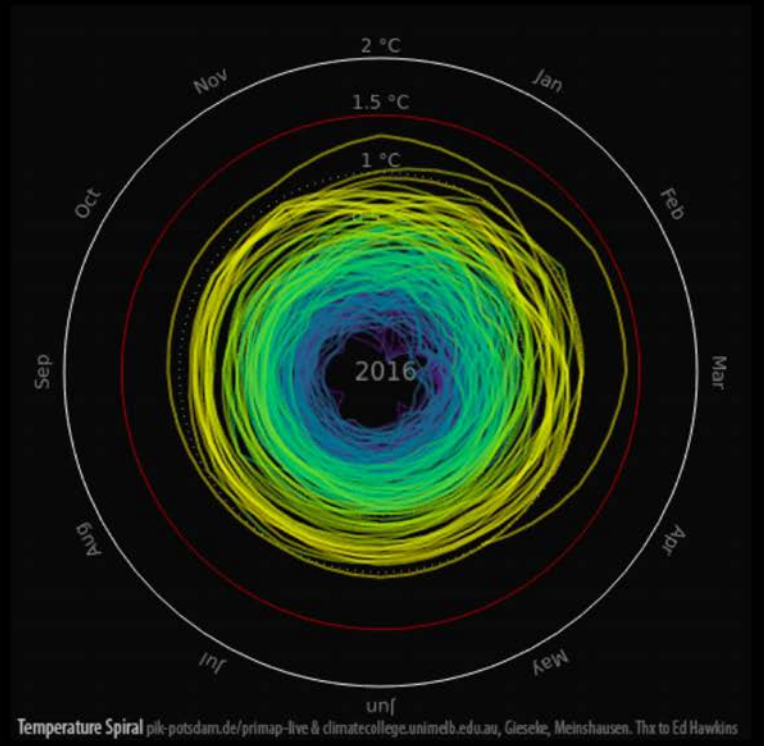
IPCC, AR5, SPM, Figure SPM.8



IPCC, AR5, SPM, Figure SPM.8

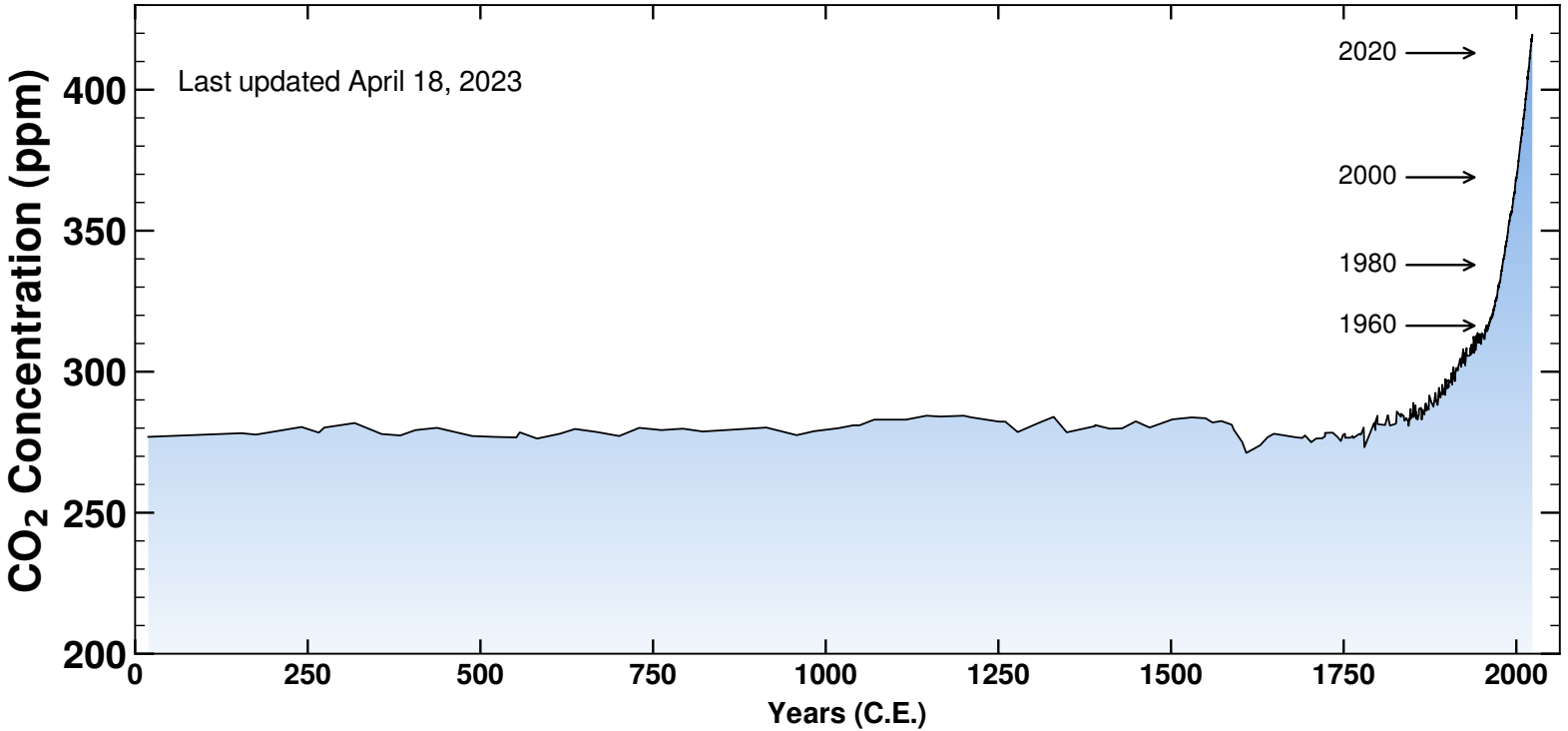
CO_2 Concentration and Temperature spirals





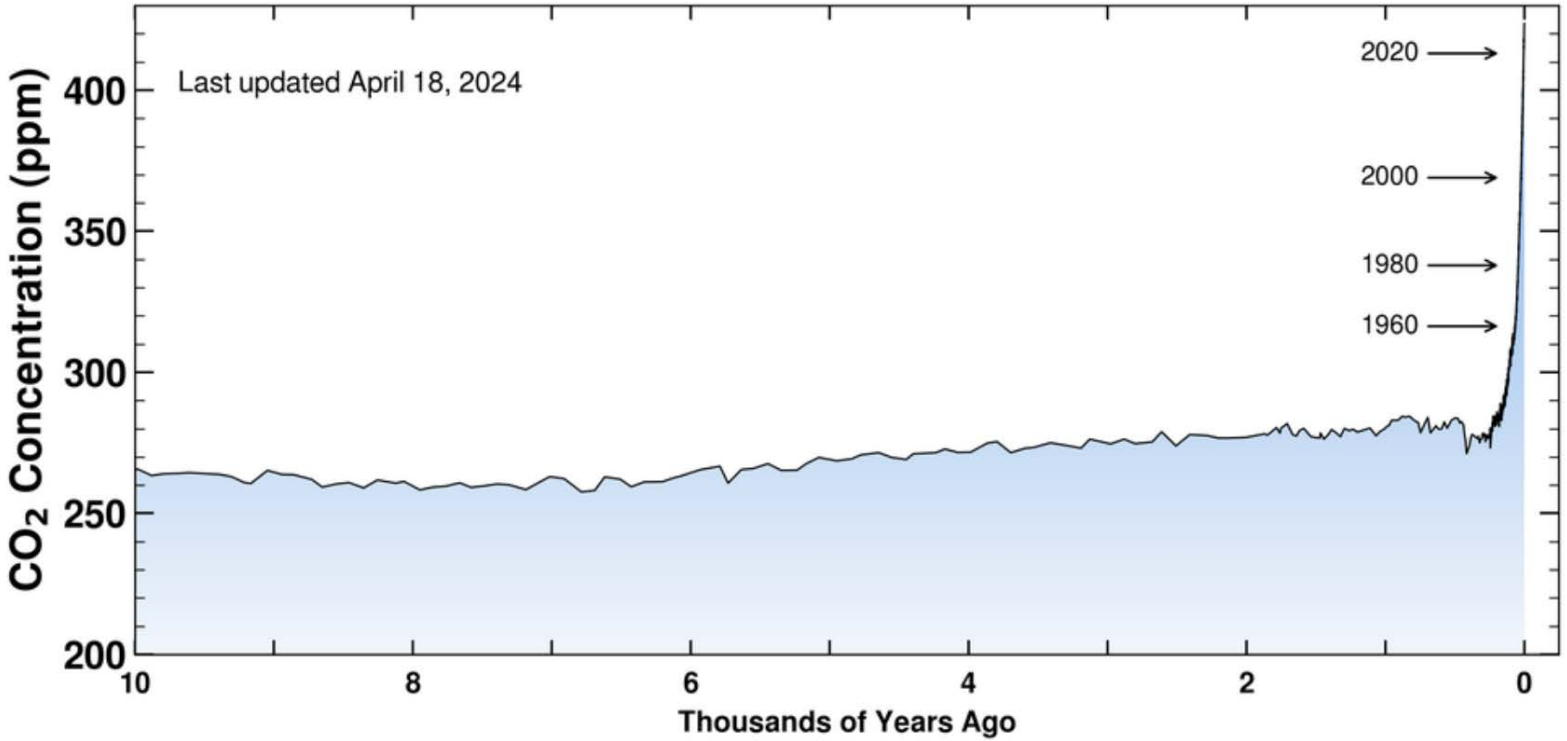
CO_2 Concentration since 1850 and Global Mean Temperature in °C relative to 1850 – 1900
Graph: Ed Hawkins (Climate Lab Book) – Data: HadCRUT4 global temperature dataset
Animation available on http://openclimatedata.net/climate-spirals/concentration-temperature/

CO_2 Concentration 18 April 2023: 424,03 ppm (Keeling curve + last 2000 years)



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

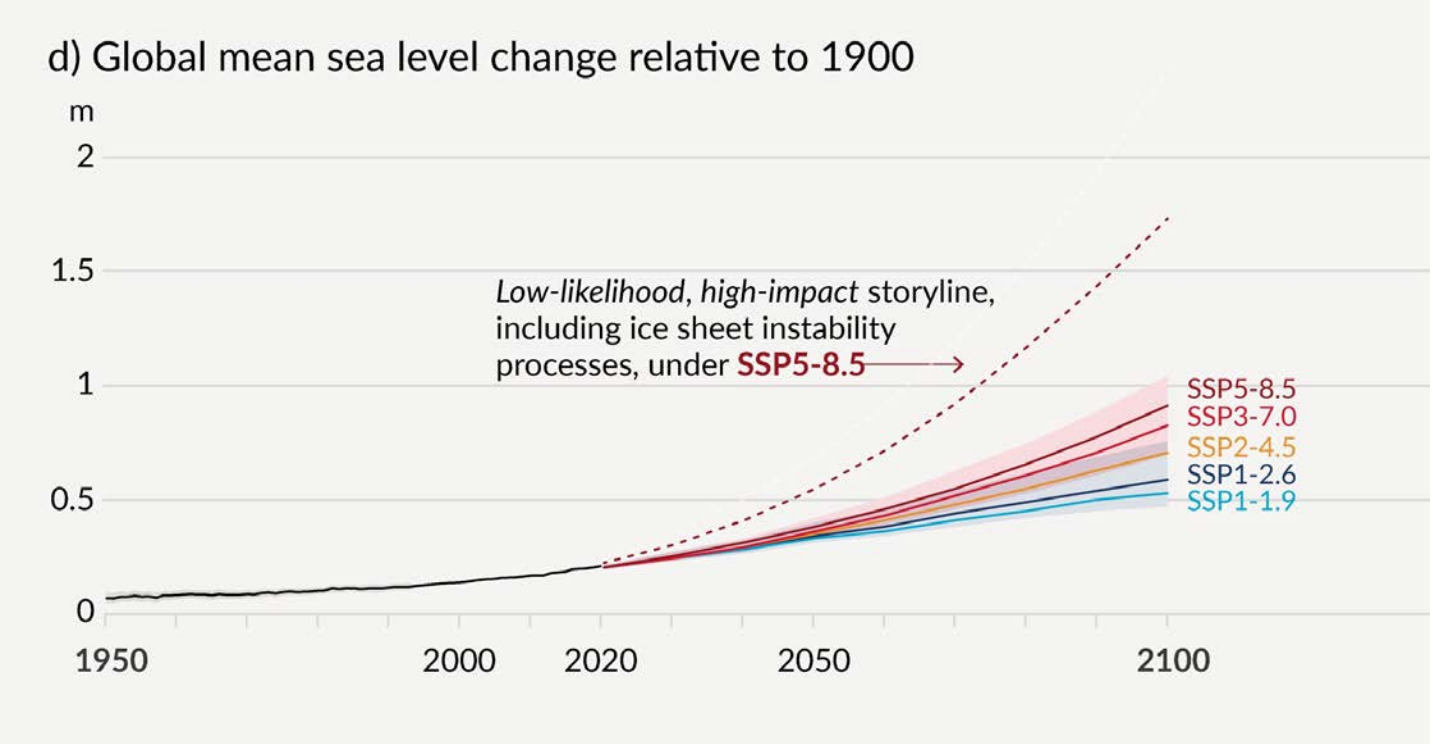
CO_2 Concentration 18 April 2024: 427,14 ppm (Keeling curve + last 10000 years)



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

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

Figure SPM.8

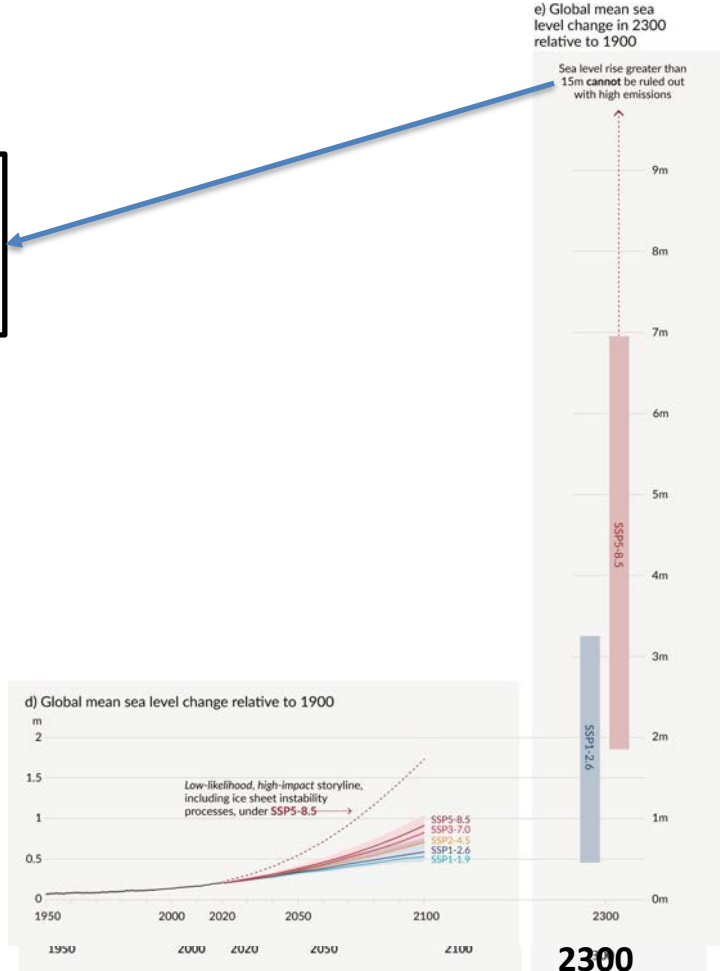


IPCC SIXTH ASSESSMENT REPORT

Working Group I – The Physical Science Basis

Figure SPM.8

« Sea level rise **greater than 15 m**
cannot be ruled out with high emissions » (in 2300)



7 m

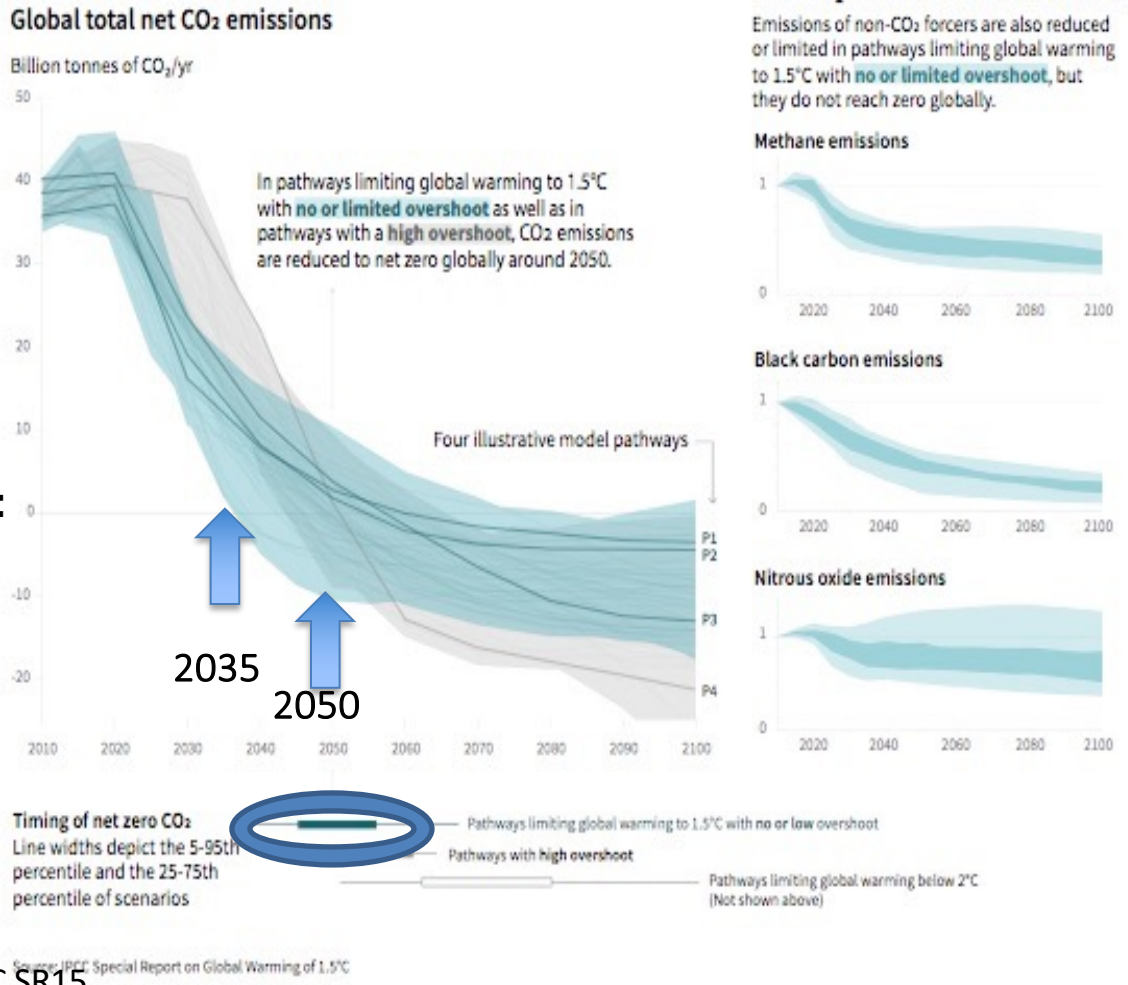
2 m

Why net zero emissions are needed as soon as possible

@JPvanYpersele

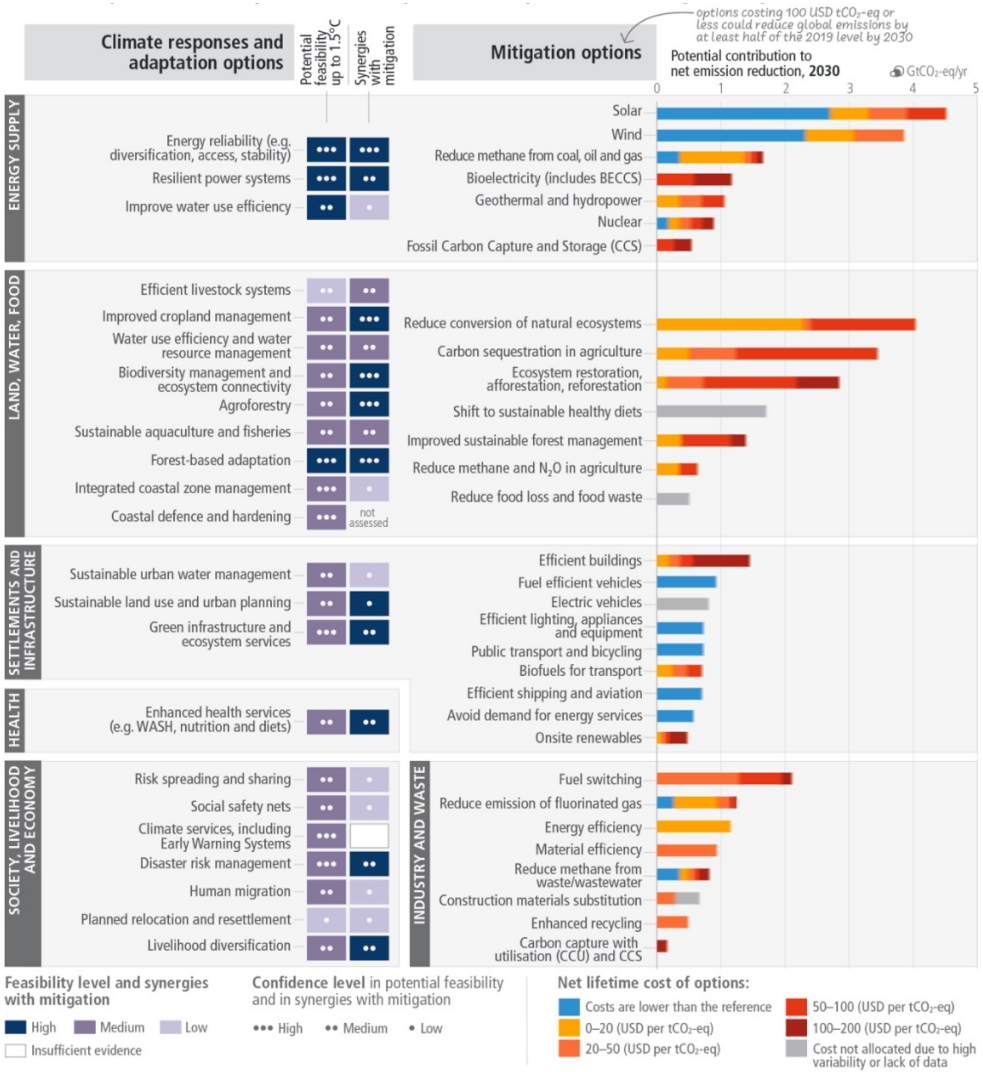
Emission pathways compatible with below 1.5° C warming:

Net ZERO:

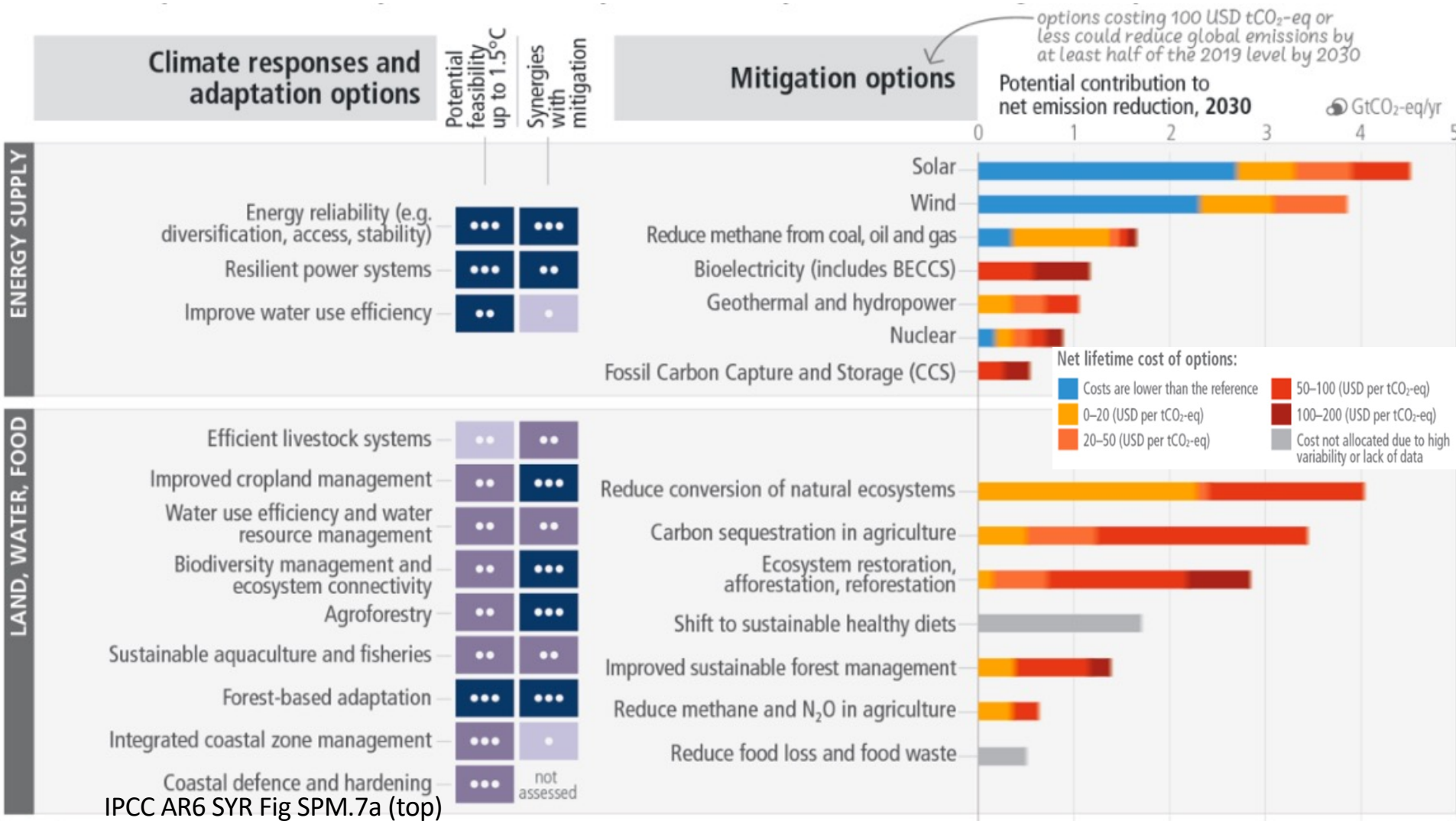


Source: IPCC SR15

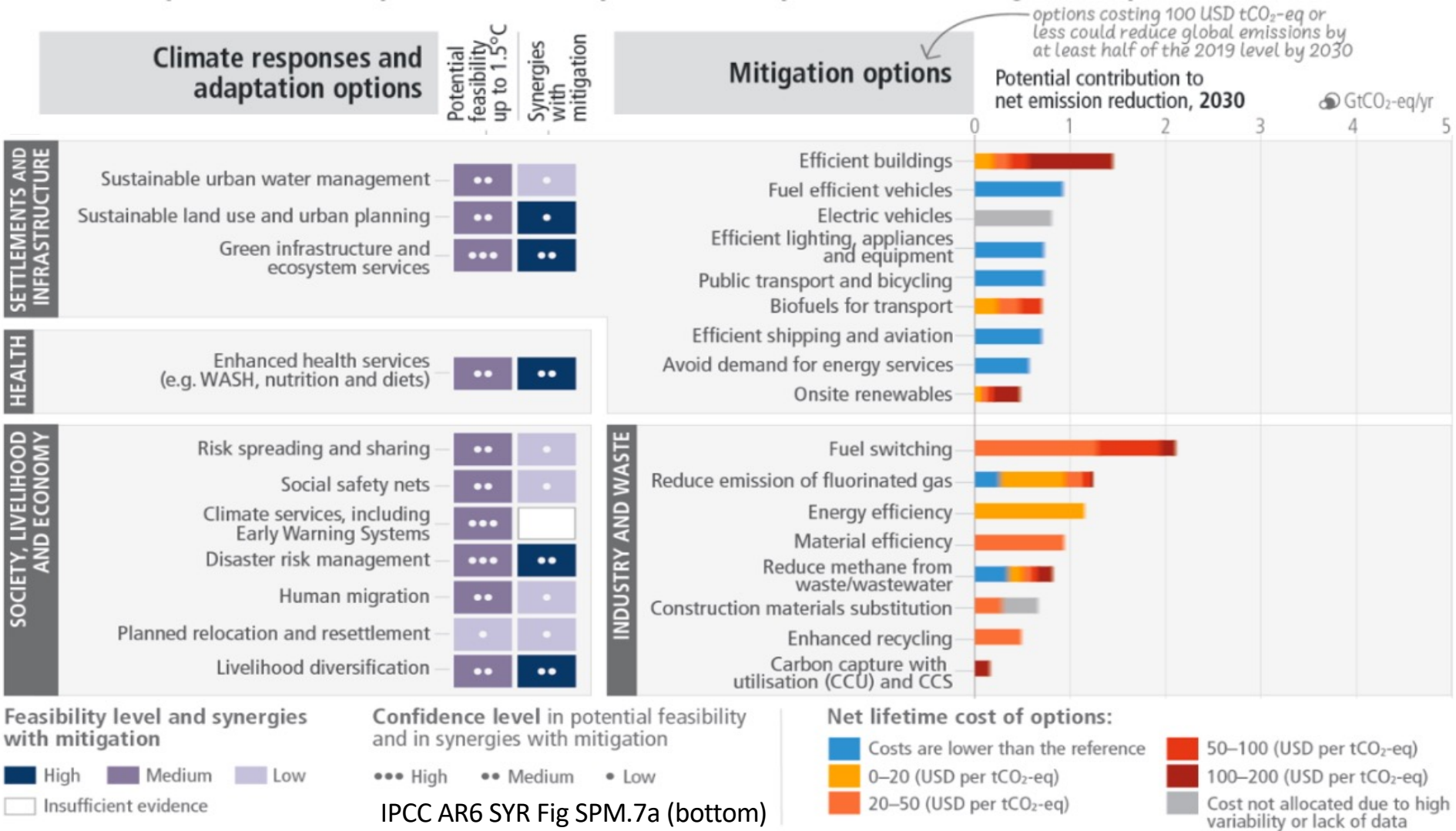
Feasibility of climate responses and adaptation, and potential of mitigation in the near-term



IPCC AR6 SYR Fig SPM.7a



IPCC AR6 SYR Fig SPM.7a (top)



IPCC AR6 SYR Fig SPM.7a (bottom)

Many co-benefits of taking climate action out of its SILO:

RCP2.6 RCP8.5

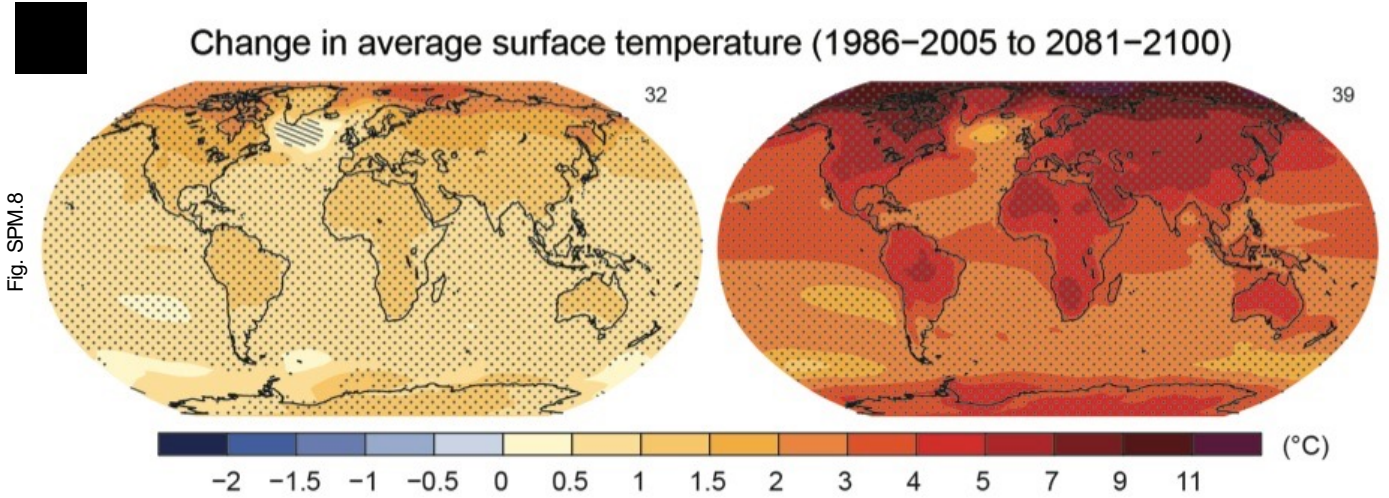
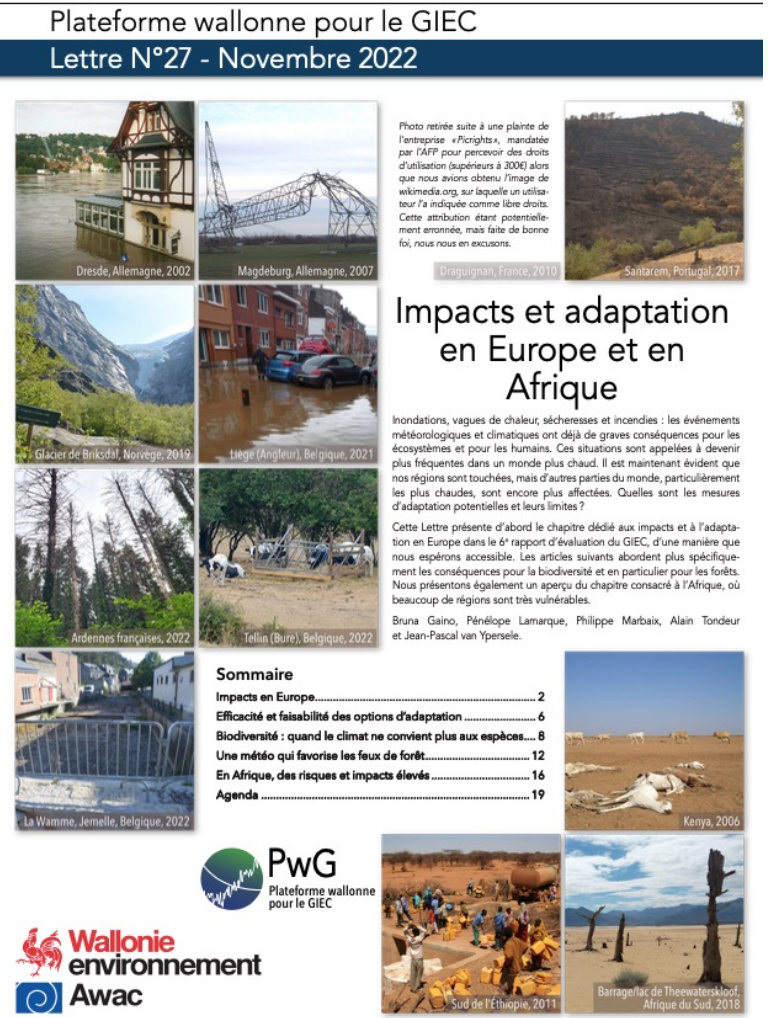


Fig. SPM.8

Humanity has the choice



Lettre N°27:

Impacts et adaptation en Europe et en Afrique

Novembre 2022

- Impacts des changements climatiques sur les systèmes humains et naturels en Europe
- Efficacité et faisabilité des options d'adaptation
- Biodiversité : quand le climat ne convient plus aux espèces
- Une météo qui favorise les feux de forêt
- En Afrique, des risques et impacts élevés

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- 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 permafrost emissions
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