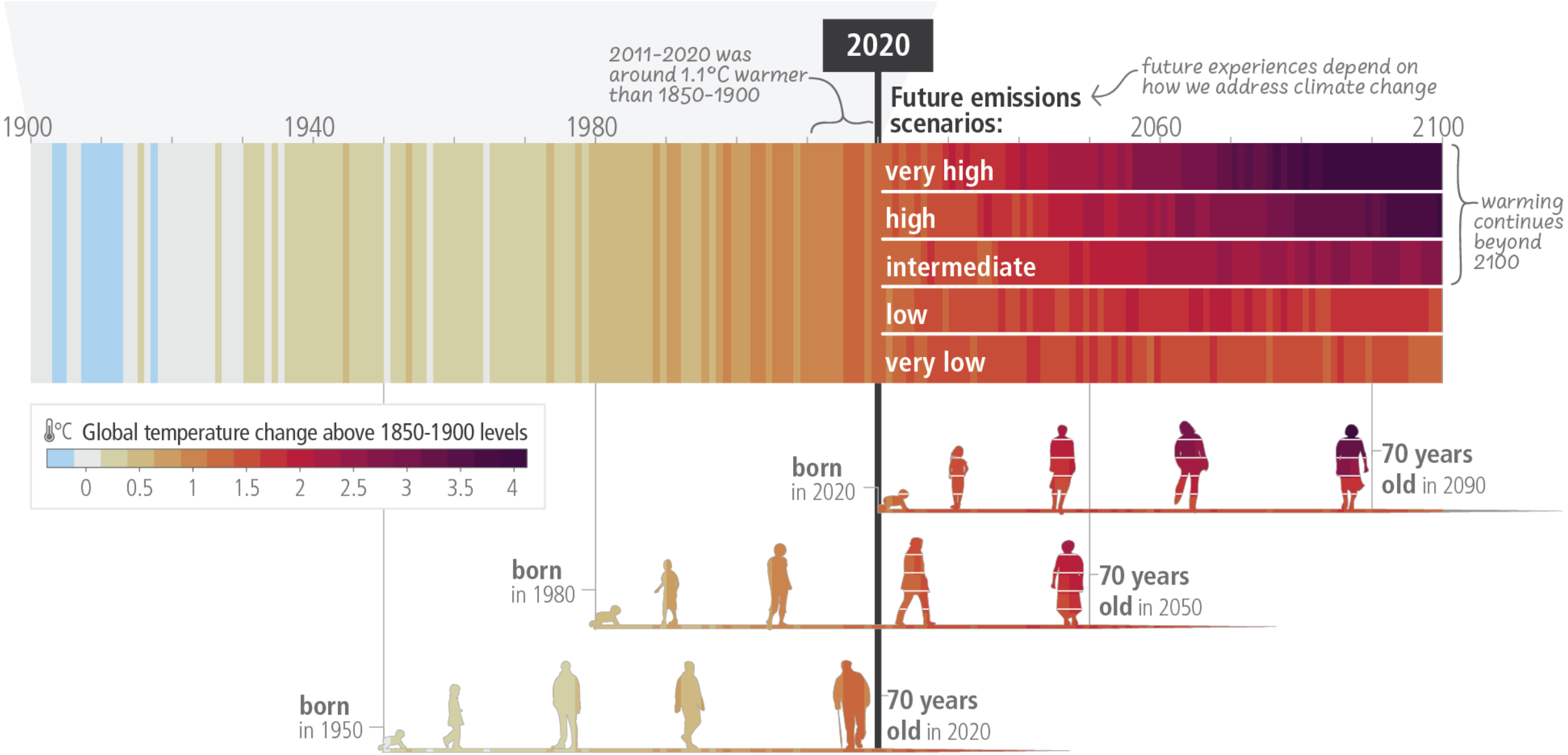
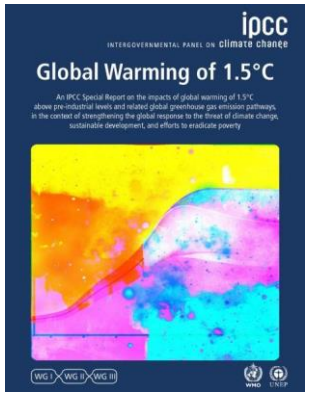
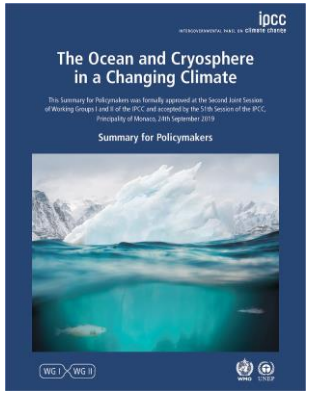
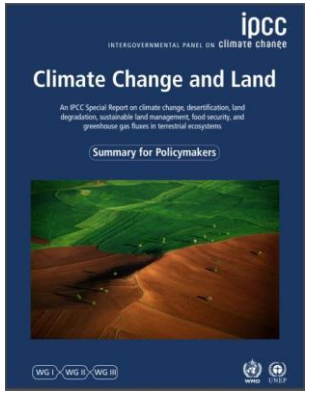
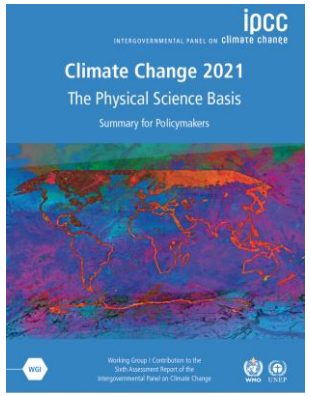
Climate change, transformation challenges

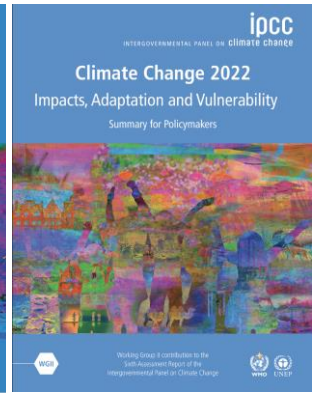


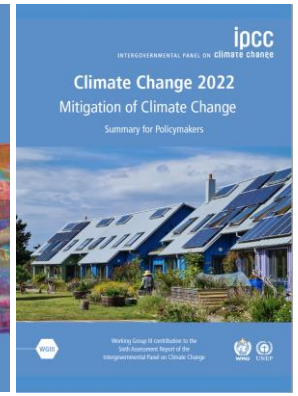












Seriousness
Urgency
Action

1000 lead authors, thousands of contributors and reviewers
85 000 publications
300 000 review comments

https://www.ipcc.ch/report/ar6/

ACCÉLÉRER LA TRANSITION CLIMATIQUE
AVEC UN SYSTÈME ALIMENTAIRE
BAS CARBONE, RÉSILIENT ET JUSTE

ACTER L'URGENCE
ENGAGER LES MOYENS

https://www.hautconseilclimat.fr

Spaces | Ekimetrics / **climate-question-answering**


Where are we now?

Climate action is gaining momentum

Steady decrease of greenhouse gas emissions
in more than 18 countries

More than half of global greenhouse gas emissions
in the scope of public policies

Progress in adaptation planning and implementation, but fragmented and incremental responses, limits, growing adaptation gaps and evidence of maladaptation

Insufficient financial flows

Public policies have prevented several billion tons of CO_2-equivalent emissions each year

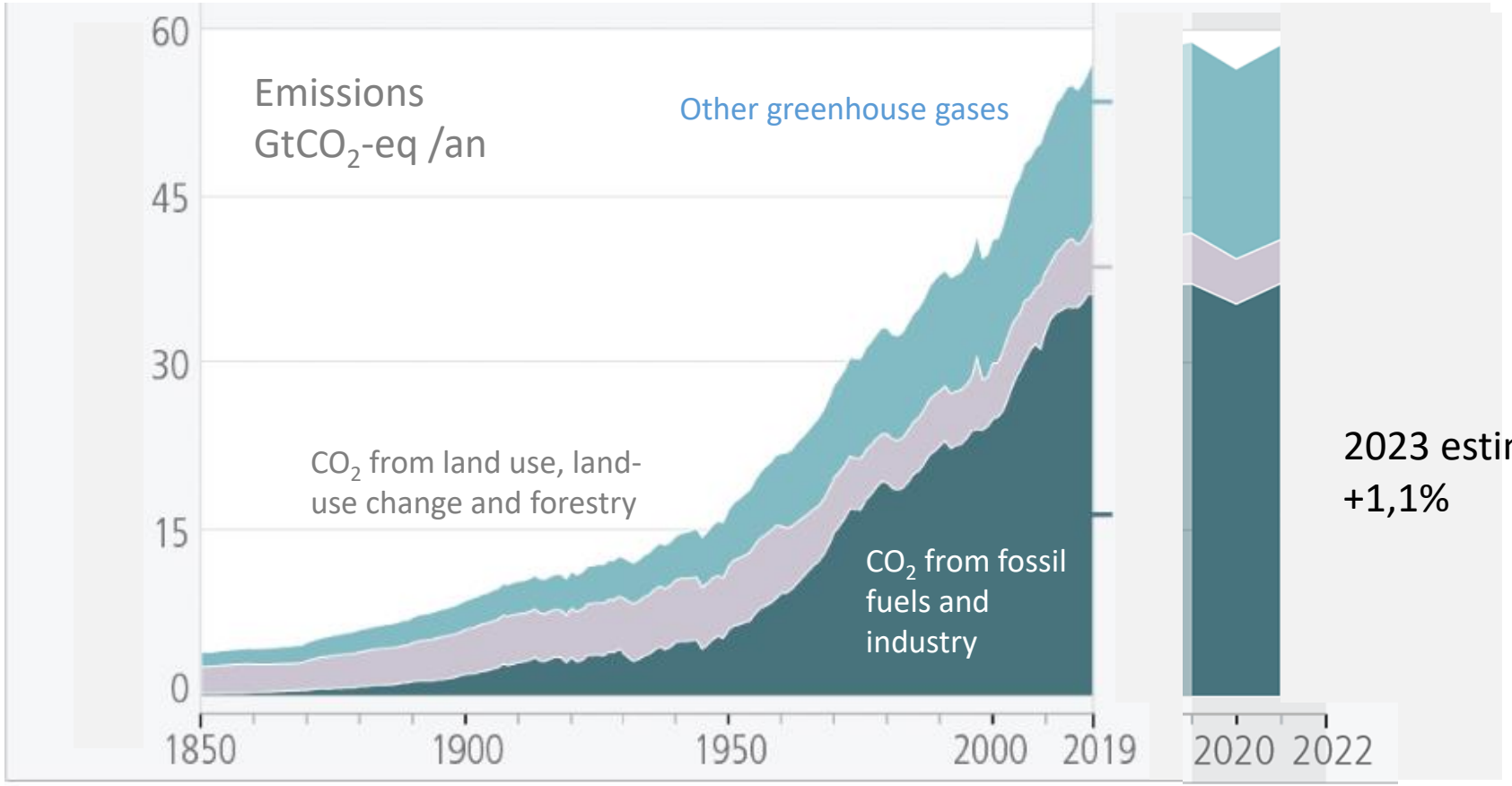
Renewable energies, batteries :
decrease in costs, increases in installed capacities

Energy efficiency, demand management, reduction of food waste :
affordable, high acceptability

Greening of cities, slowing of global net deforestation

but the pace and scale of what has been done so far, and current plans, are insufficient to limit the escalation of climate-related risks

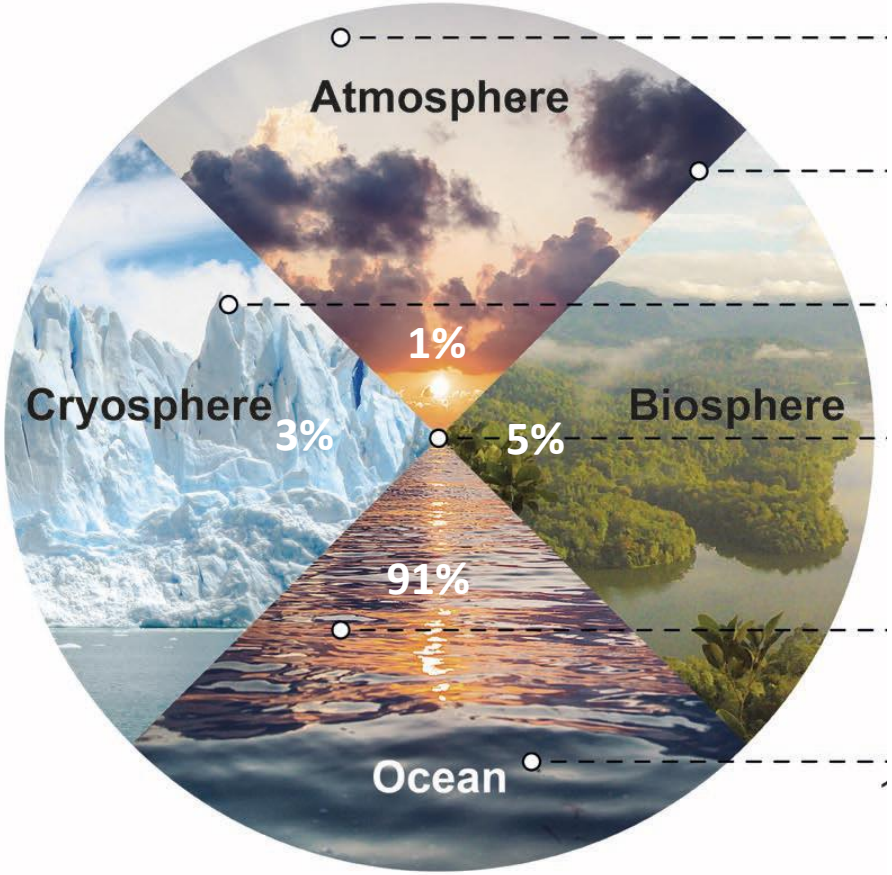
Greenhouse gas emissions resulting from human activities continue to increase, with unequal historical and ongoing contributions



unsustainable energy use, land use and land-use change, lifestyles and patterns of consumption and production across regions, between and within countries, and among individuals

Update tp 2022 : https://essd.copernicus.org/articles/15/2295/2023/essd-15-2295-2023.html, 2023 estimate : : https://globalcarbonbudget.org/carbonbudget2023/

Greenhouse gas emissions from human activities cause global heating and rapid, widespread and intensifying changes

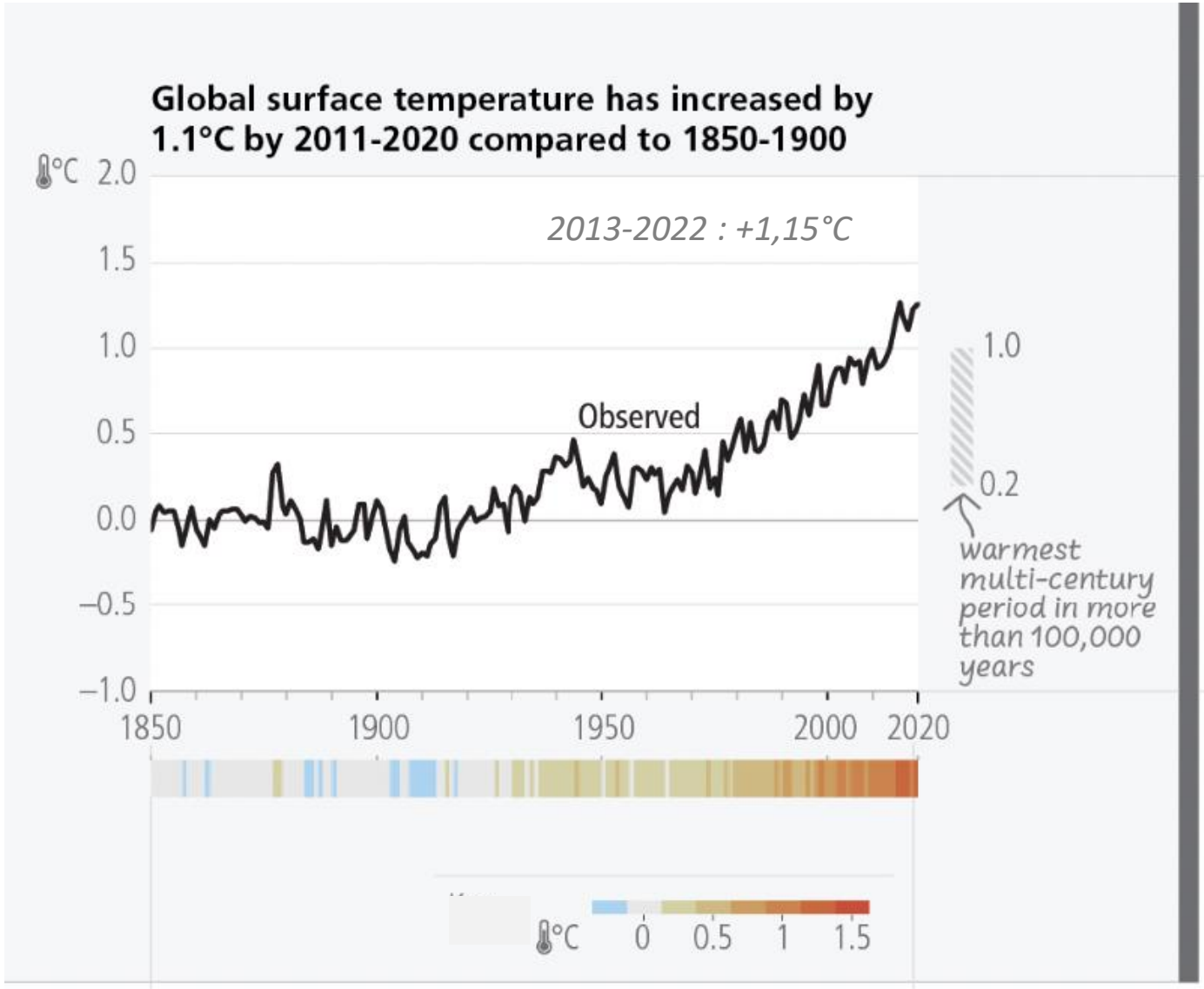


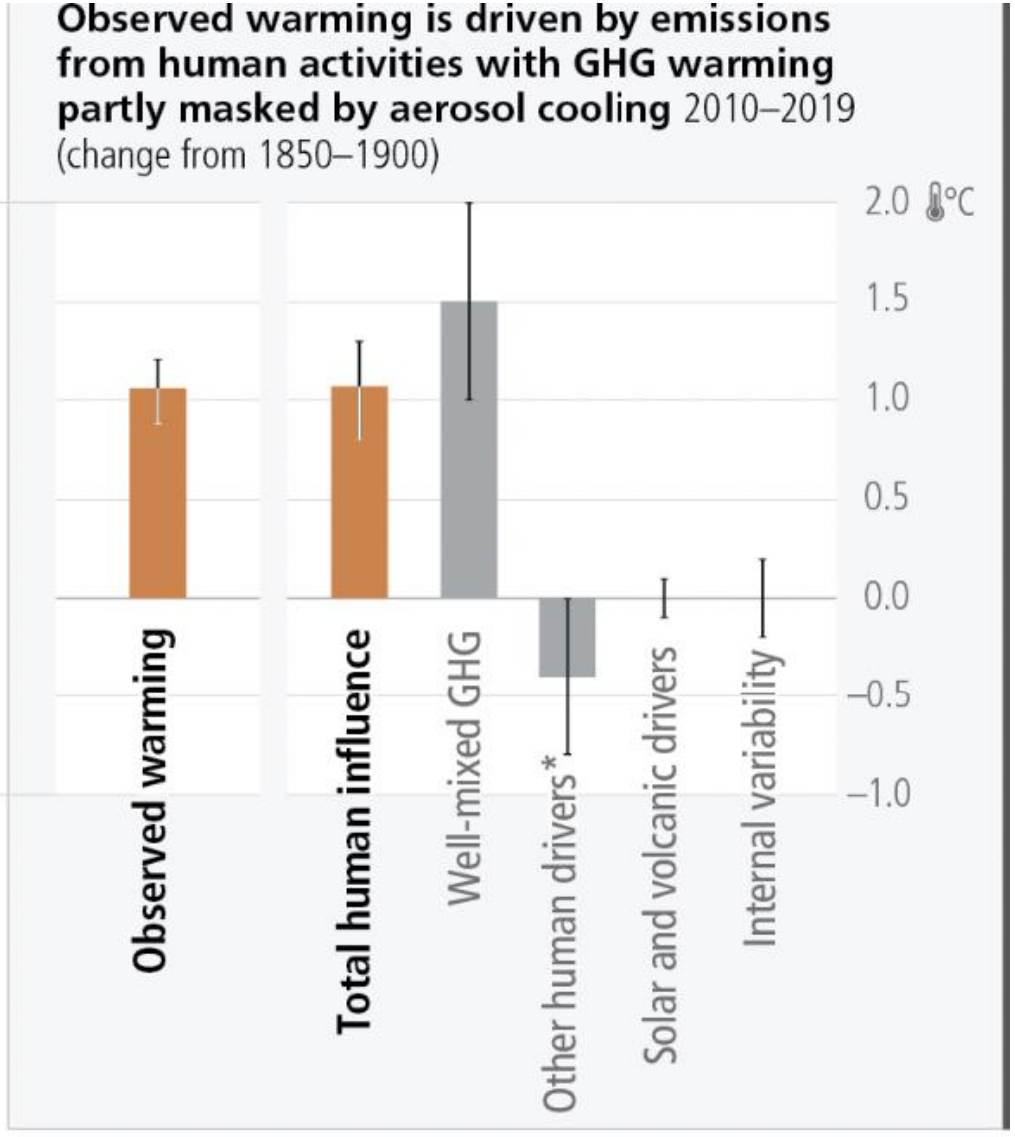
Irreversible ocean heat uptake

Delayed responses from glaciers, the deep ocean, and the Greenland and Antarctic ice sheets

Acceleration of global sea-level rise

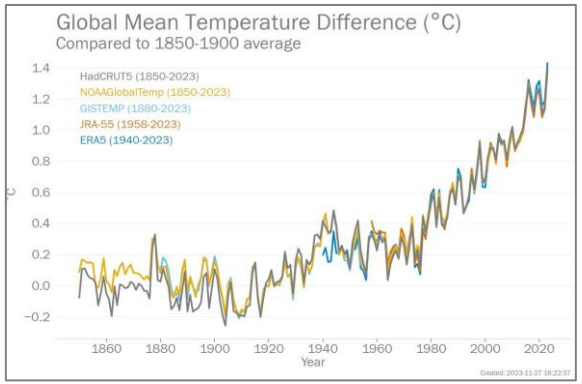
Human activities have unequivocally caused global warming





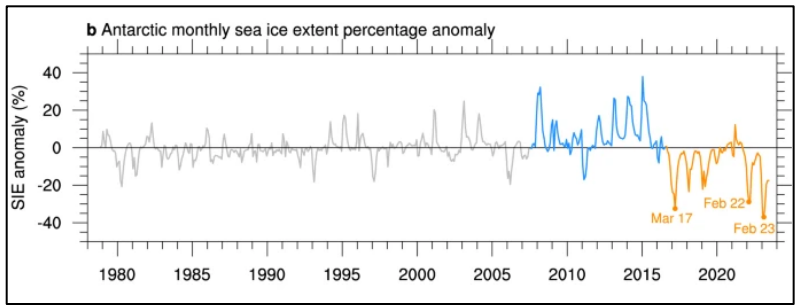
Key indicators of global climate updated in 2022

2023



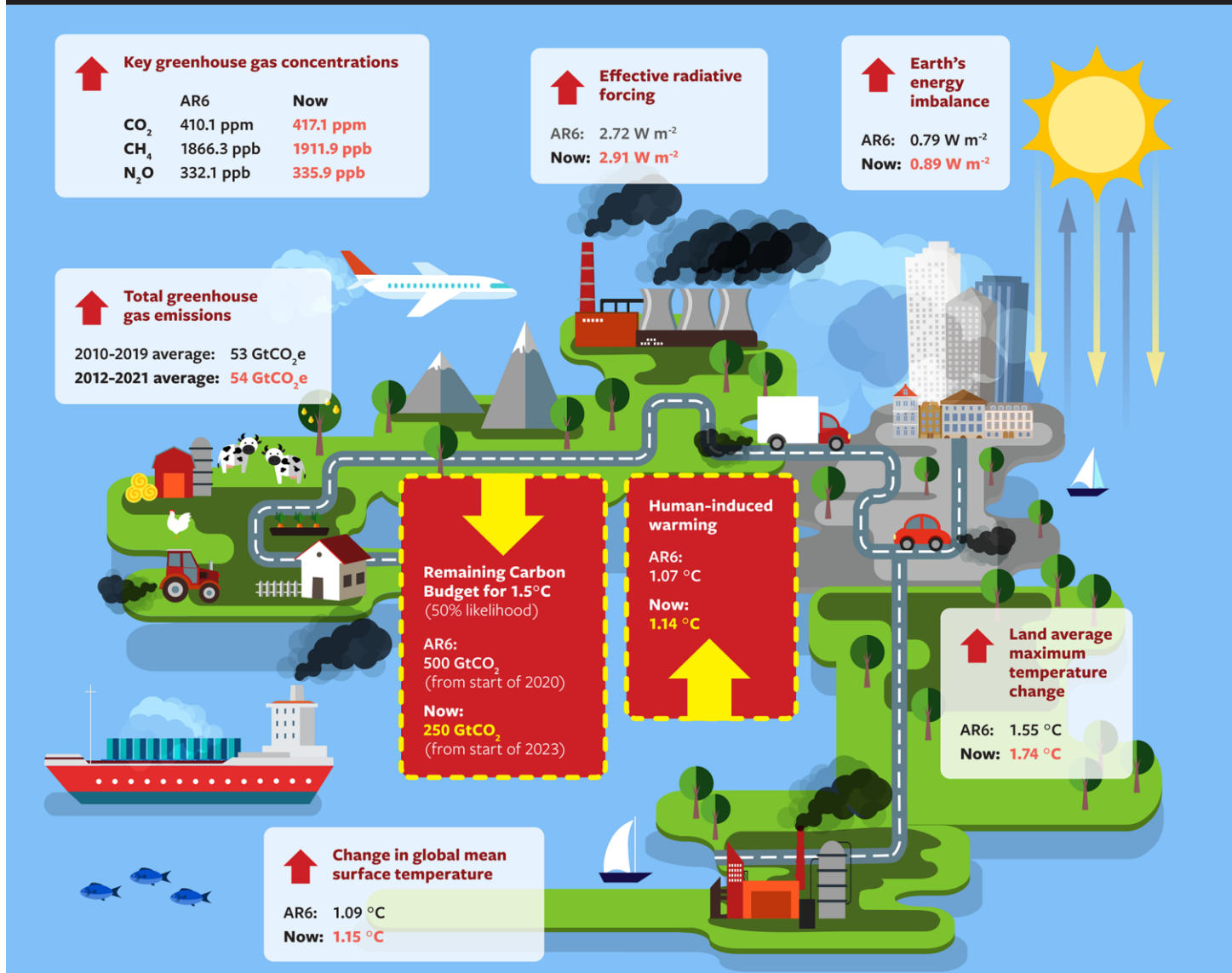
Global surface temperature

Antarctic sea ice



Key indicators of global climate: What's changed since AR6?

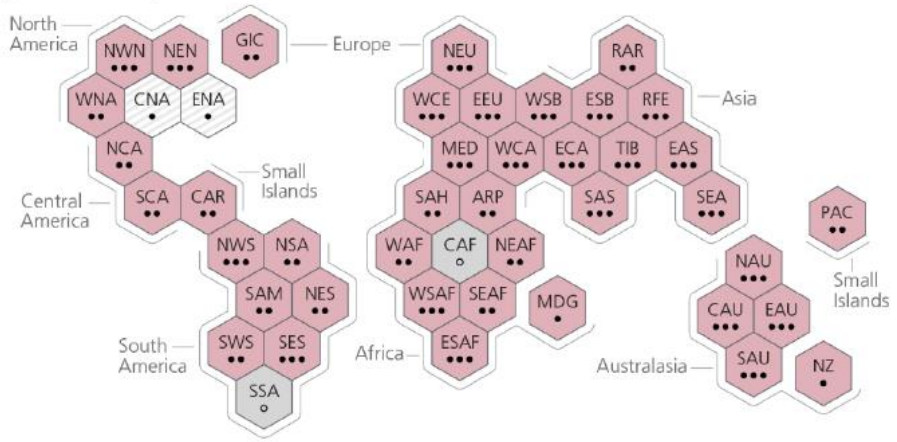
Human-induced warming is increasing at the **unprecedented rate** of over 0.2°C per decade, the result of greenhouse gas emissions being at an all-time high over the last decade, as well as reductions in the strength of aerosol cooling.



Update until 2022 : https://essd.copernicus.org/articles/15/2295/2023/essd-15-2295-2023.html

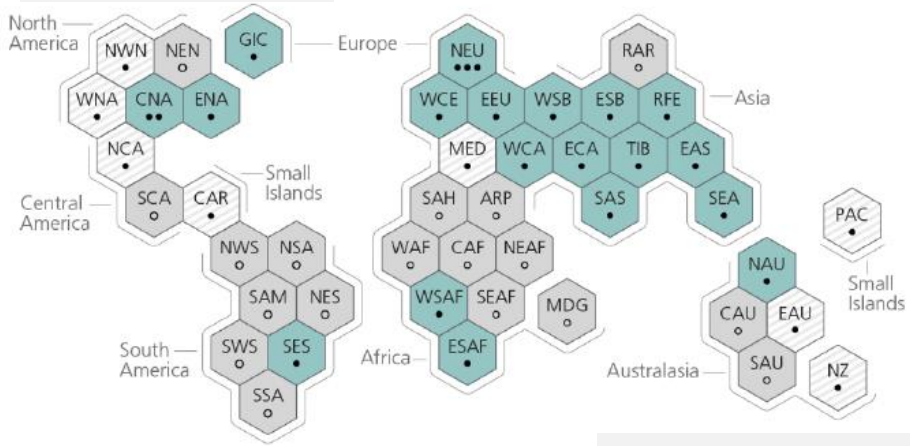
Human-caused climate change increases the frequency and severity of extreme events

Hot extremes

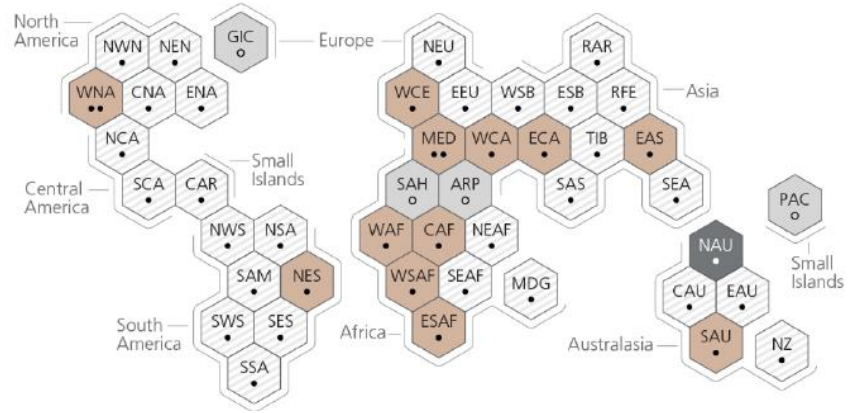


Hazard

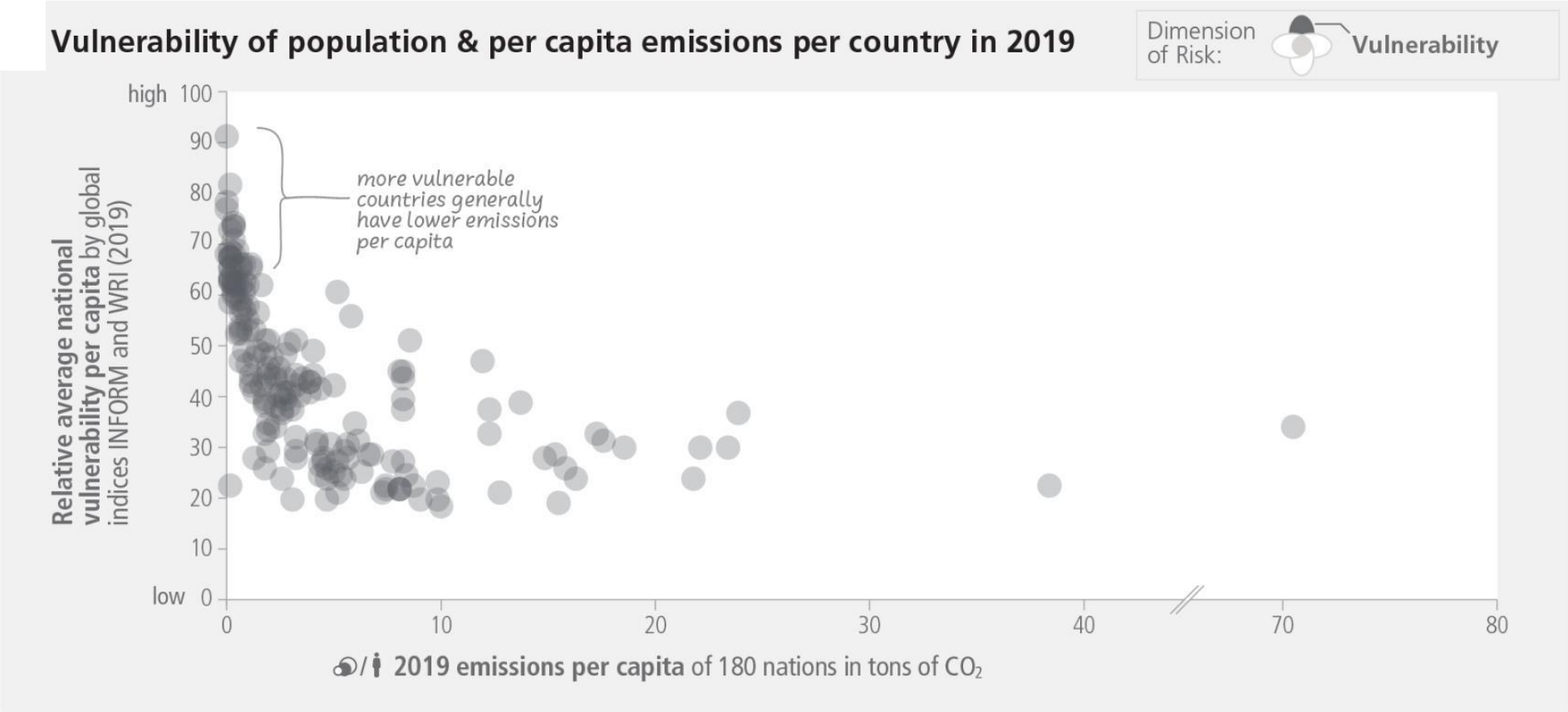
Heavy rainfall



Agricultural drought



Vulnerable communities who have historically contributed the least to current climate change are disproportionately affected



Examples of recent attribution studies

Extreme humid heat in South Asia in April 2023, largely driven by climate change, detrimental to vulnerable and disadvantaged communities

Climate change more than doubled the likelihood of extreme fire weather conditions in Eastern Canada

During May and June 2023 Cana
weather conditions, leading to e
hectares.

22 August, 2023 | WILDFIRE | NC

Extreme poverty rendering Madagascar highly vulnerable to underreported extreme heat that would not have occurred without human-induced climate change

Madagascar, in particular the most populated region around the capital of Antananarivo experienced in 2023 its hottest October ever, breaking many high and low temperature records.

23 November, 2023 | Heatwave | Africa

Climate change increased heavy rainfall, hitting vulnerable communities in Eastern Northeast Brazil

Climate change likely increased extreme monsoon rainfall, flooding highly vulnerable communities in Pakistan

Climate change exacerbated heavy rainfall leading to large scale flooding in highly vulnerable communities in West Africa

From May until October 2022, large parts of West Africa experienced large-scale flooding

16 Nover

Interplay of climate change-exacerbated rainfall, exposure and vulnerability led to widespread impacts in the Mediterranean region

During the first two weeks of September 2023 torrential rain fell in several countries across the Mediterranean, caused by low-pressure systems forming around a blocking high centred over the Netherlands.

19 September, 2023 | EXTREME RAINFALL | AFRICA, EUROPE, MEDITERRANEAN

Vulnerability and high temperatures exacerbate impacts of ongoing drought in Central South America

Human-induced climate change increased drought severity in Horn of Africa

Since October 2020 large parts of Eastern Africa have been experiencing extended dry conditions punc
led to flash floods. The below
2022 season "short rains" was
2020, including the below-ave
Continue reading

27 April, 2023 | DROUGHT | AF

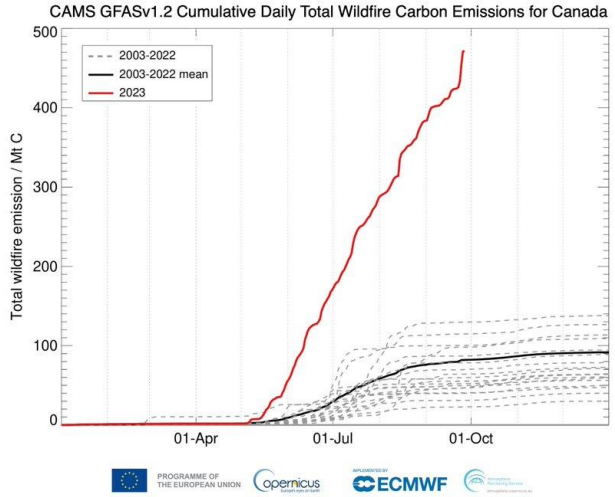
Human-induced climate change compounded by socio-economic water stressors increased severity of drought in Syria, Iraq and Iran

From boreal winter 2020 onwards, a large region in West Asia, encompassing the Fertile Crescent around the rivers Euphrates and Tigris as well as Iran has suffered from exceptionally low rains and elevated temperatures. The resulting 3-year drought has led to severe impacts on agriculture and access to potable water.

08 November, 2023 | Drought | Asia

https://www.worldweatherattribution.org

CO_2 emissions due to wildfires in Canada in 2023



Rapid evaluation based on atmospheric circulation analogues : https://www.climameter.org/

Widespread and substantial impacts and related losses and damages are attributed to human-caused climate change

Water availability and food production

- Physical water availability (••)
- Agriculture/ crop production (••)
- Animal and livestock health and productivity (•)
- Fisheries yields and aquaculture production (••)

Health and well-being

- Infectious diseases (••)
- Heat, malnutrition and harm from wildfire (•••)
- Mental health (•••)
- Displacement (•••)

Cities, settlements and infrastructure

- Inland flooding and associated damages (•••)
- Flood/storm induced damages in coastal areas (•••)
- Damages to infra-structure (•••)
- Damages to key economic sectors (••)

Biodiversity and ecosystems

- Terrestrial ecosystems (•••)
- Freshwater ecosystems (•••)
- Ocean ecosystems (•••)

Includes changes in ecosystem structure, species ranges and seasonal timing

Key

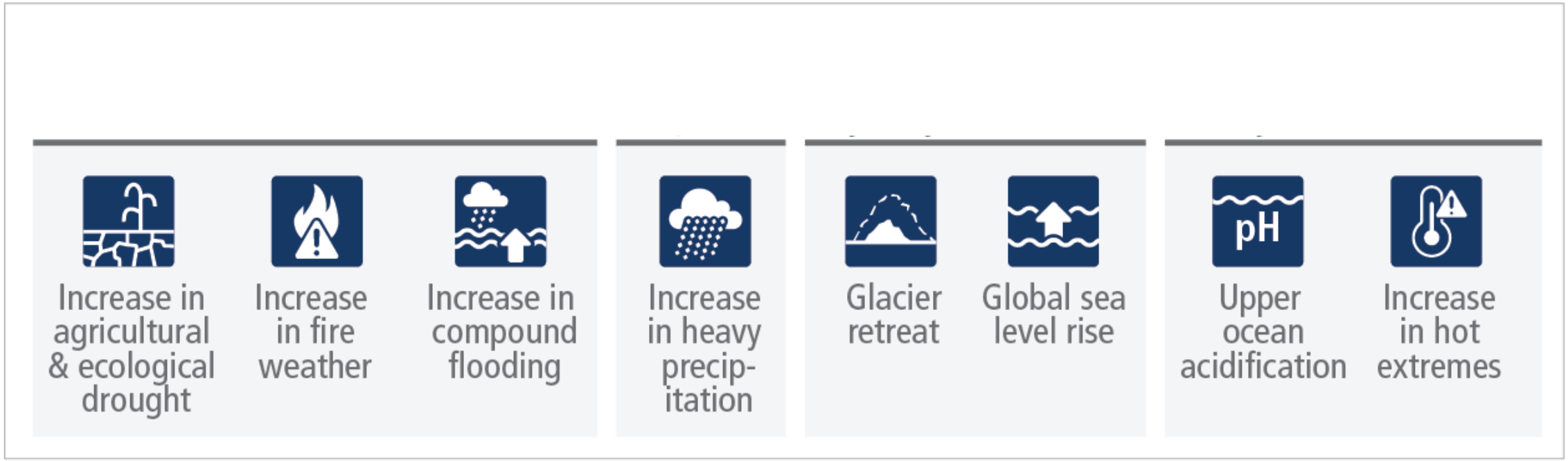
Observed increase in climate impacts to human systems and ecosystems assessed at **global level**

- Adverse impacts
- Adverse and positive impacts
- Climate-driven changes observed, no global assessment of impact direction

Confidence in attribution to climate change

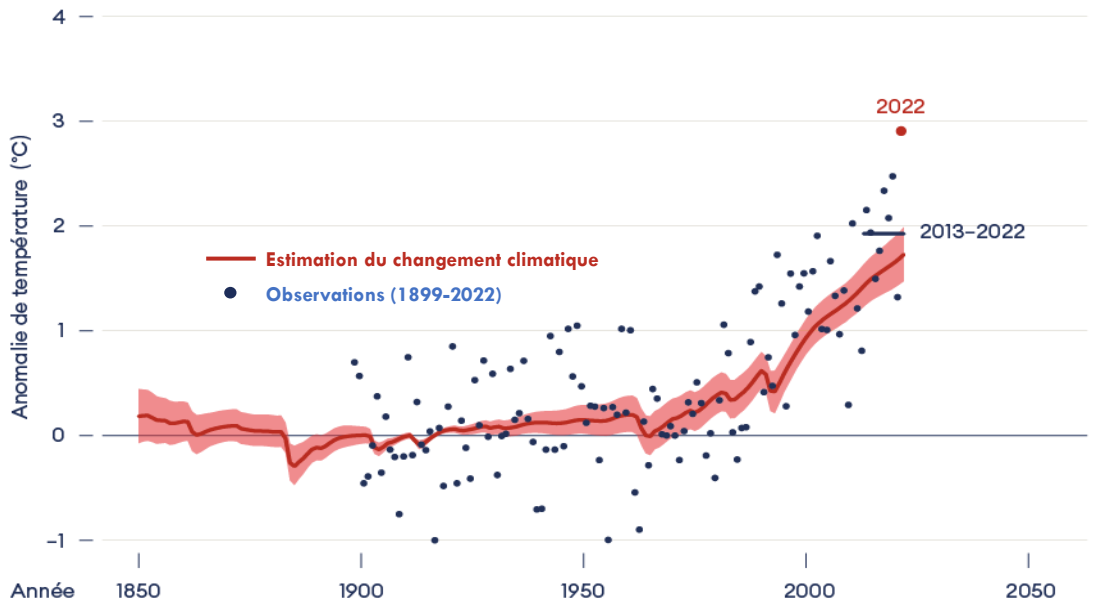
- ••• *High* or *very high confidence*
- •• *Medium confidence*
- • *Low confidence*

Impacts are caused by changes in physical climate conditions, attributed to human influence, which will increase with every further increment of global warming

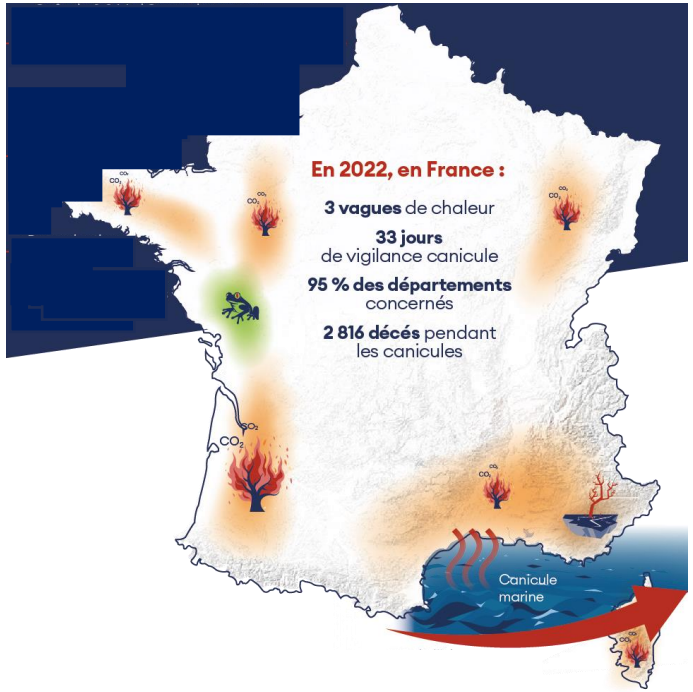


Adverse impacts from human-caused climate change will continue to intensify with every increment of global warming

France is strongly exposed to the consequences of climate change, including for food production, and not ready to face them



2022, cost for insurance companies : **2,9Mrd€**



2023

- Second hottest year after 2022
- Exceptional heatwave 17-24 August
- Hottest fall on record
- Record monthly precipitation in fall and floods in Northern France – severe drought in the South
- Oversea territories : record heat, historical drought (Guyane, Mayotte)

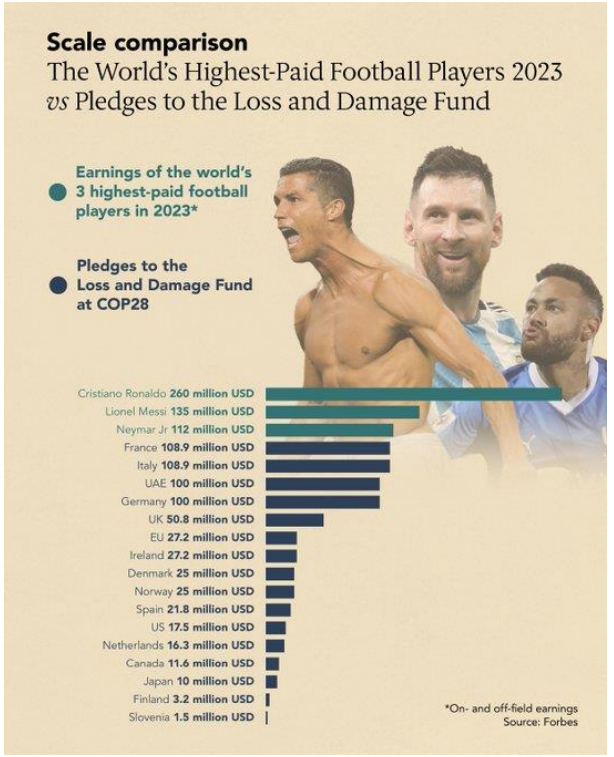
(Météo France, state of climate for 2023)

New loss and damage fund

the adverse effects of climate change, such as climate-related emergencies, sea level rise, displacement, relocation, migration, insufficient climate information and data, and the need for climate-resilient reconstruction and recovery.

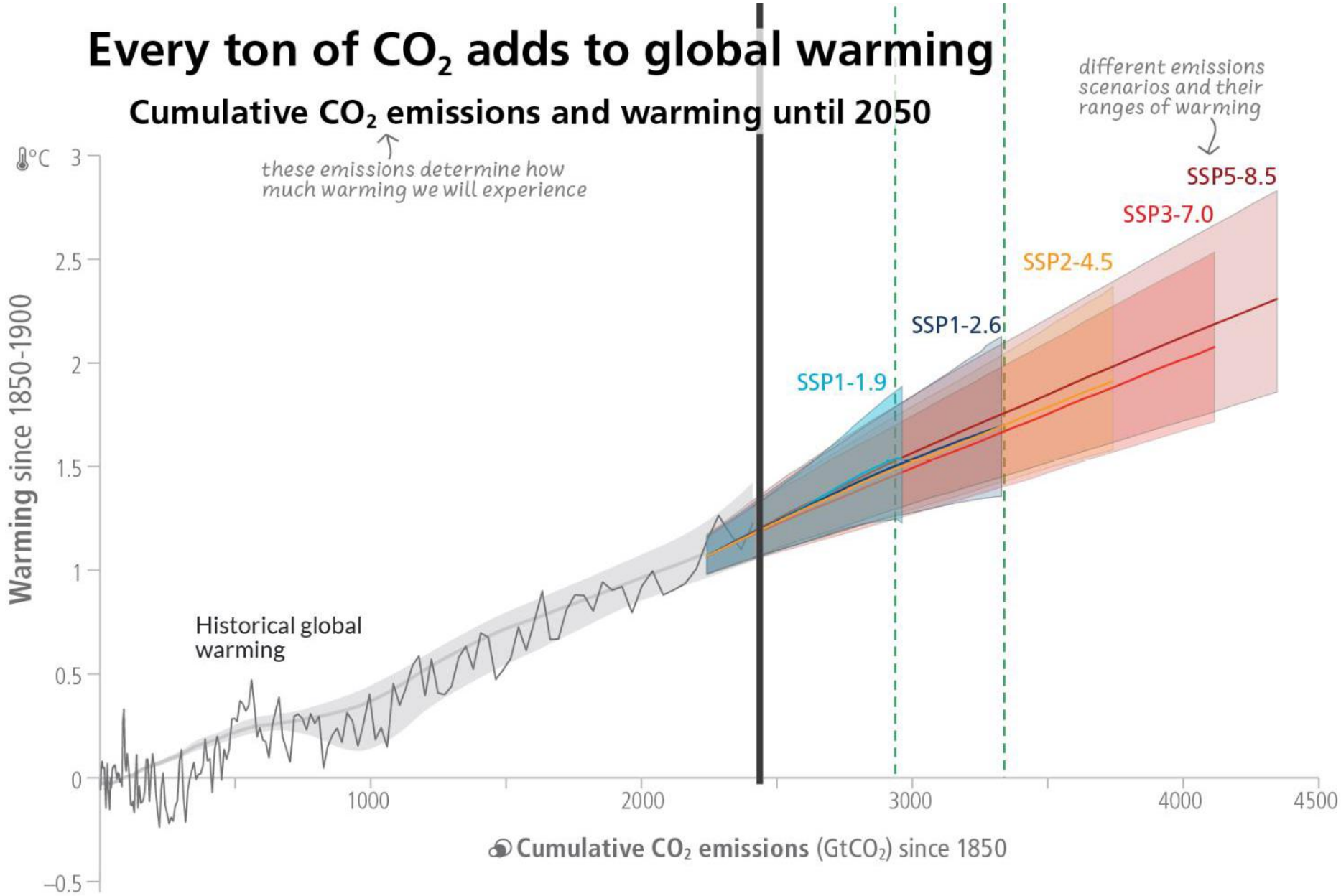
Expected needs by 2030 :
at least 100 and up to 400 billion US $ per year

2023 pledges : 0.77 billion US $



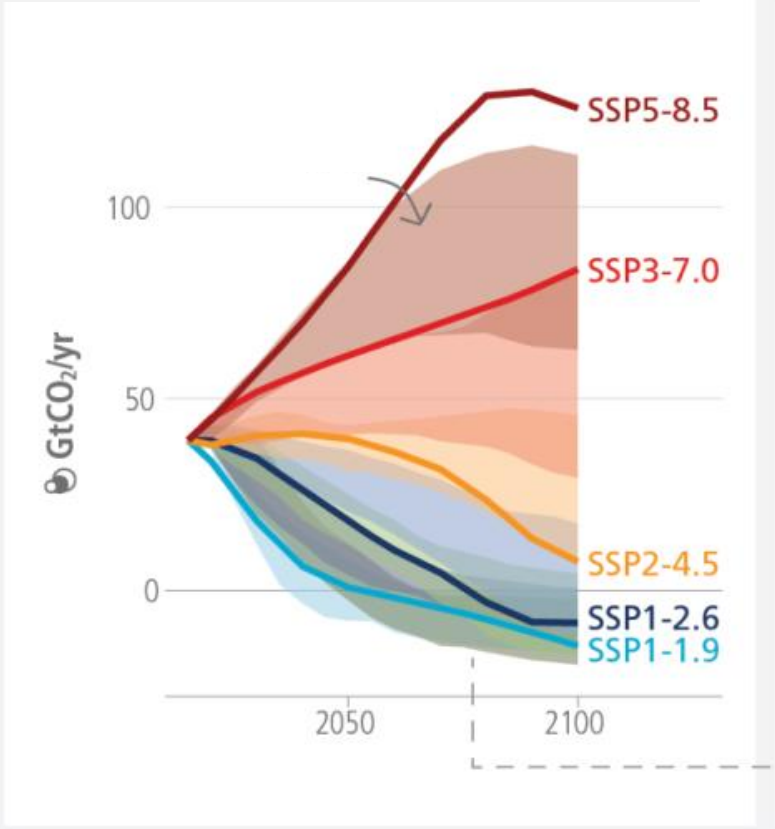
https://www.lossanddamagecollaboration.org/pages/did-cop-28-get-us-closer-to-the-world-we-want-assessing-the-outcome-on-loss-and-damage


What are
possible futures?


Every ton of CO_2 adds to global warming
Cumulative CO_2 emissions and warming until 2050
these emissions determine how much warming we will experience
different emissions scenarios and their ranges of warming
SSP5-8.5
SSP3-7.0
SSP2-4.5
SSP1-2.6
SSP1-1.9
Historical global warming
°C
3
2.5
2
1.5
1
0.5
0
−0.5
Warming since 1850-1900
1000
2000
3000
4000
4500
Cumulative CO_2 emissions ($GtCO_2$) since 1850

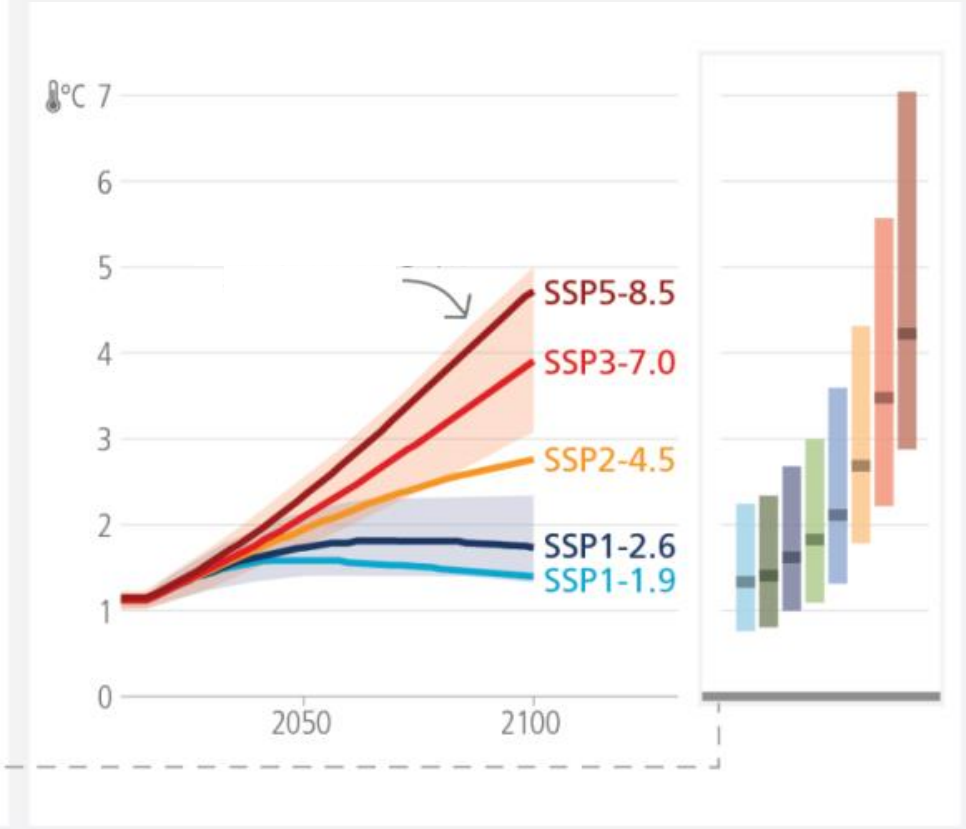
Future emissions will cause future warming
Global warming of 1.5°C will be reached in the early 2030s

Emissions
scenarios and pathways



+ emissions of short-lived compounds

Global surface temperature change

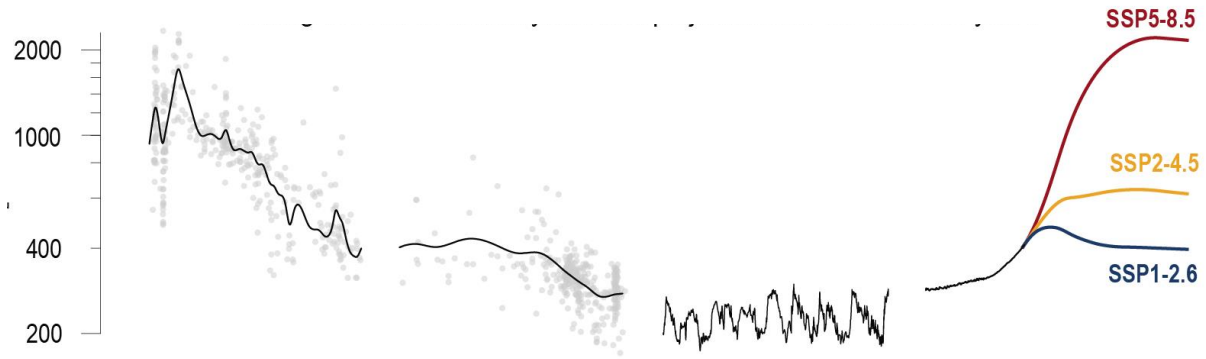


+ modulation by natural variability

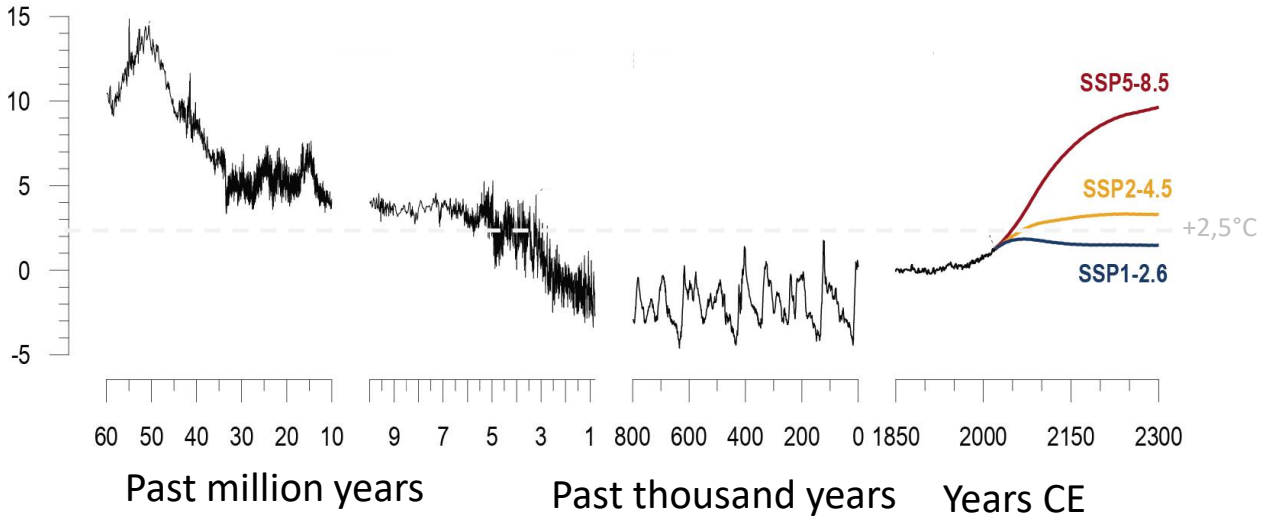
in the case of sharp emission reductions, discernable effets within 20 years on global surface temperature

Projections by 2300 in the context of past climate variations

Atmospheric CO_2 concentration (ppm)

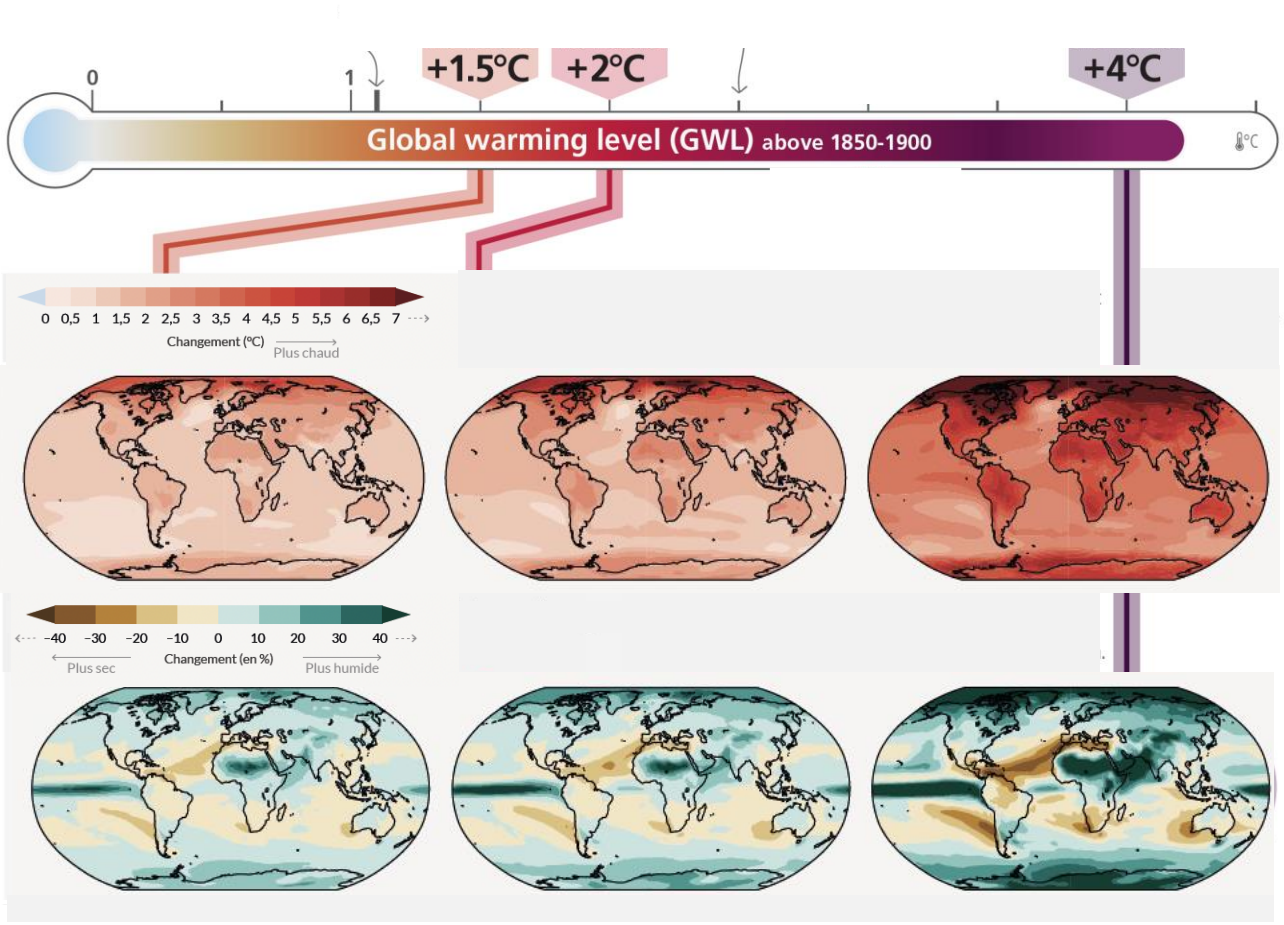


Change in global mean surface temperature compared to 1850-1900 (°C)



With every increment of global warming, regional changes in mean climate become more widespread and pronounced

Change in annual mean temperature



Change in annual mean precipitation

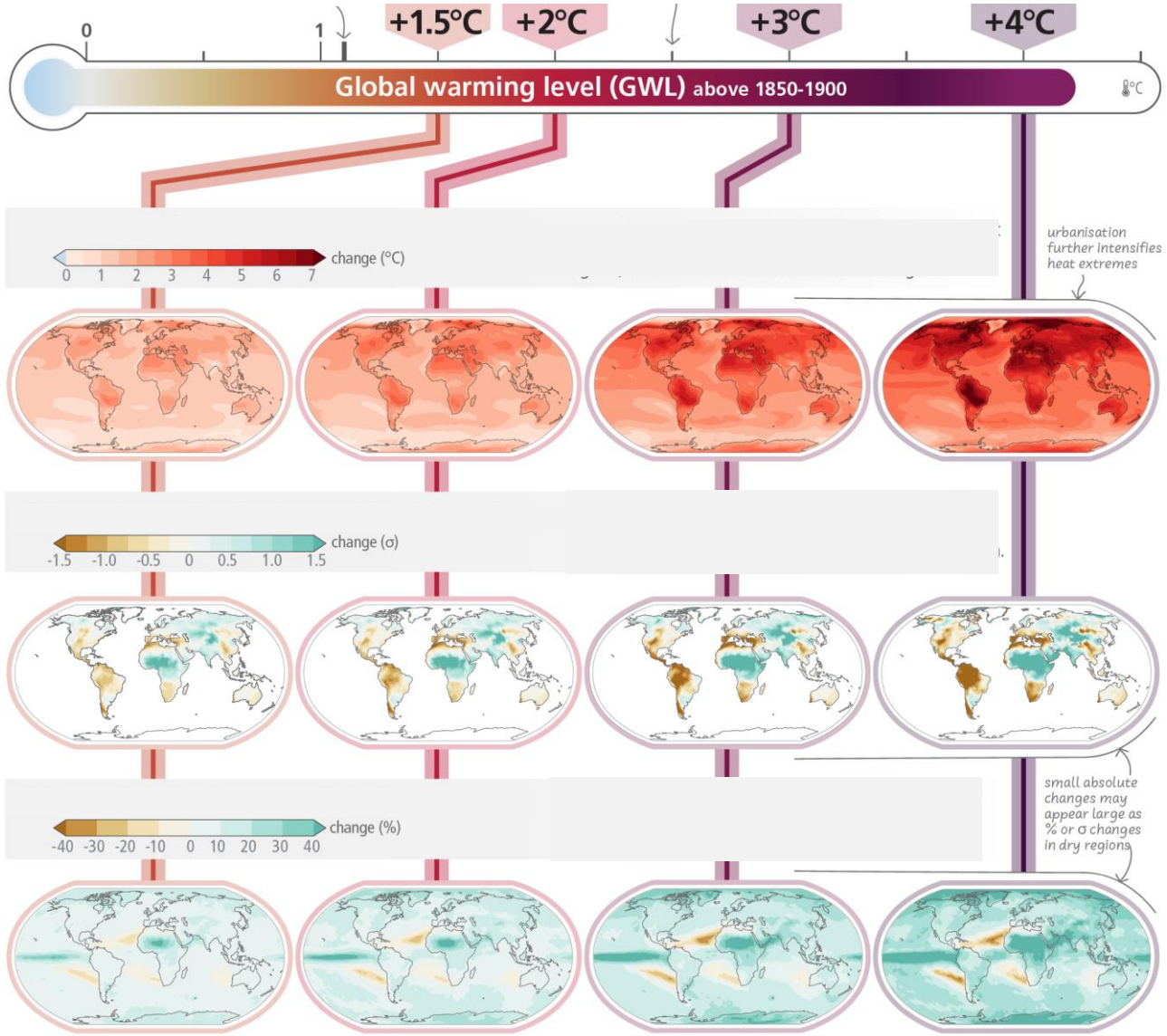
https://interactive-atlas.ipcc.ch/

With every increment of global warming, regional changes in mean climate and extremes become more widespread and pronounced

Change in hottest day temperature (°C)

Change in annual mean soil moisture

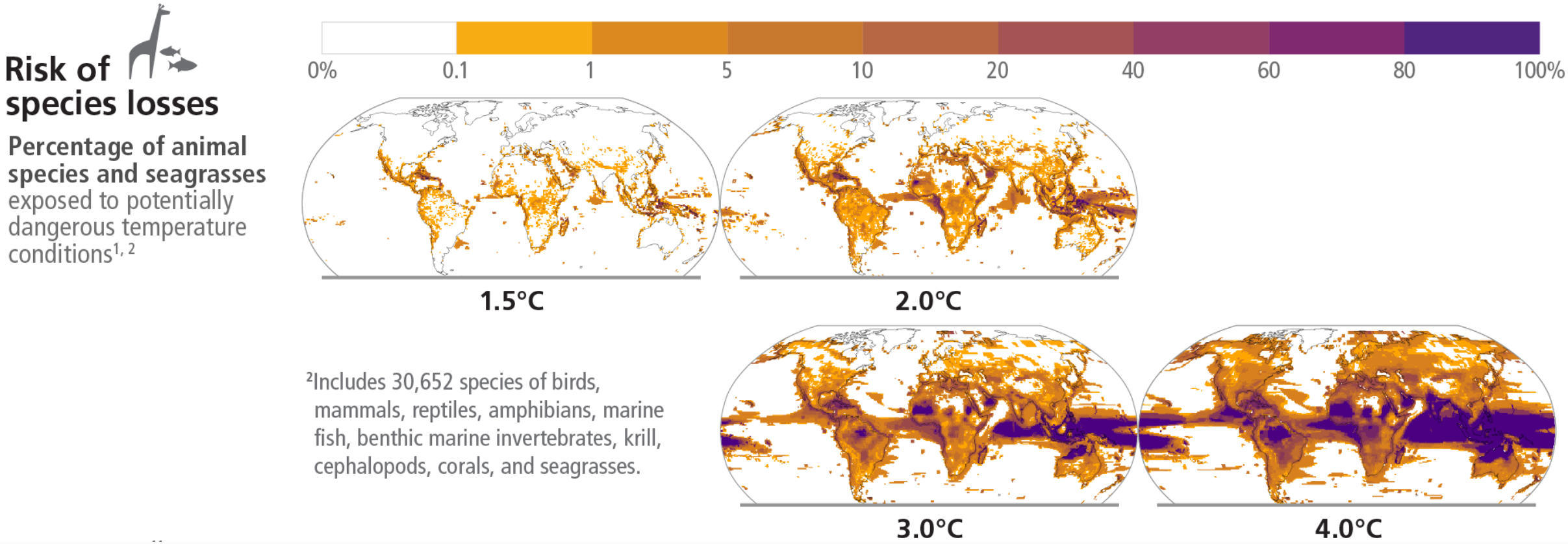
Change in wettest day precipitation (%)



Intensification of the water cycle and its variability

Future climate change is projected to increase the severity of impacts across natural and human systems and will increase regional differences

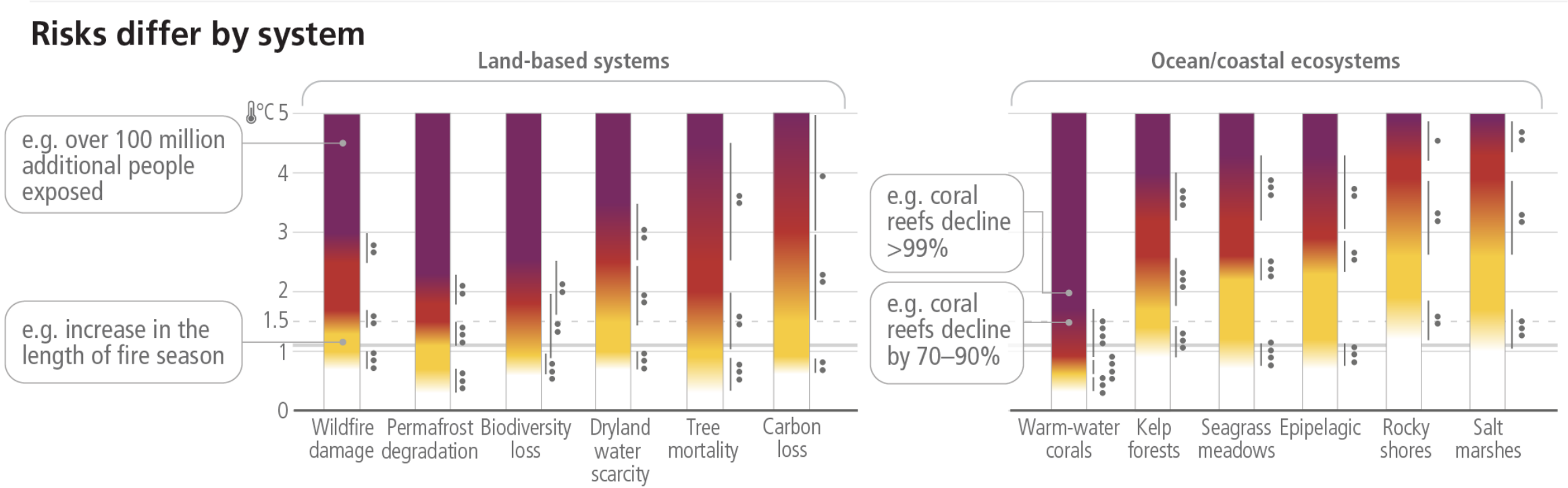
Examples of impacts without additional adaptation



Conservation, protection and restauration of ecosystems

Future climate change is projected to increase the severity of impacts across natural and human systems and will increase regional differences

Examples of impacts without additional adaptation

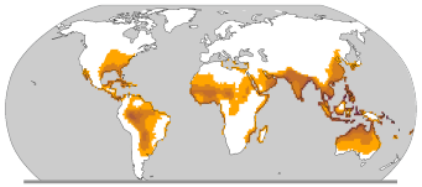


Loss of efficiency of adaptation options related to water and based on ecosystems

Future climate change is projected to increase the severity of impacts across natural and human systems and will increase regional differences

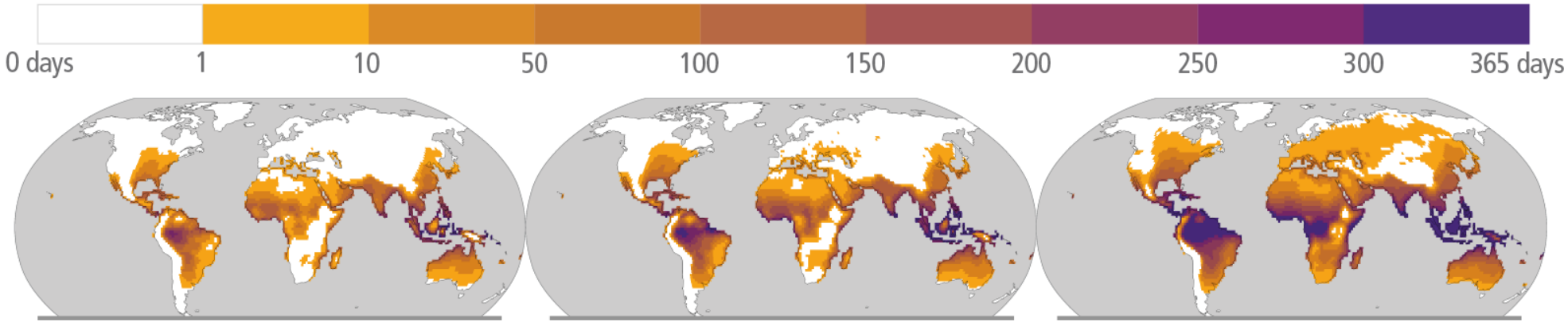
Examples of impacts without additional adaptation

Heat-humidity risks to human health



Historical 1991–2005

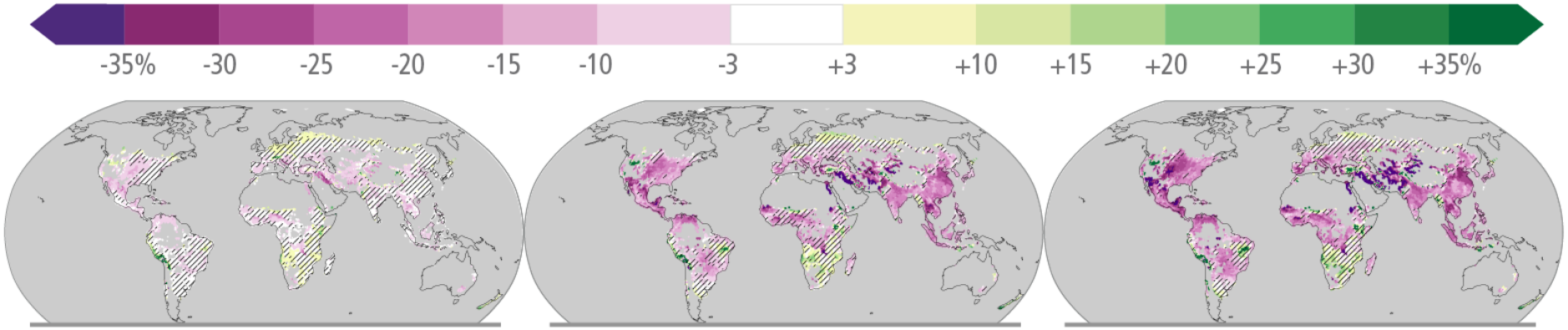
Days per year where combined temperature and humidity conditions pose a risk of mortality to individuals[3]



Future climate change is projected to increase the severity of impacts across natural and human systems and will increase regional differences

Examples of impacts without additional adaptation

Food production impacts



Maize yield[4]

Changes (%) in yield

1.6 – 2.4°C

3.3 – 4.8°C

3.9 – 6.0°C

Fisheries yield[5]

Changes (%) in maximum catch potential

0.9 – 2.0°C

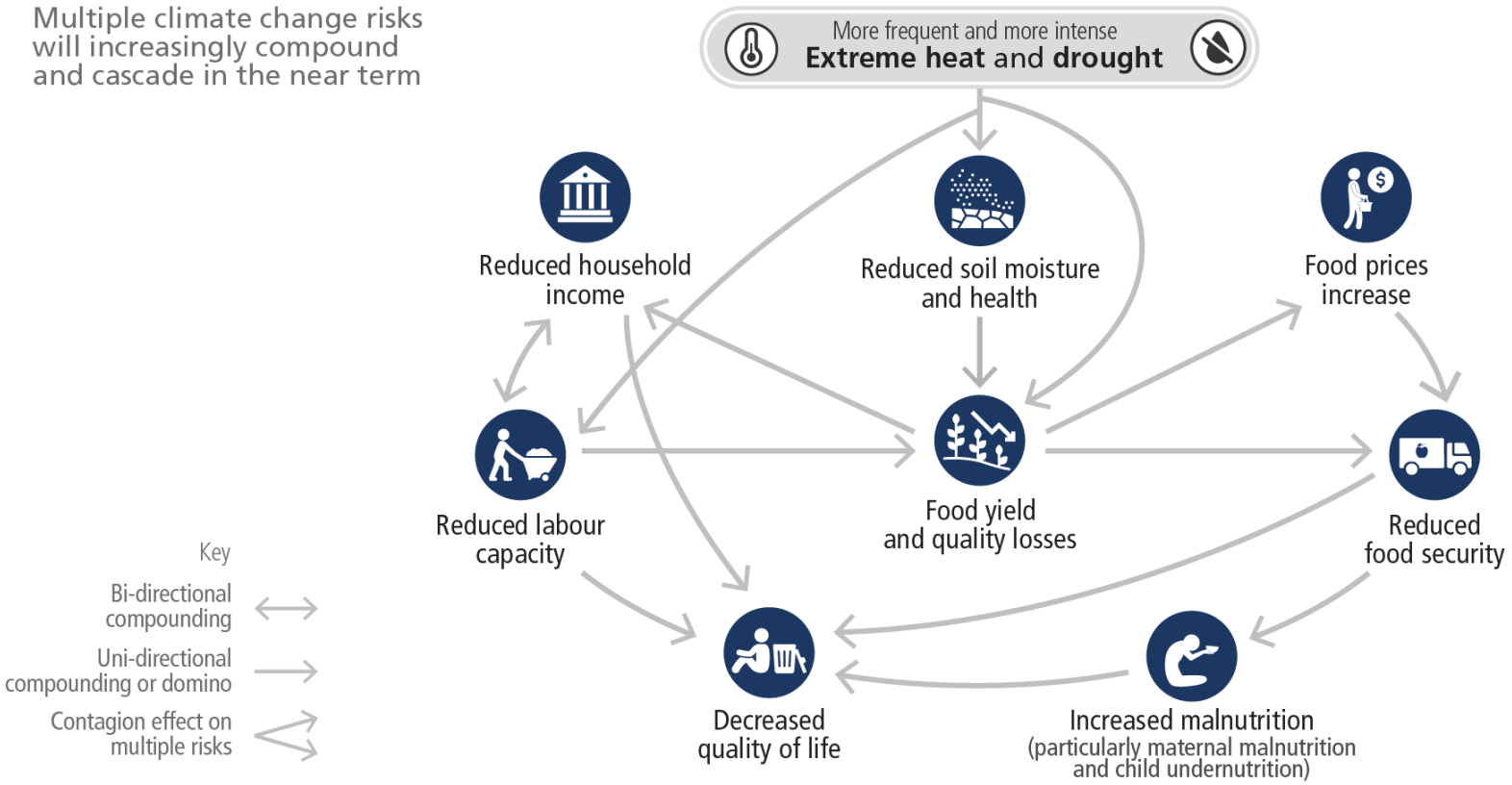
3.4 – 5.2°C

Areas with little or no production, or not assessed

Areas with model disagreement

Climate-related risks are increasingly complex and difficult to manage

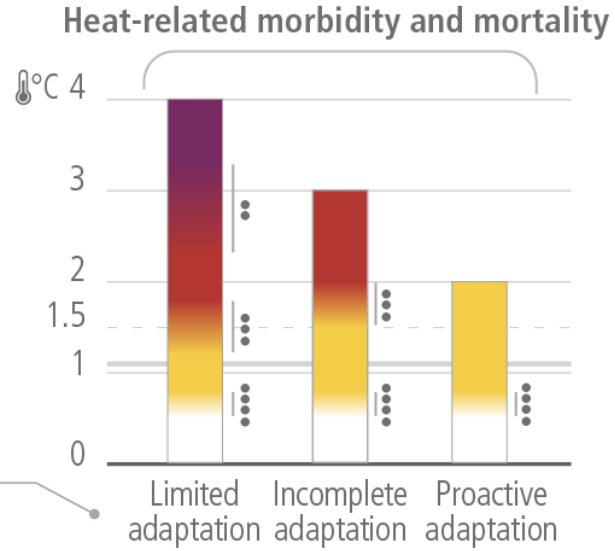
Example of complex risk, where impacts from climate extreme events have cascading effects on food, nutrition, livelihoods and well-being of smallholder farmers

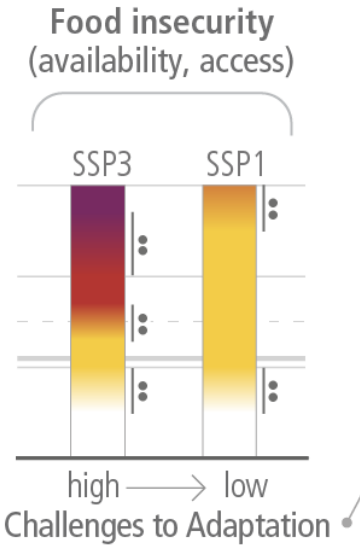


Losses and damages are part of our future, hitting the most vulnerable ecosystems and people especially hard, but the actions we take now will make a difference

Adaptation and socio-economic pathways affect levels of climate related risks

Limited adaptation (failure to proactively adapt; low investment in health systems); incomplete adaptation (incomplete adaptation planning; moderate investment in health systems); proactive adaptation (proactive adaptation management; higher investment in health systems)

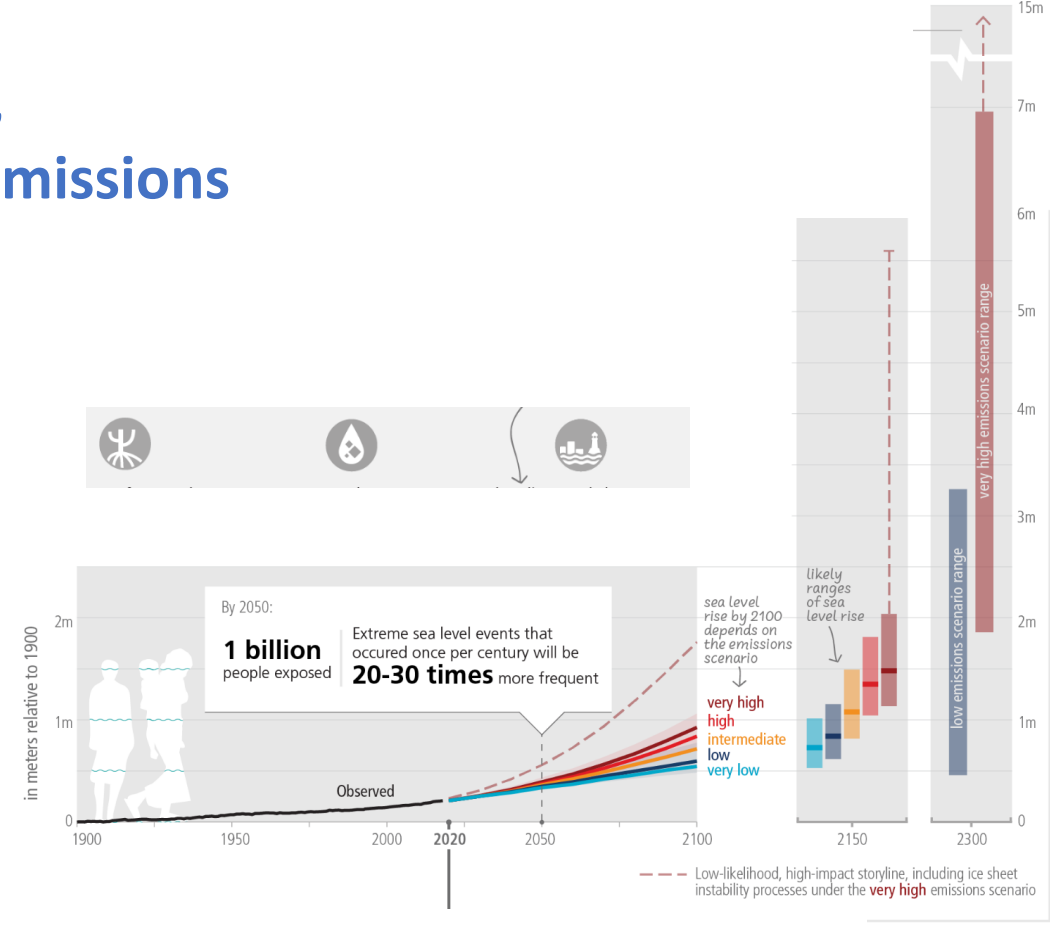




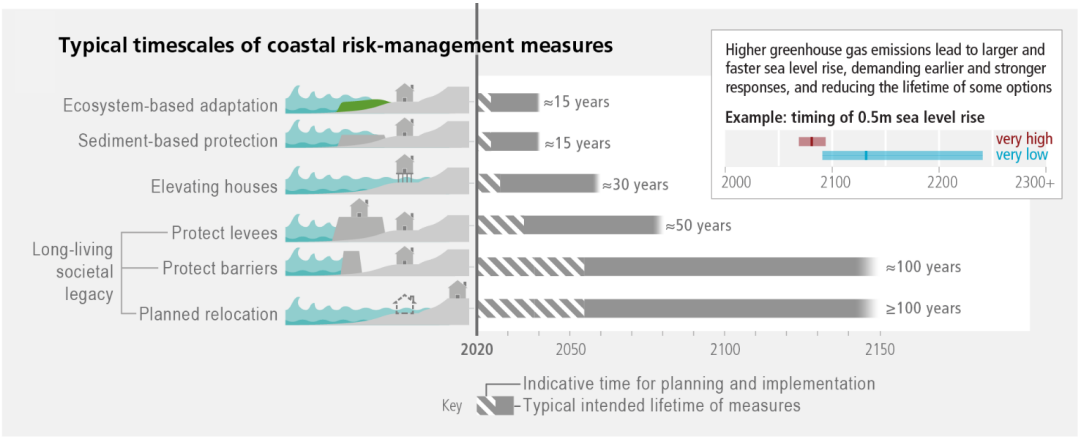
The SSP1 pathway illustrates a world with low population growth, high income, and reduced inequalities, food produced in low GHG emission systems, effective land use regulation and high adaptive capacity (i.e., low challenges to adaptation). The SSP3 pathway has the opposite trends.

Sea level rise will continue for millennia, but how fast and how much depends on future emissions

The probability of abrupt / irreversible changes increases with the level of global warming

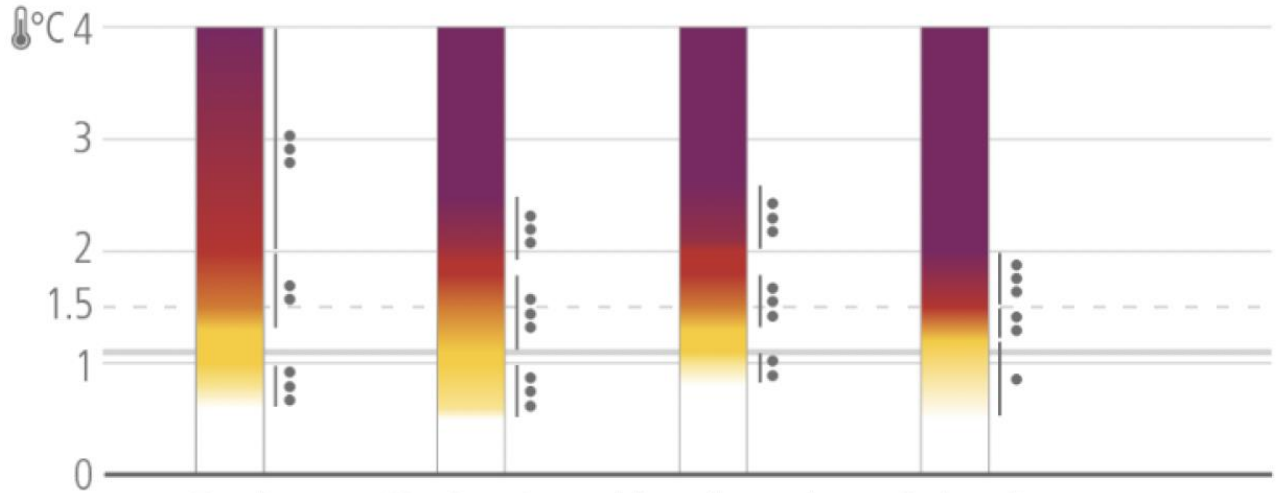


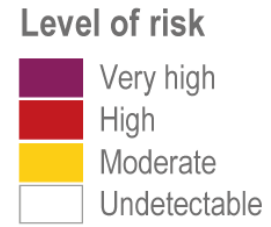
Responding to sea level rise requires long-term planning



Every increment of global warming intensifies key risks in every region

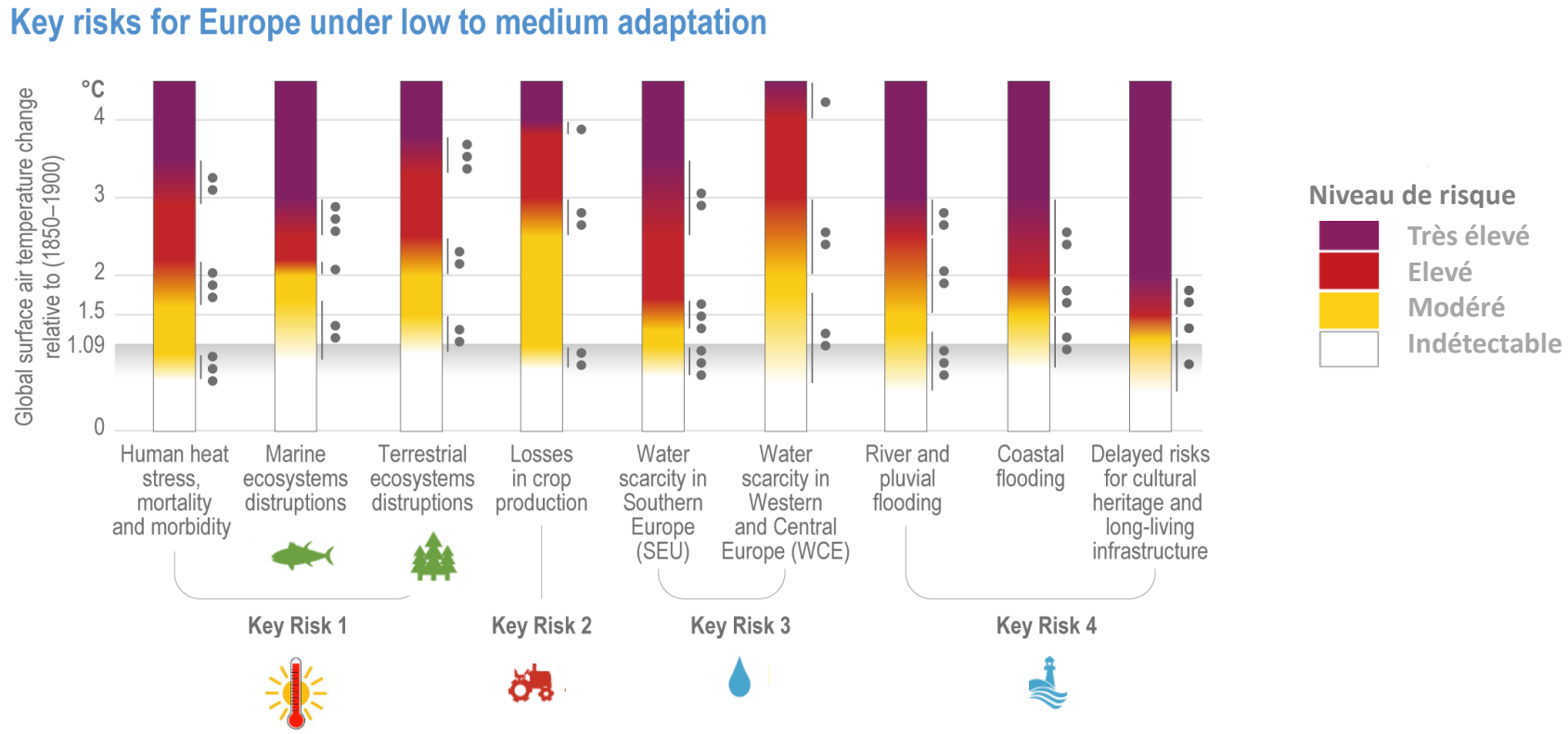
Africa





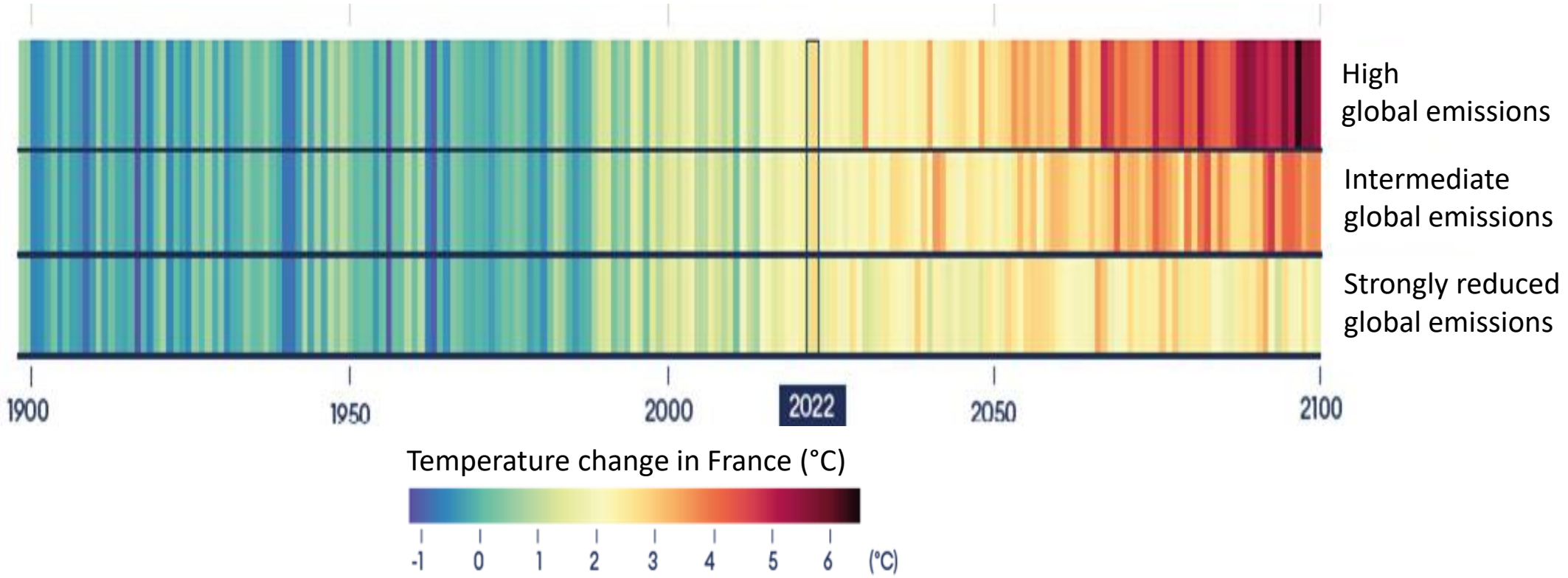
Migrations
Cultural heritage
Reduced economic growth

Every increment of global warming intensifies key risks in every region



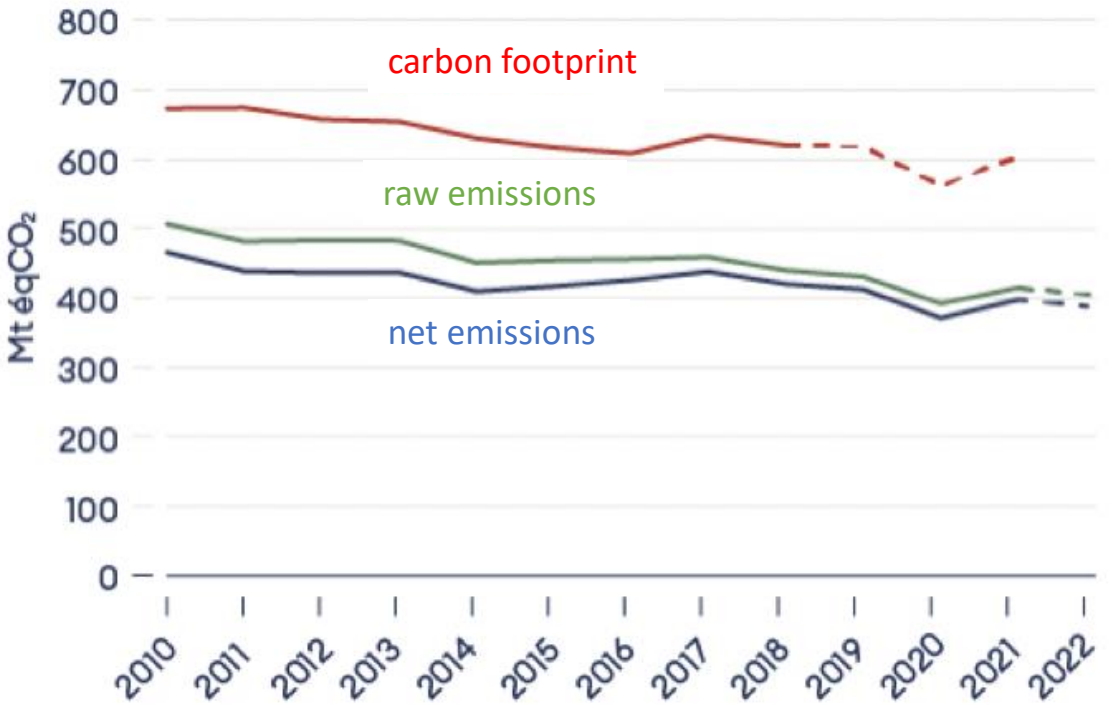
Small islands

- By 2050-2060, 2°C of global warming imply 3°C warming for France (= record temperature in 2022)
- By 2100, 3°C of global warming imply around 4°C for France
- Reference framework for adaptation including low likelihood, high impact eventualities
- Adaptation must shift from the current prevalent mode today to become transformative,
  building on scientific knowledge and anticipating costs




How to accelerate climate action?

France greenhouse gas emissions



Raw emissions
2021-2022 : -2.7%
2022-2023 : -4,6% (partial estimate)

Conjunctural factors (energy, inflation)

The second carbon budget (2019-2023) could be exceeded when accounting for the weaker managed forest sink

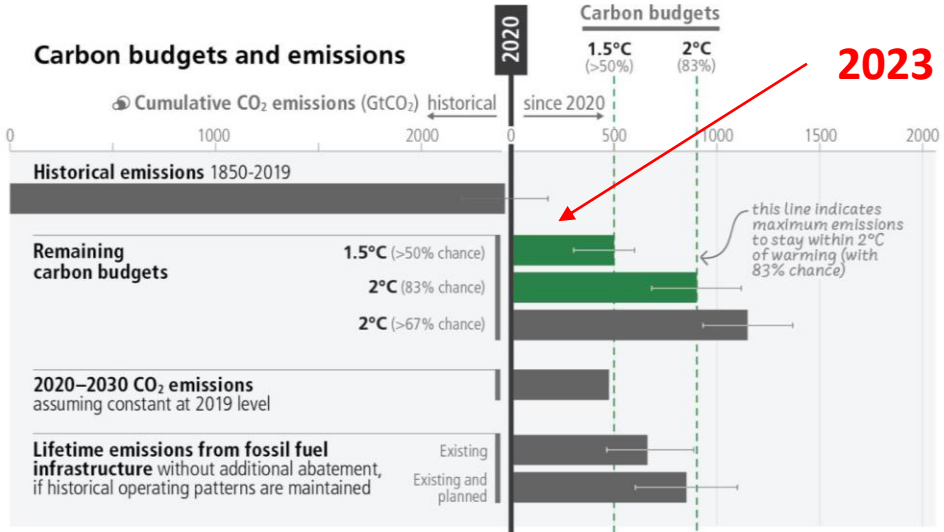
Rates of emission reductions should almost double in 2023-2030 compared to 2019-2022 to be compliant with targets

Accelerated efforts are needed in each sector supported by just transition economical policies

Food system, 22% of the French carbon footprint (including 46% from imported emissions)

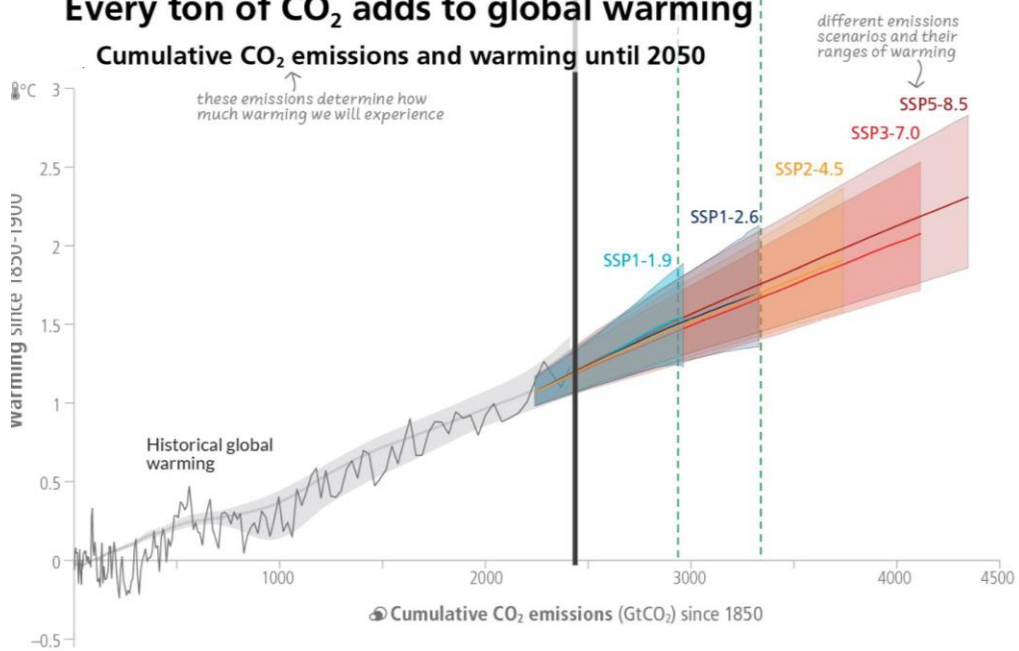
Remaining carbon budgets to limit warming to 1.5°C could soon be exhausted, and those for 2°C largely depleted

Remaining carbon budgets are similar to emissions from use of existing and planned fossil fuel infrastructure, without additional abatement

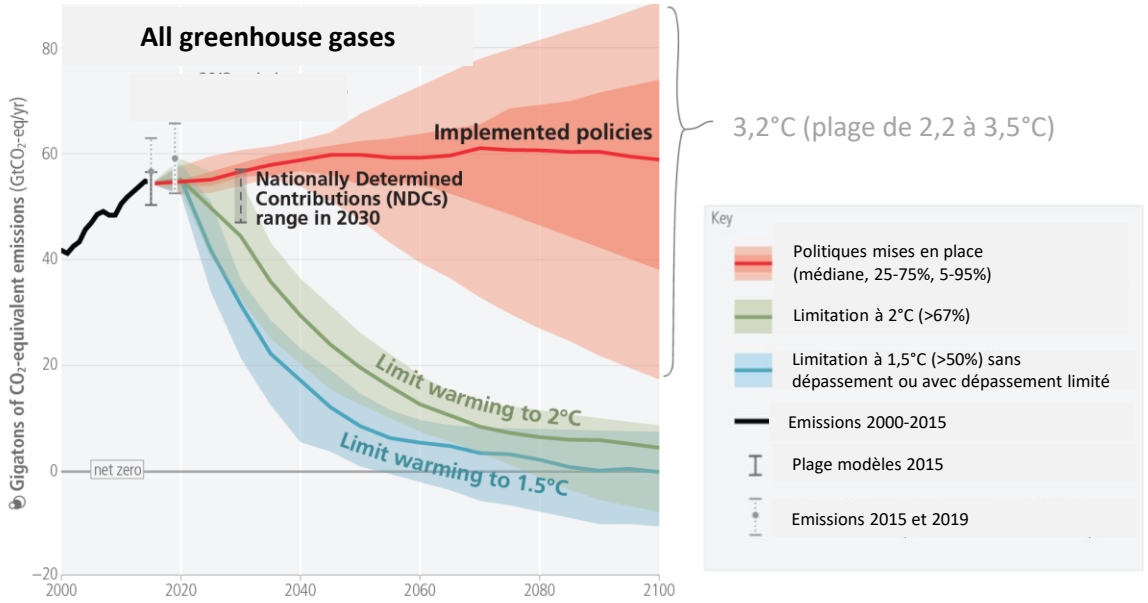


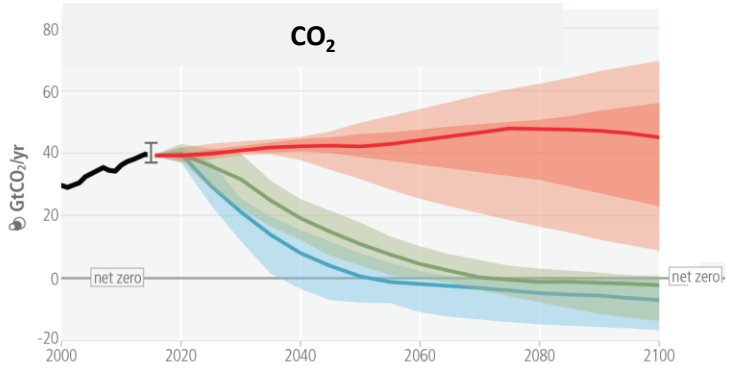
2023 update : divided by 2

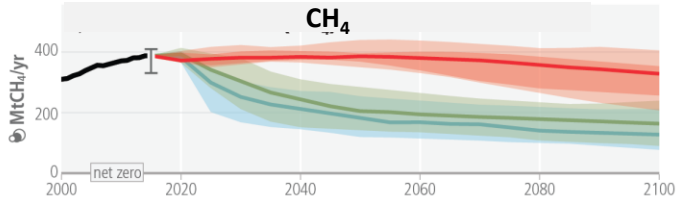
Every ton of CO_2 adds to global warming



Limiting global warming well below 2°C and close to 1.5°C requires immediate, rapid and deep reductions in greenhouse gas emissions



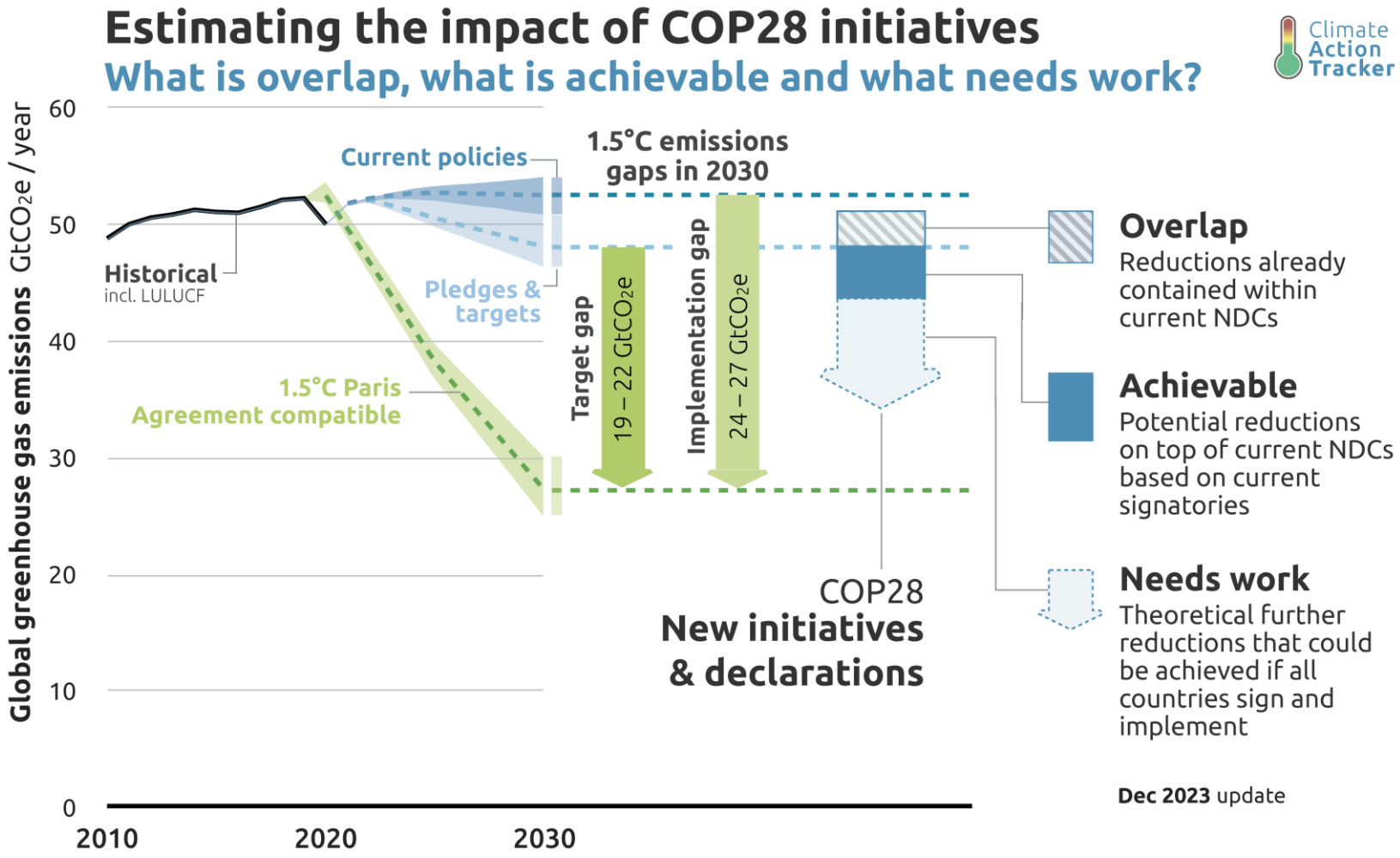




Technical potential to divide emissions by a factor of 2 by 2030 when combining technological innovation, demand management and ecosystem-based responses

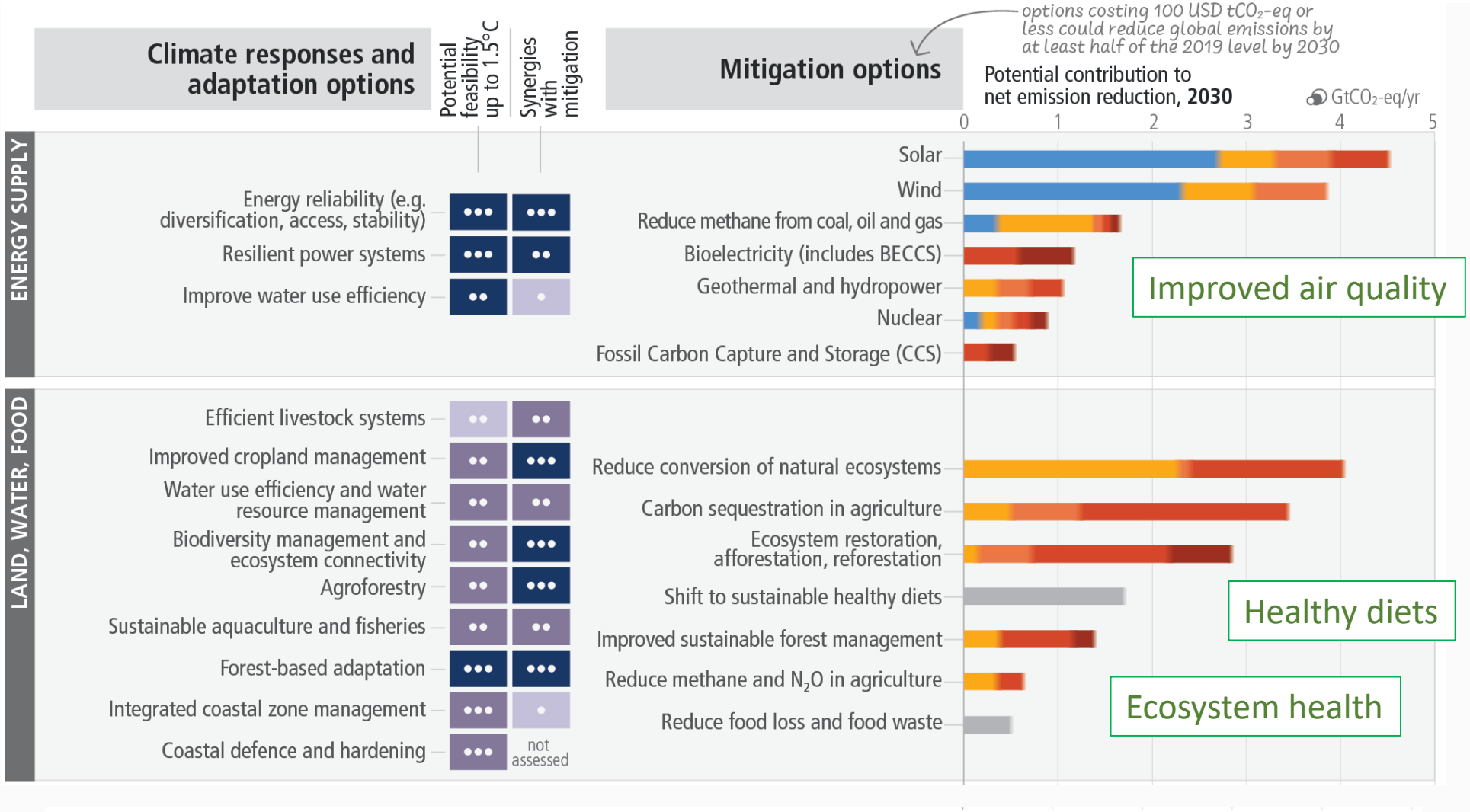
COP28 outcomes

- Global framework for adaptation
- Energy transition



There are multiple opportunities for scaling up climate action

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



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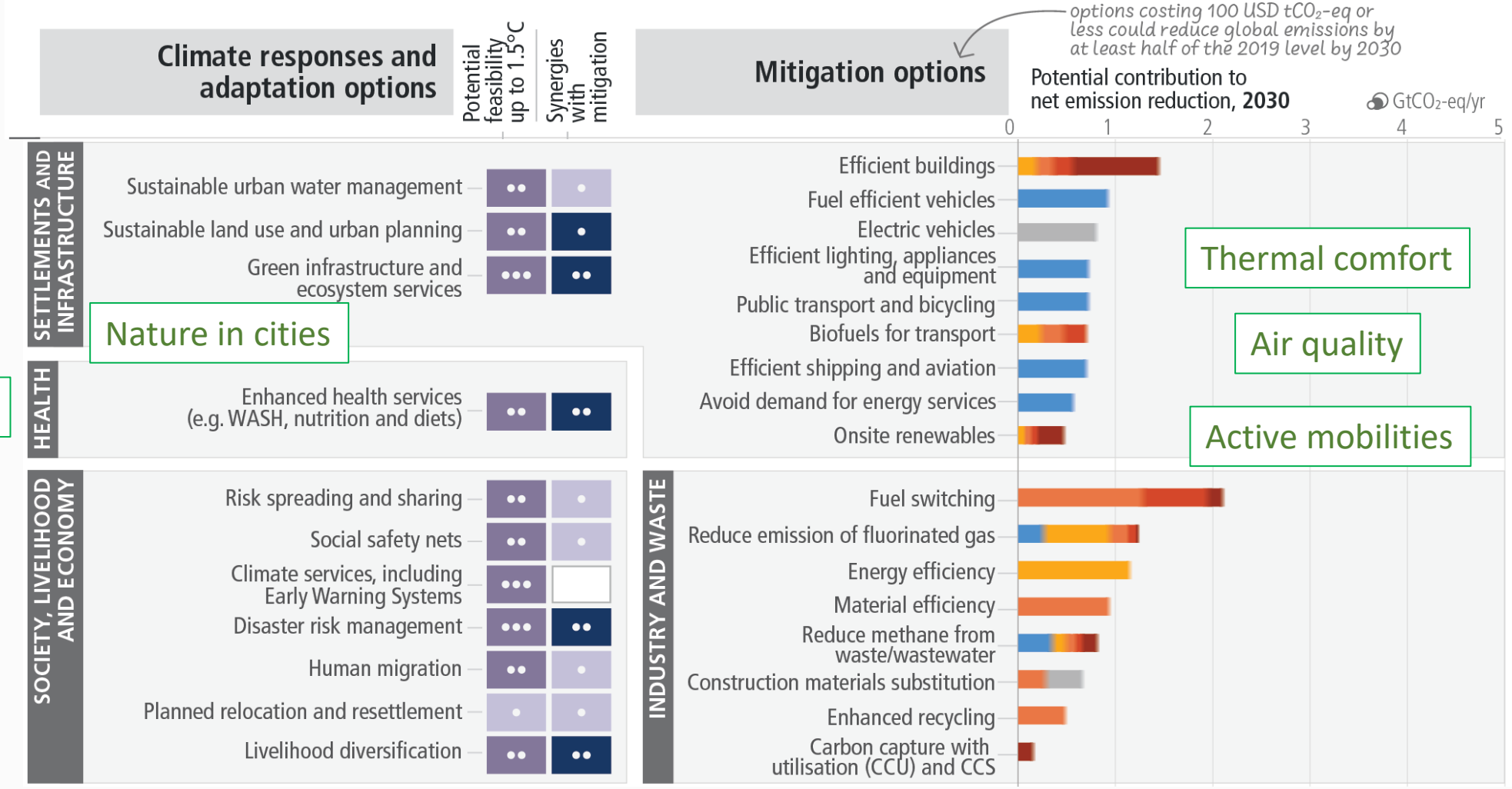
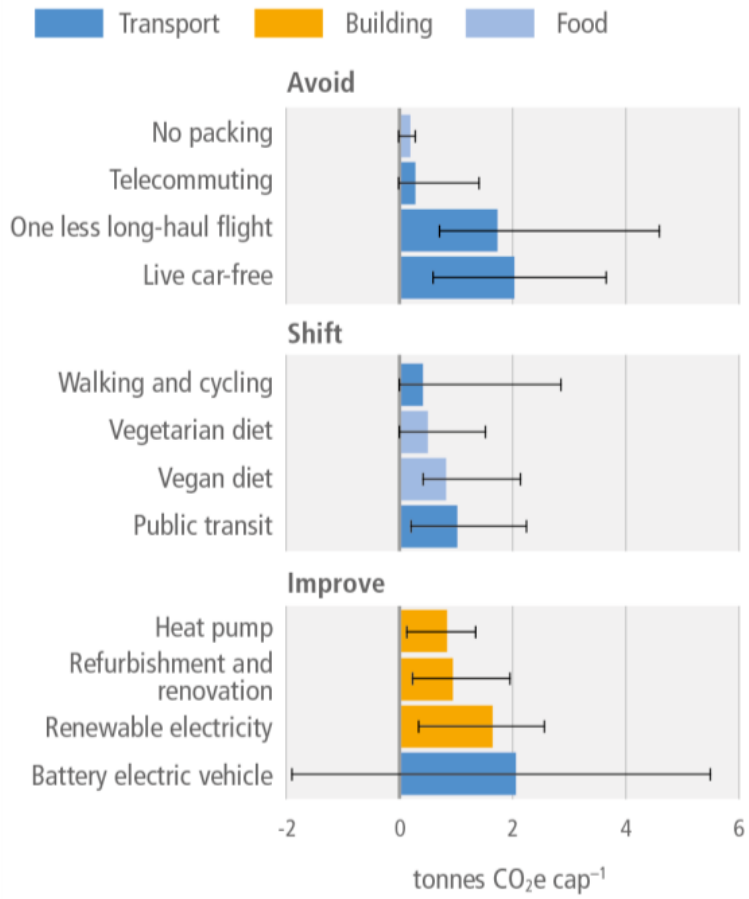


Strategies and infrastructures to enable low-carbon lifestyles



Demand-side options (efficiency, sufficiency) :
40 - 70% of global greenhouse gas emission reduction potential by 2050

Equity and just transition

Quality of life, well-being and health benefits

Sufficiency : set of measures and daily practices that avoid demand for energy, materials, land and water while delivering human well-being for all within planetary boundaries.

Scaling-up adaptation and mitigation actions is critical for sustainable development

Their implementation needs to account for co-benefits and possible trade-offs with each sustainable development goal

With rapid action, it is possible to build a liveable and sustainable future for all through climate resilient development