Climate Change and Global Politics: A scientific introduction

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X/Twitter: @JPvanYpersele

CERIS (ULB Diplomatic School of Brussels),
17 February 2024

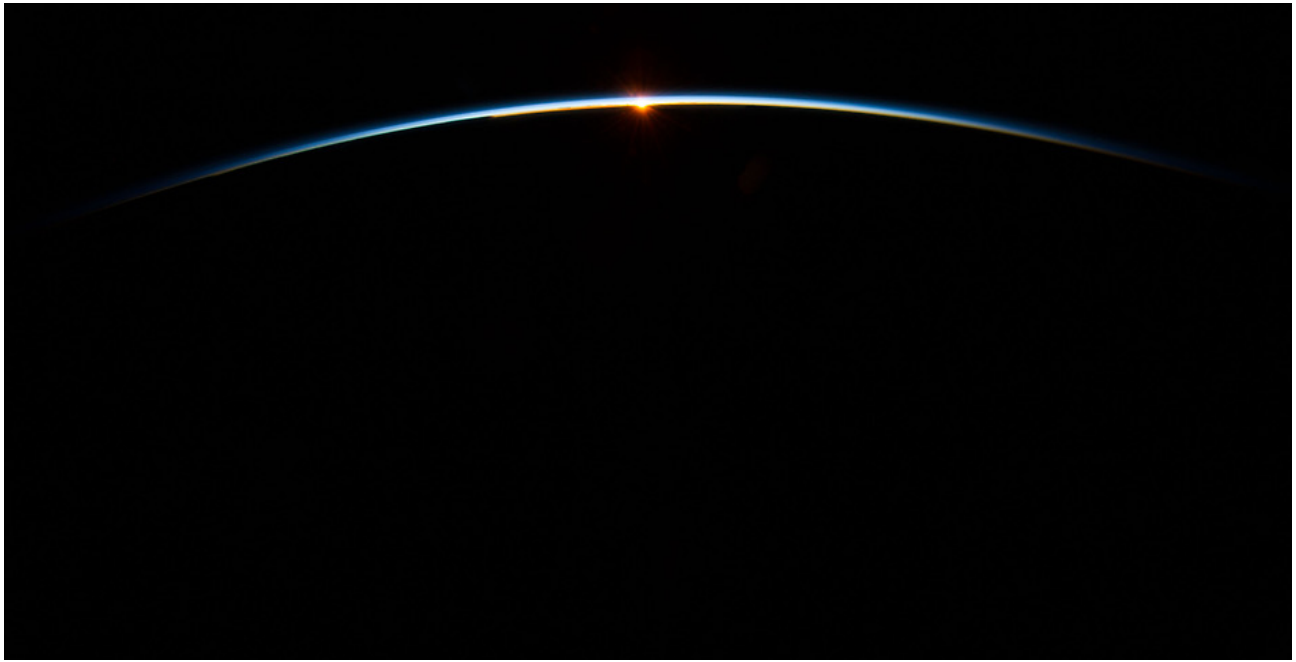
Thanks to the Walloon Government (funding the Walloon Platform for IPCC) and to my team at the Université catholique de Louvain for their support

Source: @JohnfoCook

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

@JPvanYpersele

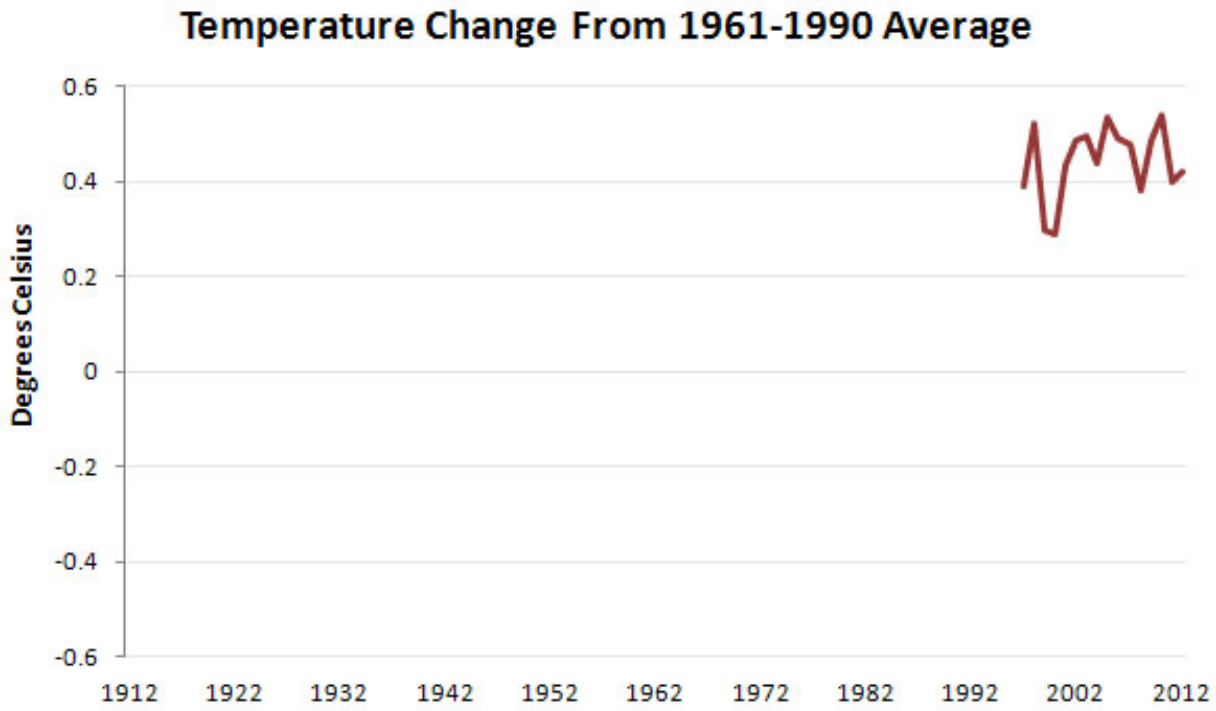
Our atmosphere is thin and fragile (as seen by ISS crew on 31 July 2013)



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

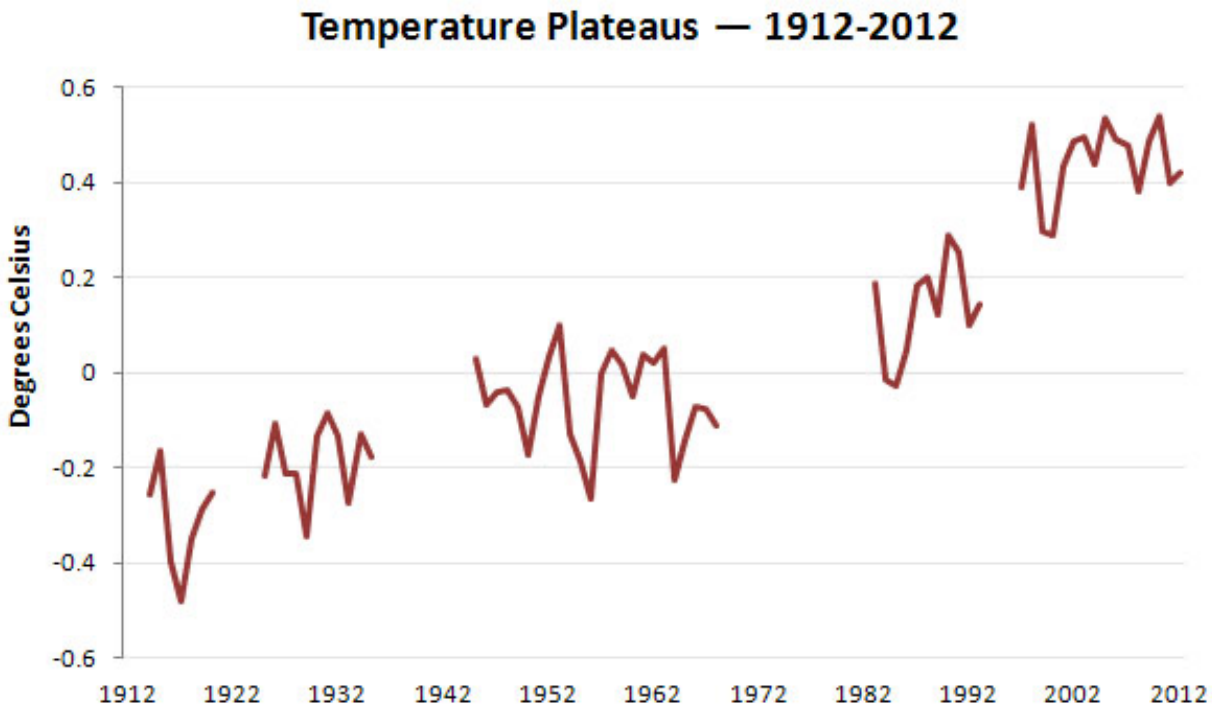
Let us think about the future of these children from Machakos in a warming climate

Photo:
@JPvanYpersele
April 2015



http://www.motherjones.com/kevin-drum/2012/10/lying-statistics-global-warming-edition

Lying With Statistics, Global Warming Edition



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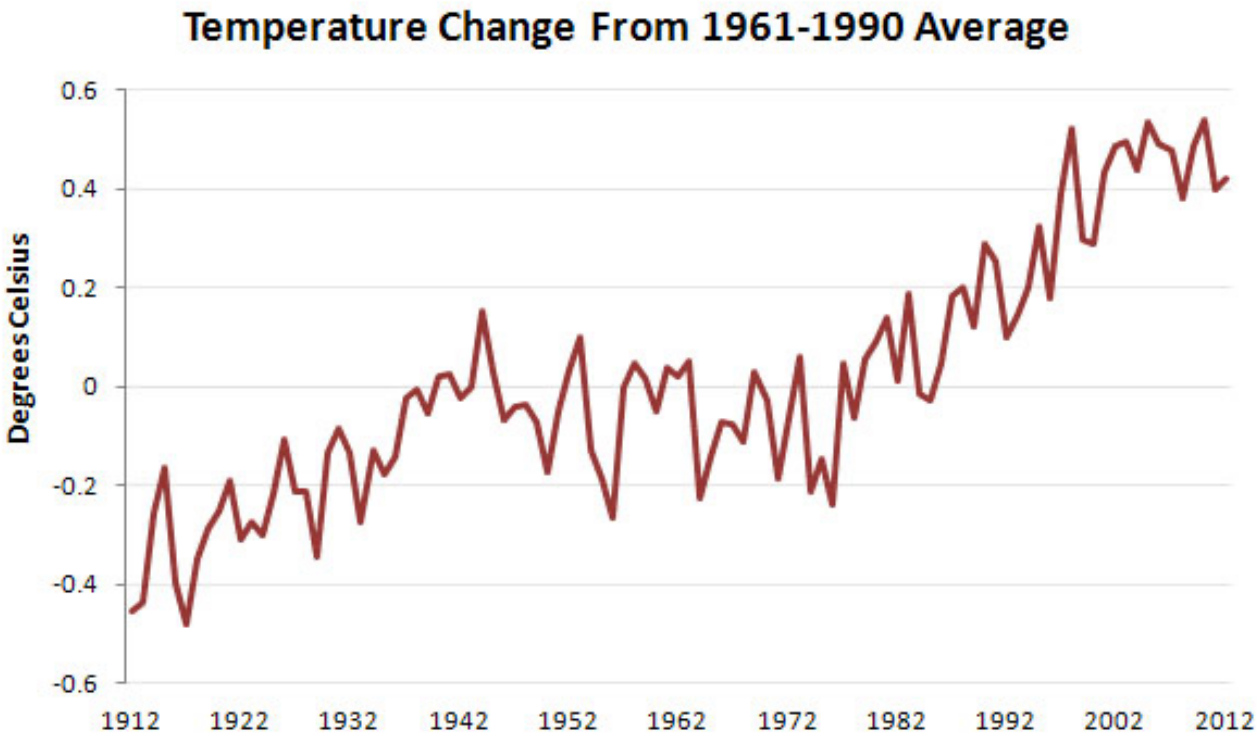

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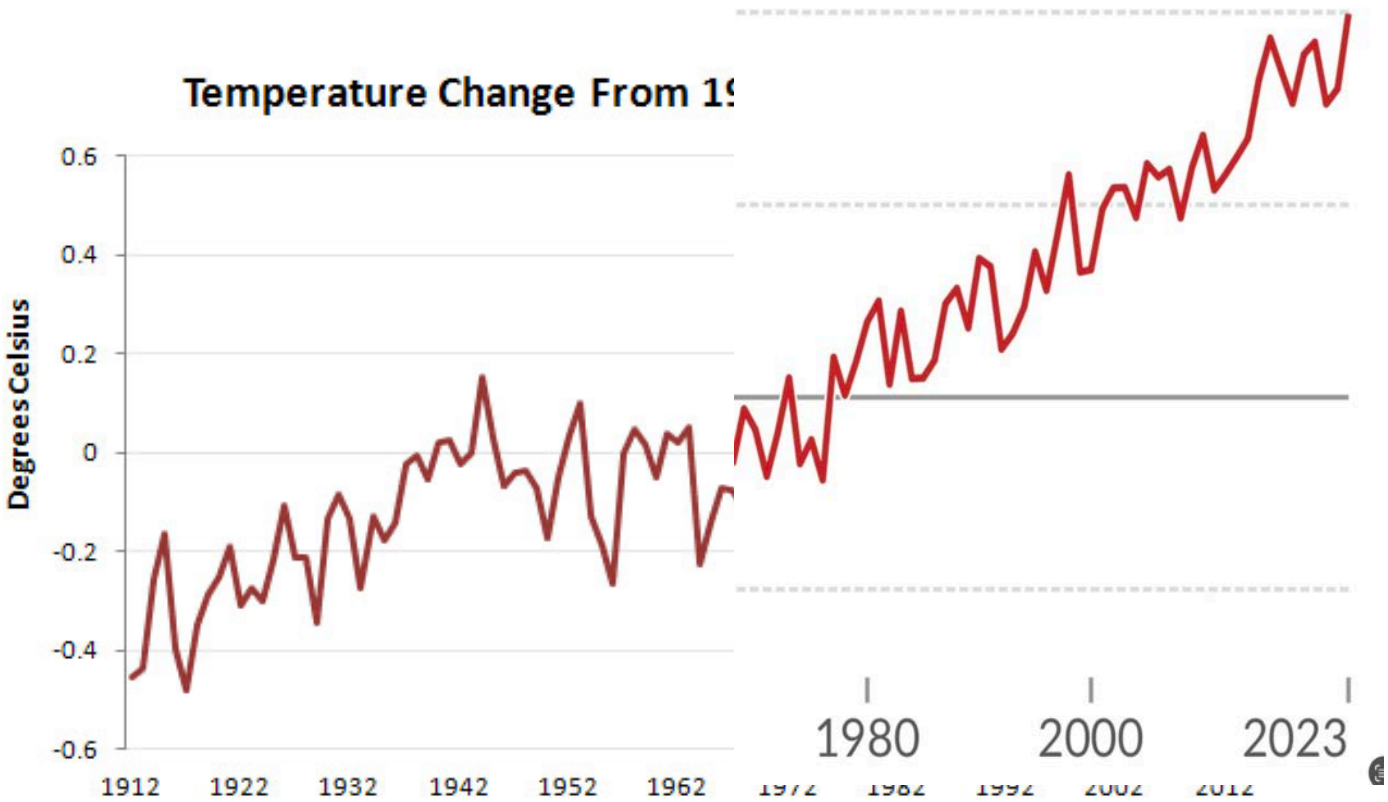

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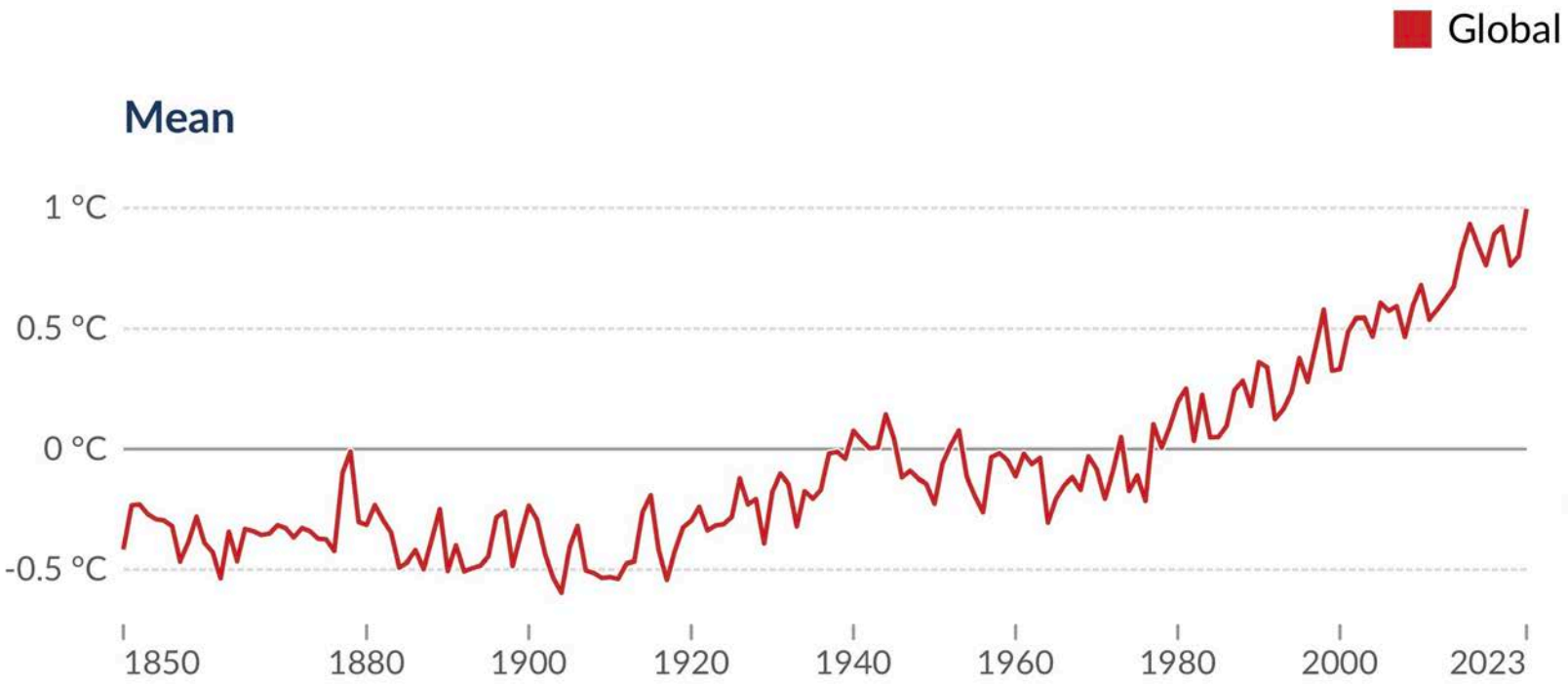


Plot: Our World in Data; **Data source:** Met Office Hadley Centre (2023)

In the USA alone, organizations which sow doubt about climate change spend almost a billion dollars/year! (Brulle 2014, average numbers for 2003-2010)

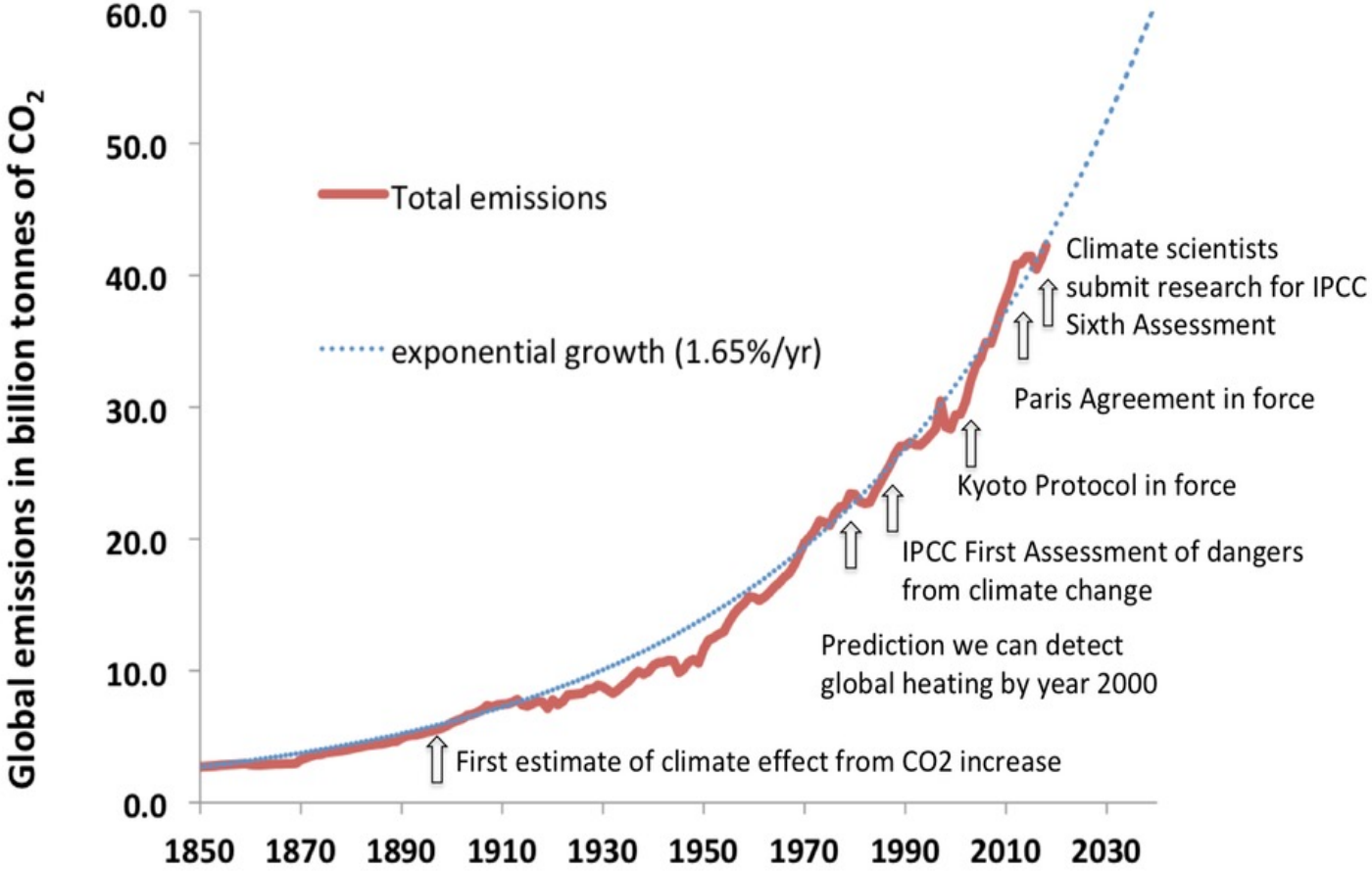
The European Union fares a little better, but many Brussels lobbyists try to dilute the EU environmental efforts (see the car industry…)

@JPvanYpersele

The « merchants of doubt » have evolved in their arguments:

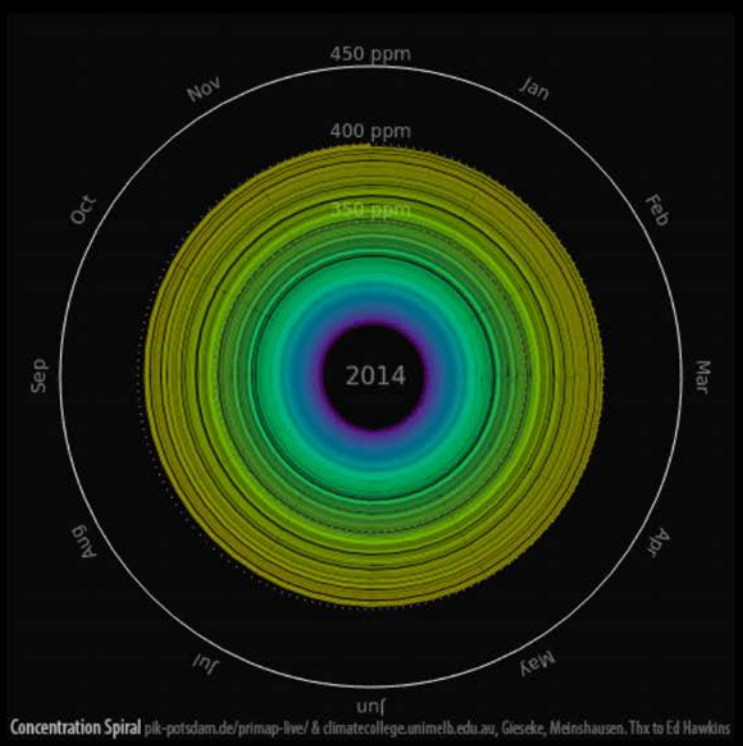
- Existence of global warming
- Human responsability in the warming
- Cost of decarbonization
- Drawbacks from alternatives

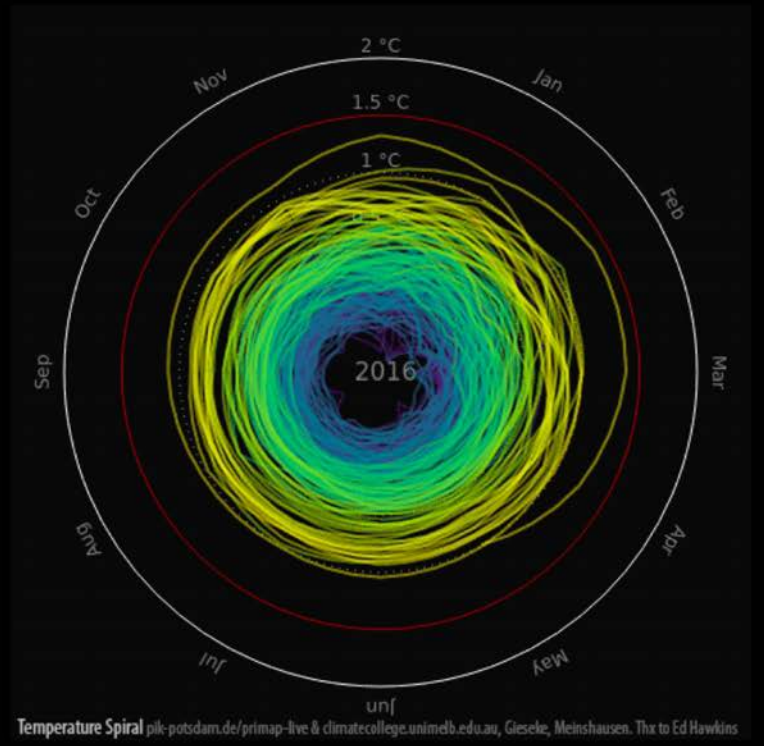
(recent example: so-called enormous needs of cobalt for electric mobility reported on CNN; see critical analysis on https://www.desmogblog.com/2018/05/02/cnn-wrongly-blames-electric-cars-unethical-cobalt-mining)



Source: Wolfgang Knorr, in The Conversation (2019)

CO_2 Concentration and Temperature spirals





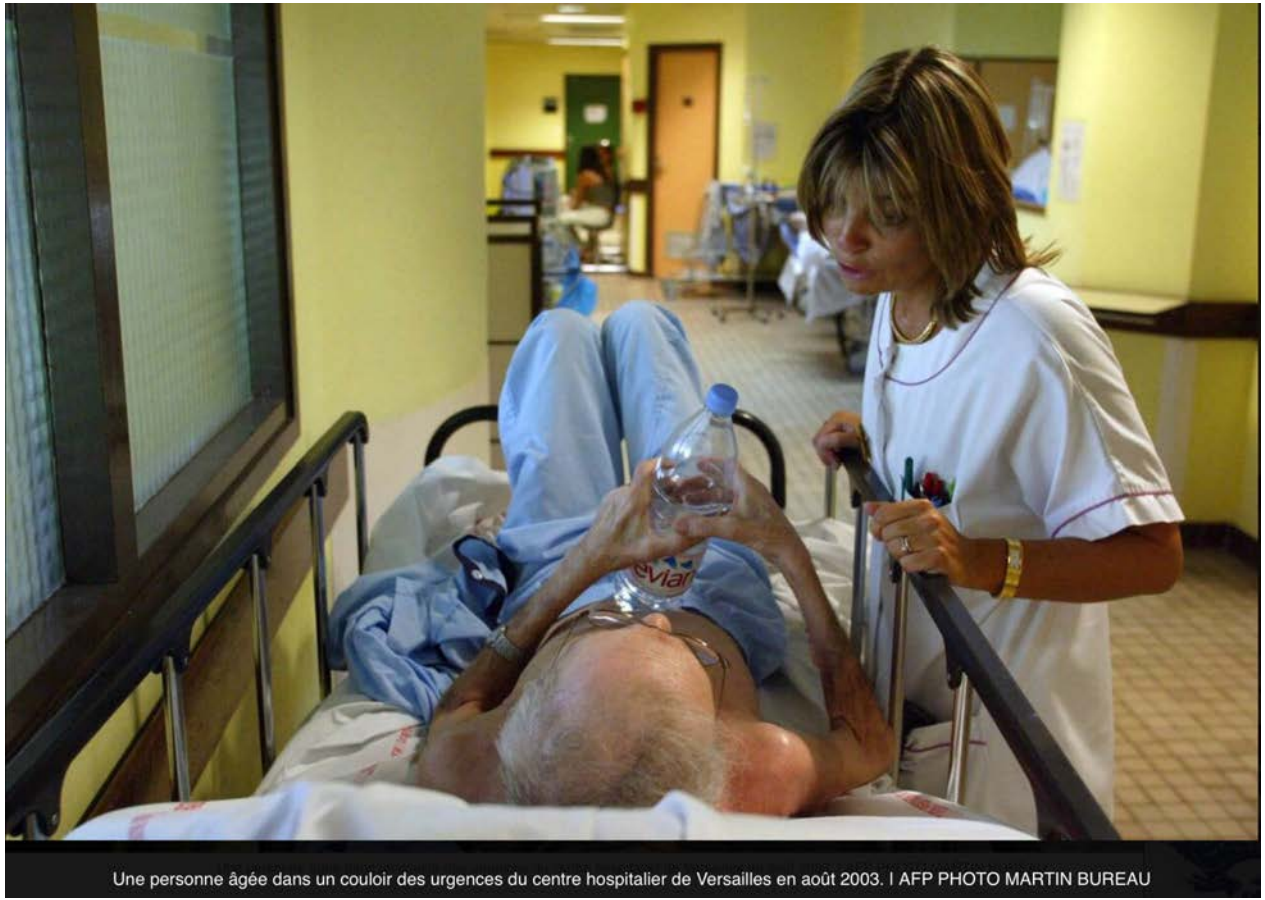
CO_2 Concentration since 1850 and Global Mean Temperature in °C relative to 1850 – 1900
Graph: Ed Hawkins (Climate Lab Book) – Data: HadCRUT4 global temperature dataset
Animation available on http://openclimatedata.net/climate-spirals/concentration-temperature/

Fact: Extreme weather events are becoming more frequent or intense due to climate change, sealevel rise threatens coastal communities…

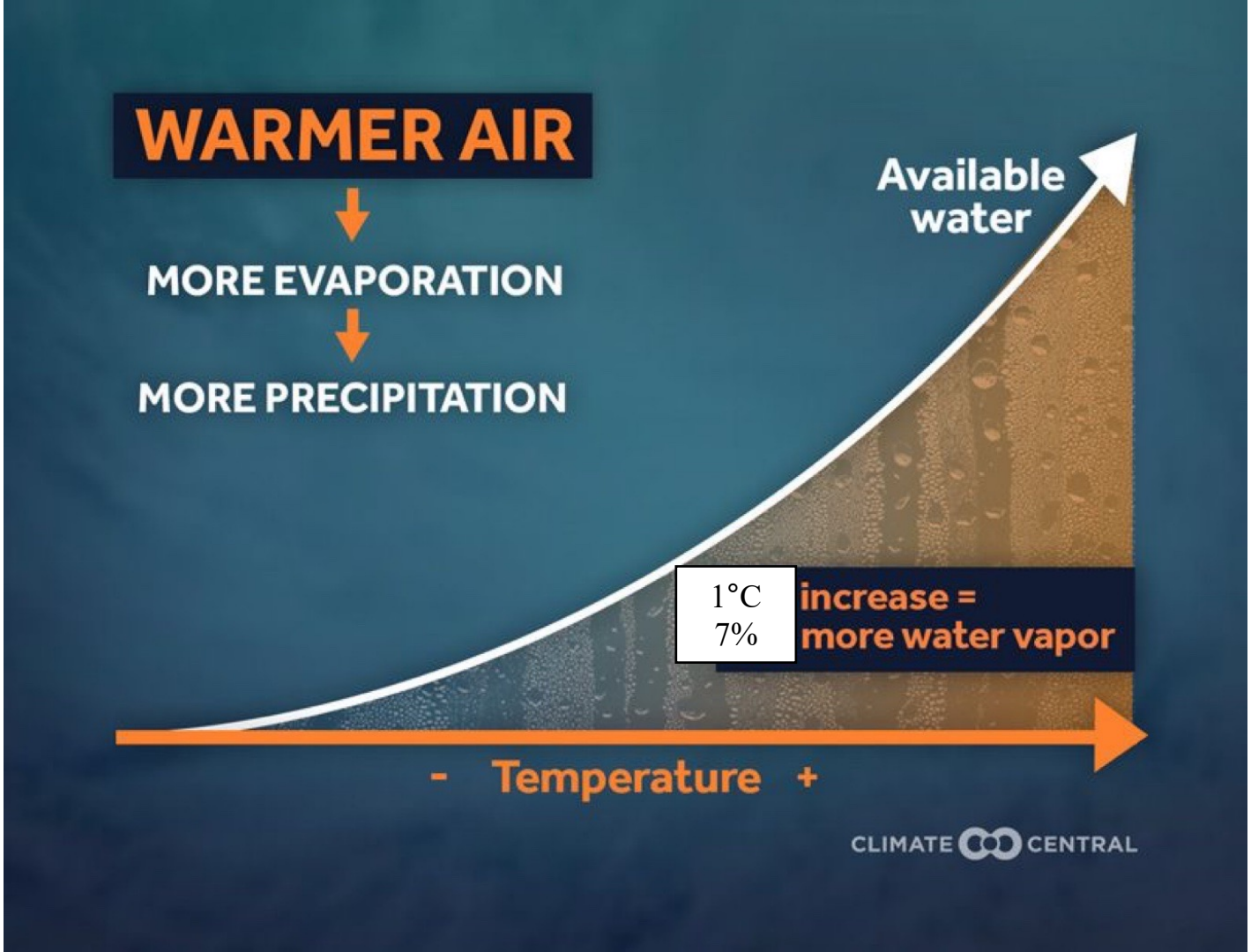
Since 1950, extreme hot days and heavy precipitation have become more common

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


WARMER AIR
MORE EVAPORATION
MORE PRECIPITATION
Available water
1°C
7%
increase =
more water vapor
- Temperature +
CLIMATE CENTRAL

Wallonia Floods, July 2021

Source:
VRT Nieuws

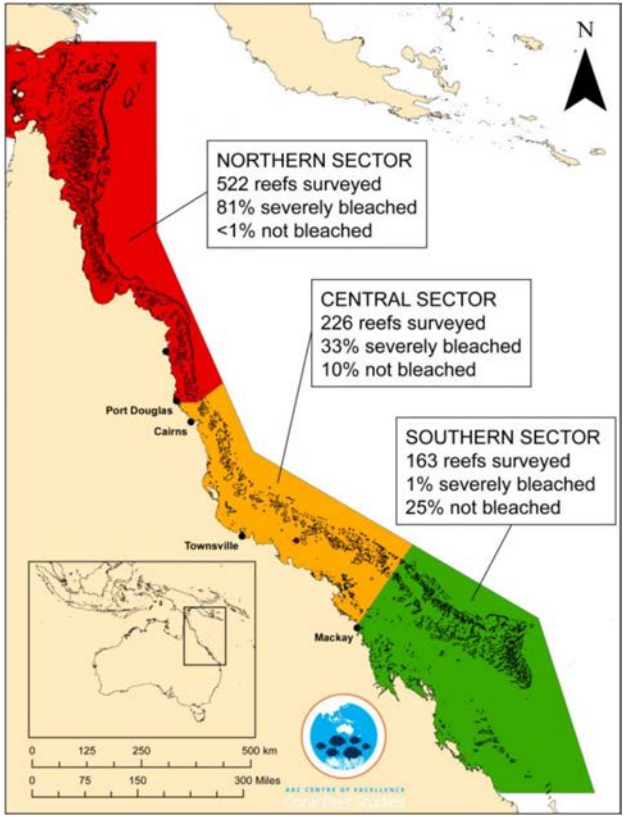
Felix Schaad (Tages Anzeiger, Switzerland)

Floods cost

Coral reefs are dying

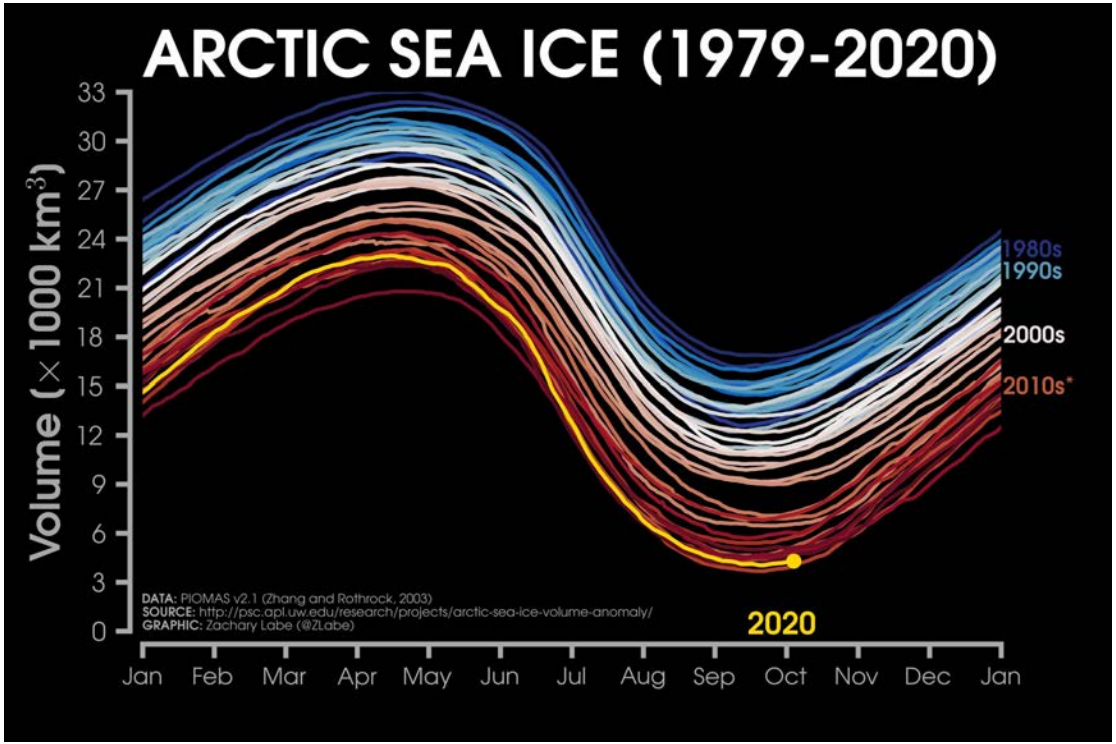
American Samoa (from www.globalcoralbleaching.org)

Only 7% of the Great Barrier Reef has avoided coral bleaching (May 2016)



JCU Australia - ARC Centre of Excellence for Coral Reef Studies / Tom

Arctic sea-ice *volume* 1979-2020



Source: @ZLabe

Plateau Glacier (1961)
(Alaska)

http://www.weather.com/news/science/environment/alaskas-glaciers-capturing-earth-changing-our-eyes20131125?cm_ven=Email&cm_cat=ENVIRONMENT_us_share

Plateau Glacier (2003)
(Alaska)

http://www.weather.com/news/science/environment/alaskas-glaciers-capturing-earth-changing-our-eyes-20131125?cm_ven=Email&cm_cat=ENVIRONMENT_us_share

Les glaciers, d'un siècle à l'autre

Rédaction : Philippe Marbaix et Bruna Gaino

La Mer de Glace (massif du Mont-Blanc, France)

1919 2019

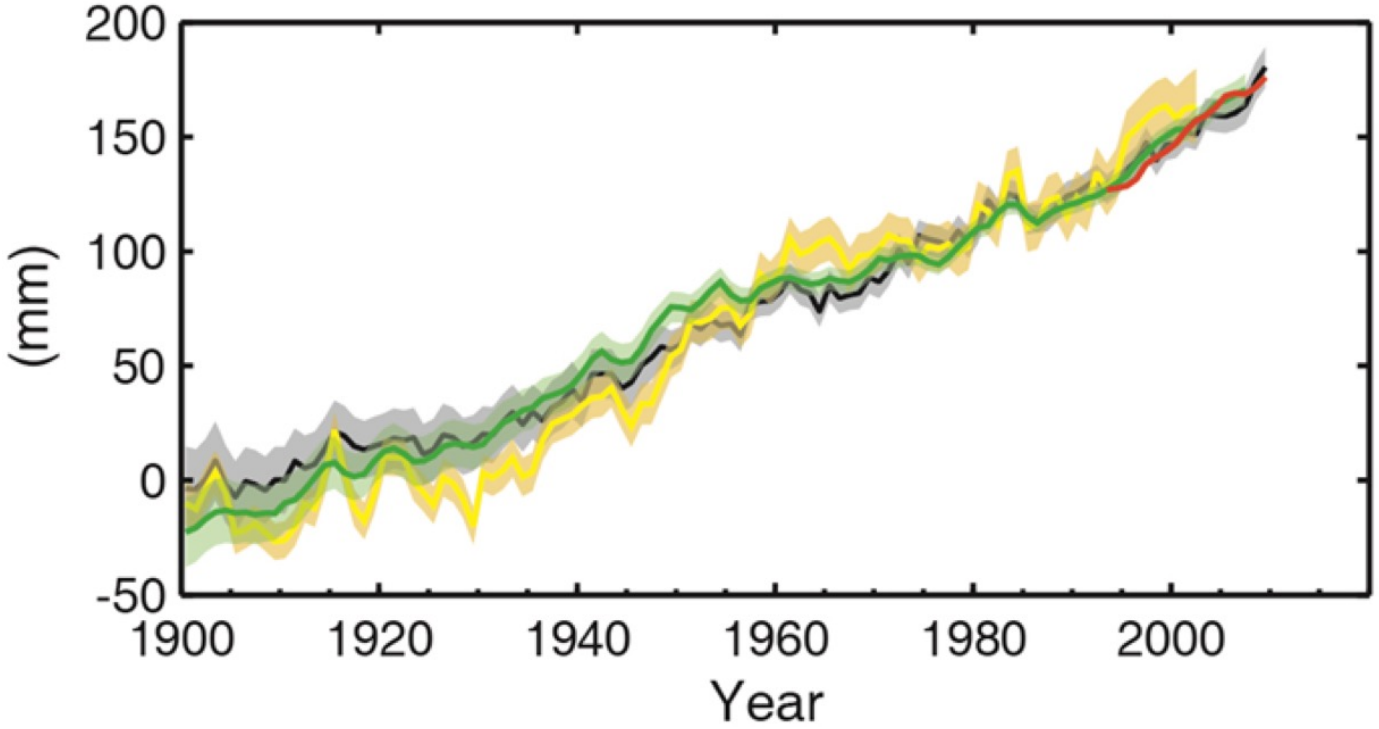
Photo : Walter Mittelholzer, ETH-Bibliothek Zürich

Photo : Dr Kieran Baxter, Université de Dundee

20-7-2020

Photo: @RaphvanYpersele (Instagram)

Change in average sea-level change



AR5 WGI SPM - Approved version / subject to final copyedit

Why the IPCC ?

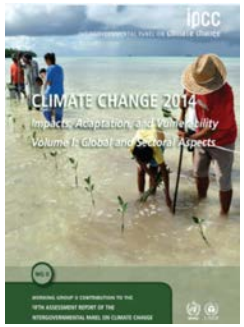
Established by WMO and UNEP in 1988

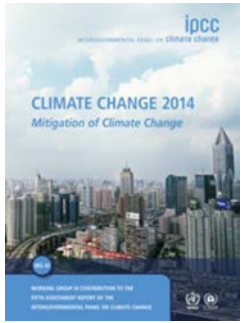
to provide policy-makers with an objective source of information about

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

WMO=World Meteorological Organization

UNEP= United Nations Environment Programme





What is happening in the climate system?

What are the risks?

What can be done?

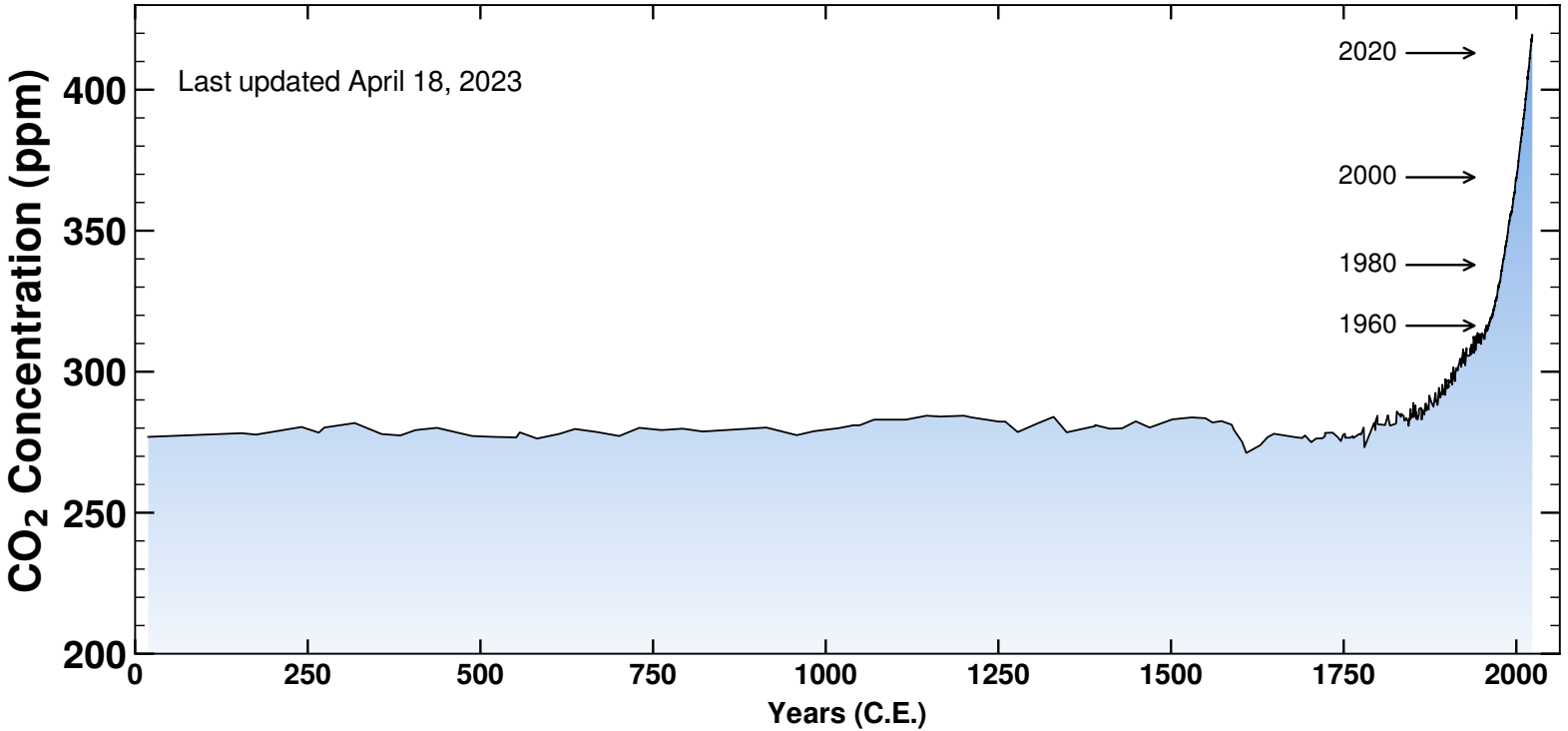
ipcc
INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

Key messages from IPCC AR5

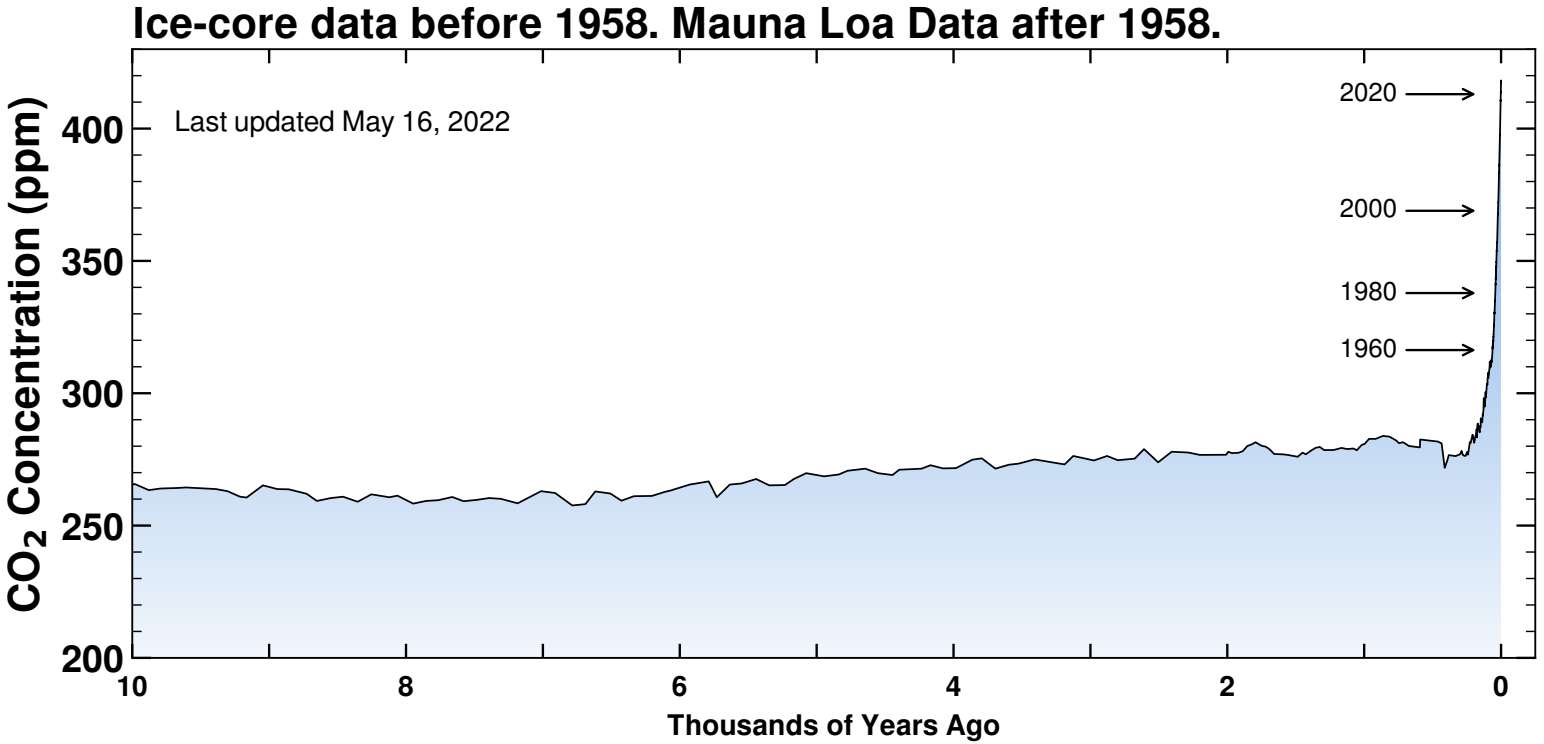
- → **Human influence on the climate system is clear**
- → **Continued emissions of greenhouse gases will increase the likelihood of severe, pervasive and irreversible impacts for people and ecosystems**
- → **While climate change is a threat to sustainable development, there are many opportunities to integrate mitigation, adaptation, and the pursuit of other societal objectives**
- → **Humanity has the means to limit climate change and build a more sustainable and resilient future**

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

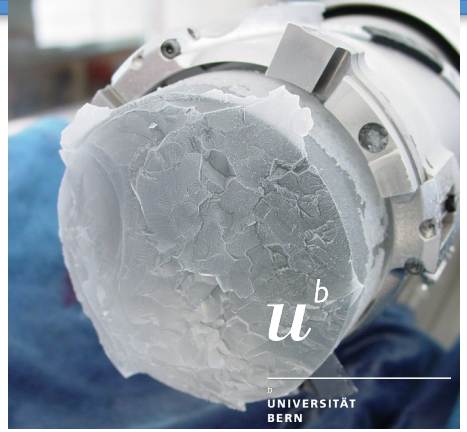


Source: scripps.ucsd.edu/programs/keelingcurve/

CO_2 Concentration 16 May 2022: 421,36 ppm (Keeling curve + last 10000 years)



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

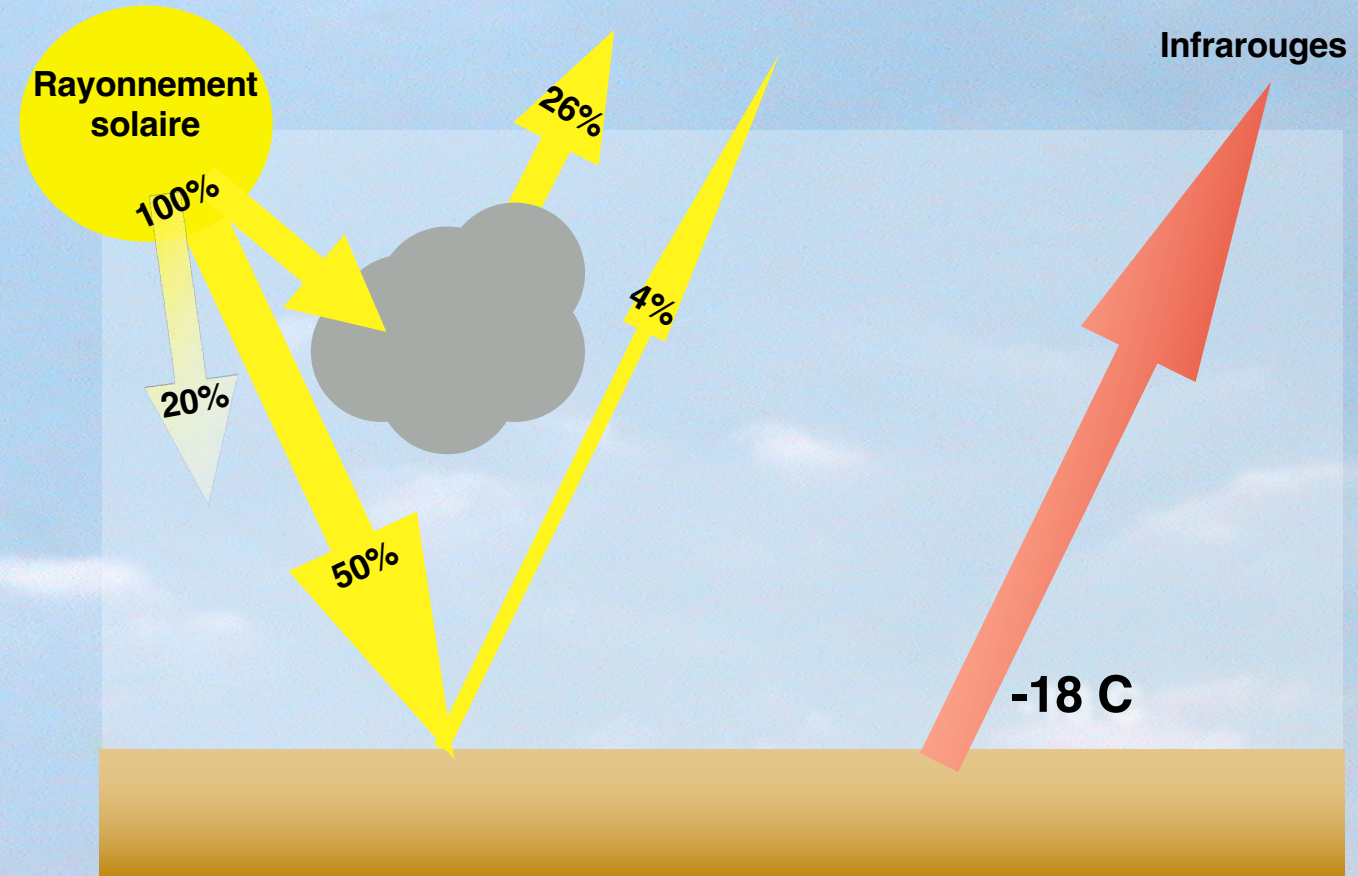


Atmospheric concentrations of CO_2

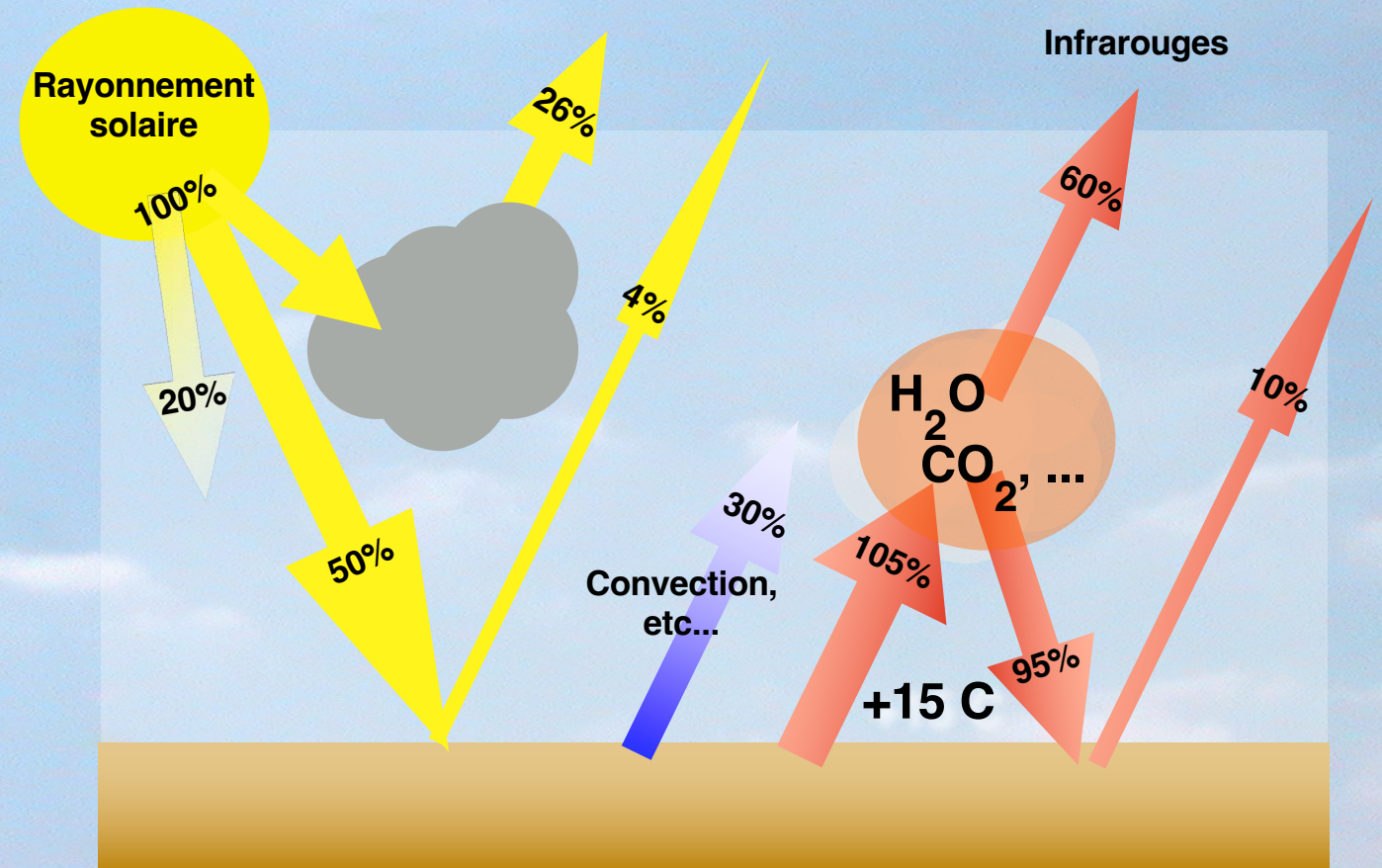
(Lüthi et al.,2008, NOAA)

The concentrations of CO_2 have increased to levels unprecedented in at least the last 800,000 years.

Cycle de l'énergie et effet de serre

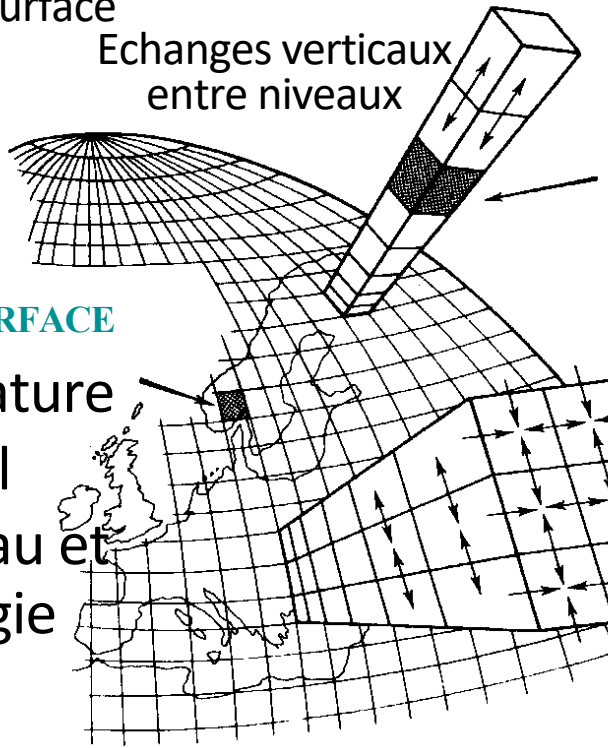


Cycle de l'énergie et effet de serre



Modèles climatiques

Atmosphère et surface



DANS LA COLONNE ATMOSPHERIQUE

- Vecteurs vent
- Humidité
- Nuages
- Température
- Altitude

A LA SURFACE

- Température au sol
- Flux d'eau et d'énergie

Résolution typique ~ 2°x 2°(modèle global, atmosphère)
Intervalle de temps typique : ≤ 30 minutes

Progression of Understanding: Greater and Greater Certainty in Attribution

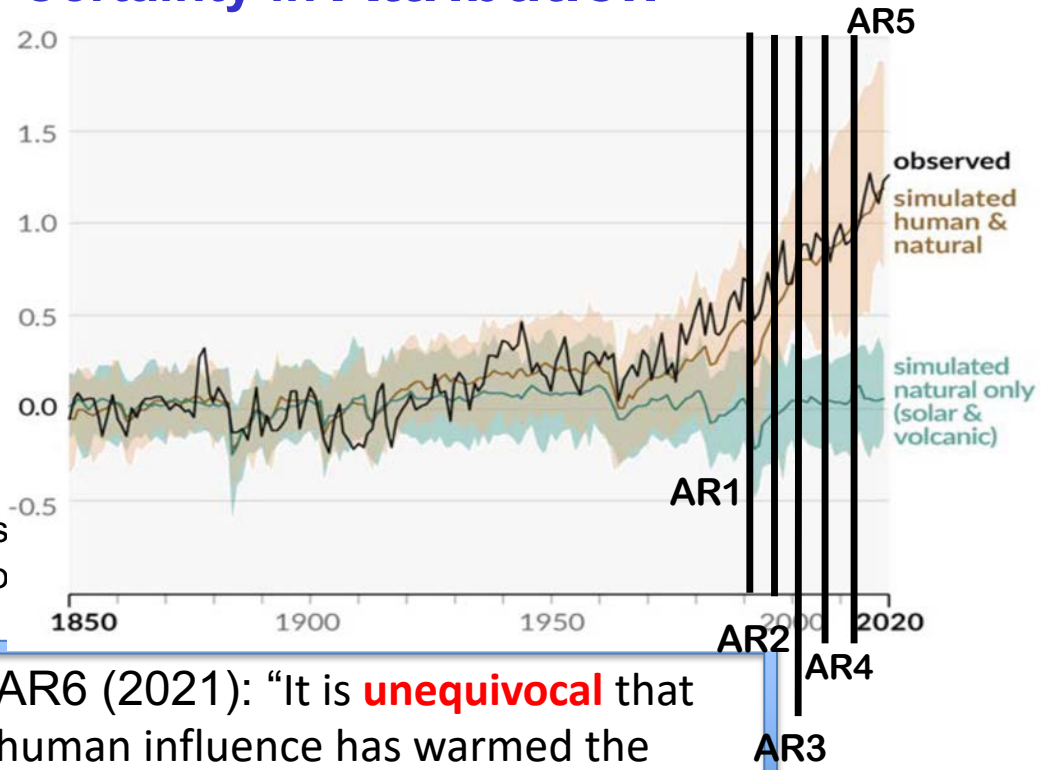
AR1 (1990): “unequivocal detection not likely for a decade”

AR2 (1995): “balance of evidence suggests **discernible** human influence”

AR3 (2001): “most of the warming of the past 50 years is **likely** (odds 2 out of 3) due to human activities”

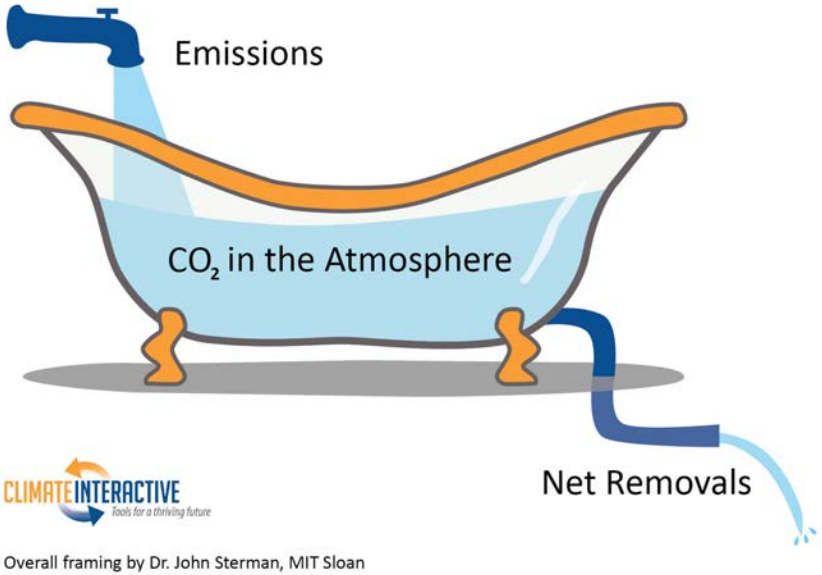
AR4 (2007): “most of the warming is **very likely** (odds 9 out of 10) due to greenhouse gases”

AR5 (2013) «It is **extremely likely** (odds 95 out of 100) that human influence has been the dominant cause… »



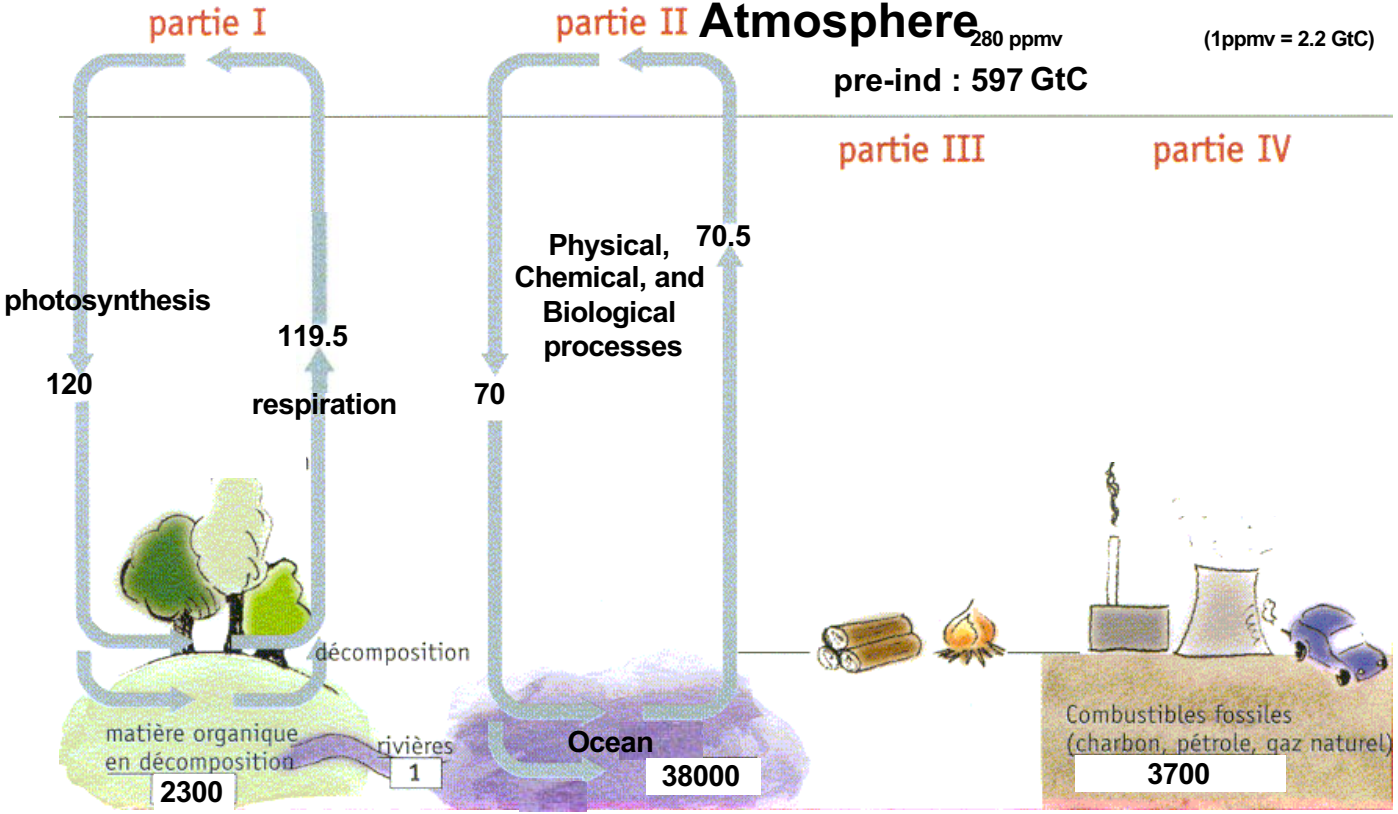
AR6 (2021): “It is **unequivocal** that human influence has warmed the atmosphere, ocean, and land.”

The Carbon Bathtub



Source: @CarbonInteractive

Carbon cycle: unperturbed fluxes

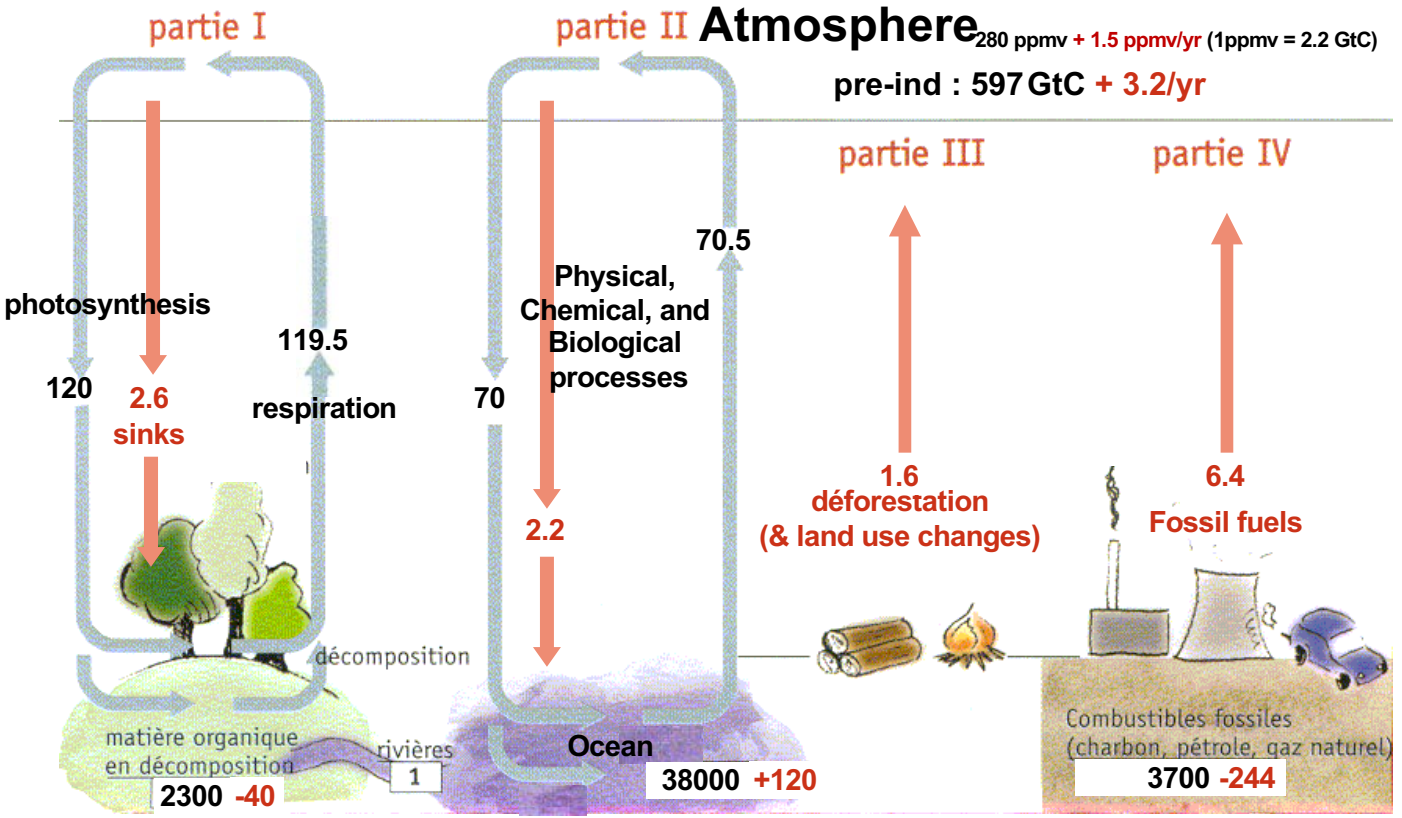


Units: GtC (billions tons of carbon) or GtC/year (multiply by 3.7 to get $GtCO_2$)

vanyp@climate.be

Carbon cycle: perturbed by human activities

(numbers for the decade 1990-1999s, based on IPCC AR4)



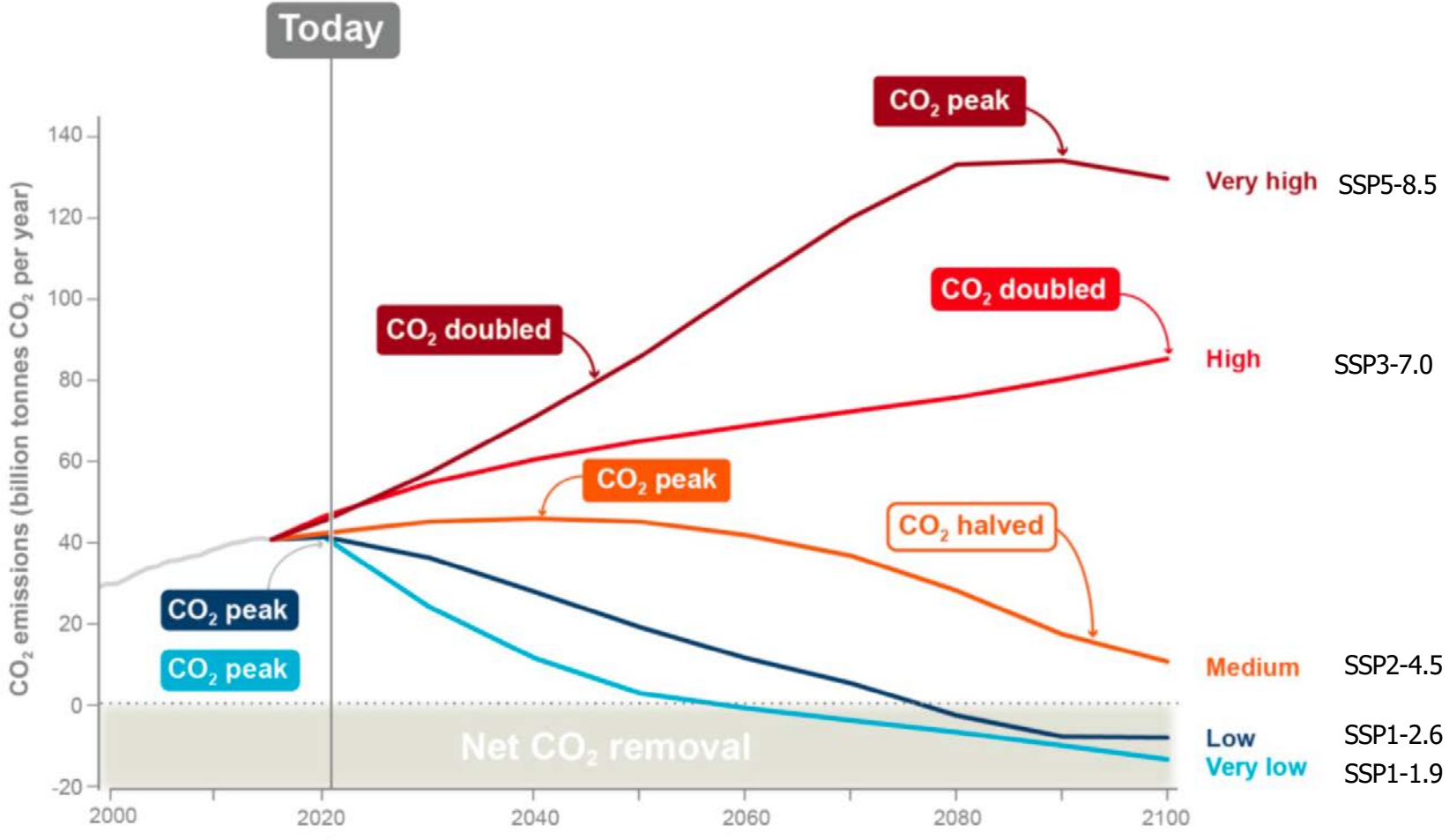
Units: GtC (billions tons of carbon) or GtC/year

Stocks!

vanyp@climate.be

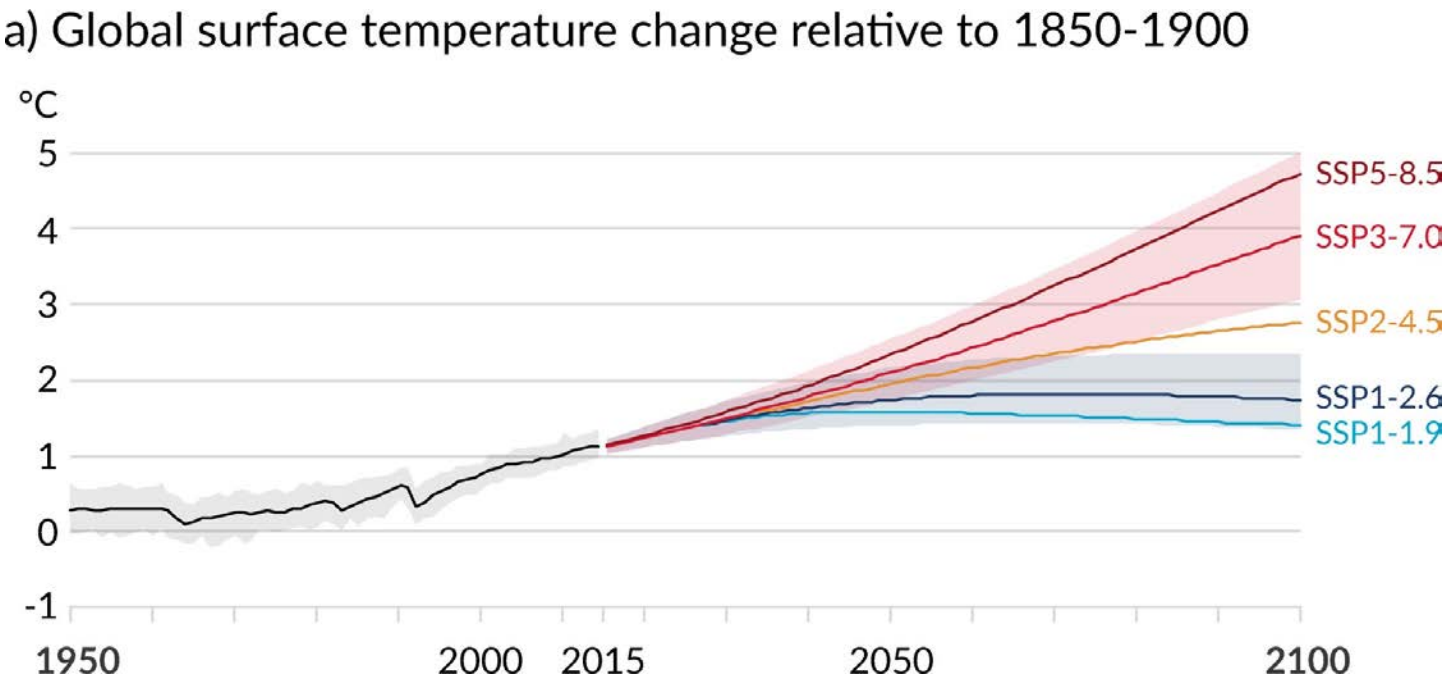
The carbon cycle is policy-relevant

- **CO_2 accumulates in the atmosphere as long as human emissions are larger than the natural absorption capacity**
- **Historical emissions from developed countries therefore matter for a long time**
- **As warming is function of cumulated emissions, the carbon « space » is narrowing fast (to stay under 1.5 or 2° C warming)**


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

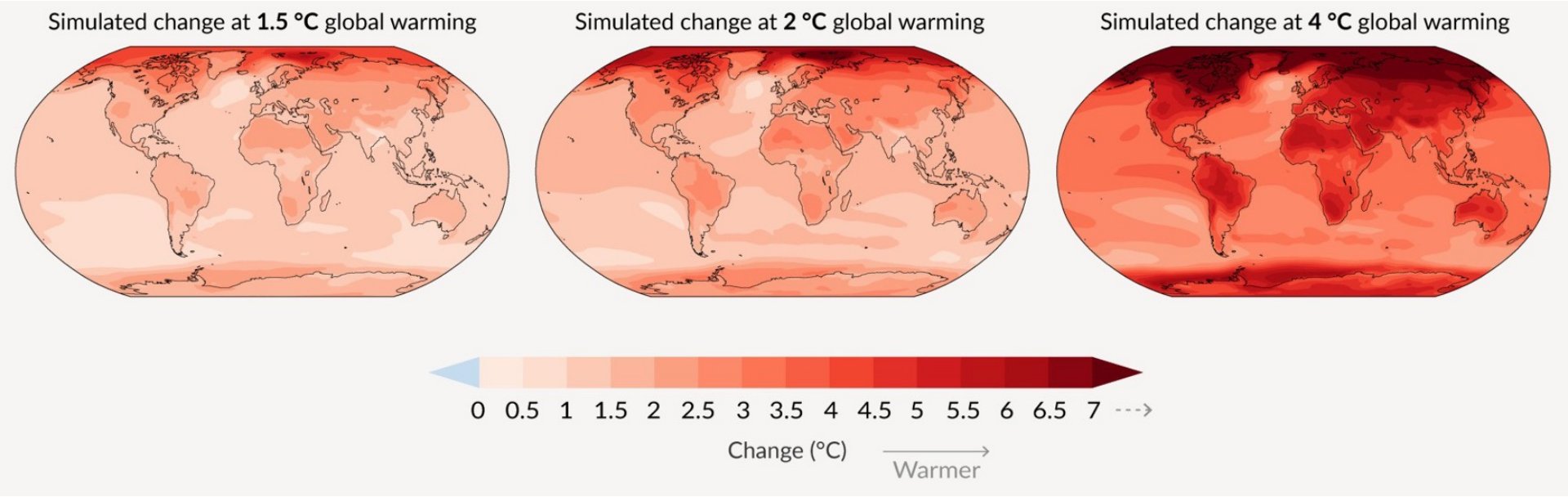


Across warming levels, land areas warm more than oceans, and the Arctic and Antarctica warm more than the tropics

+1.5° C

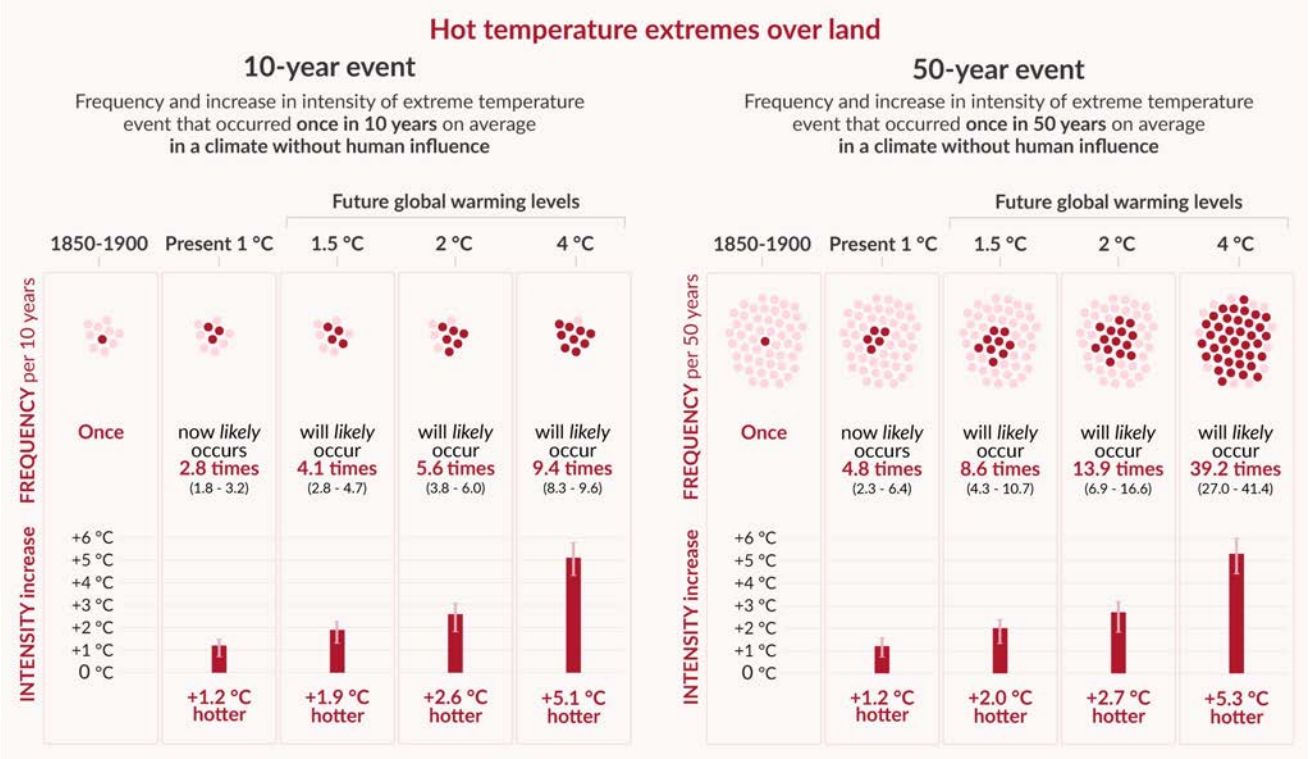
+2° C

+4° C



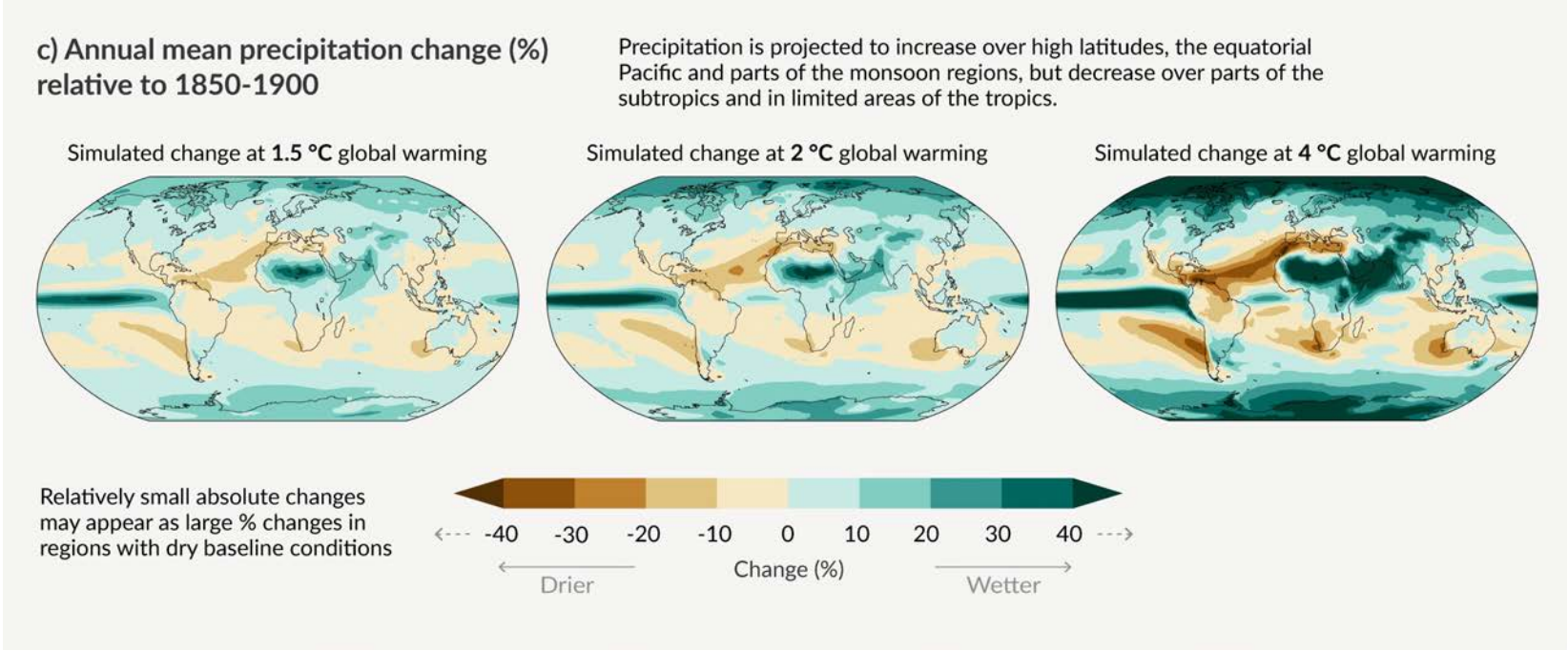
Projected changes in extremes are larger in frequency and intensity with every additional increment of global warming

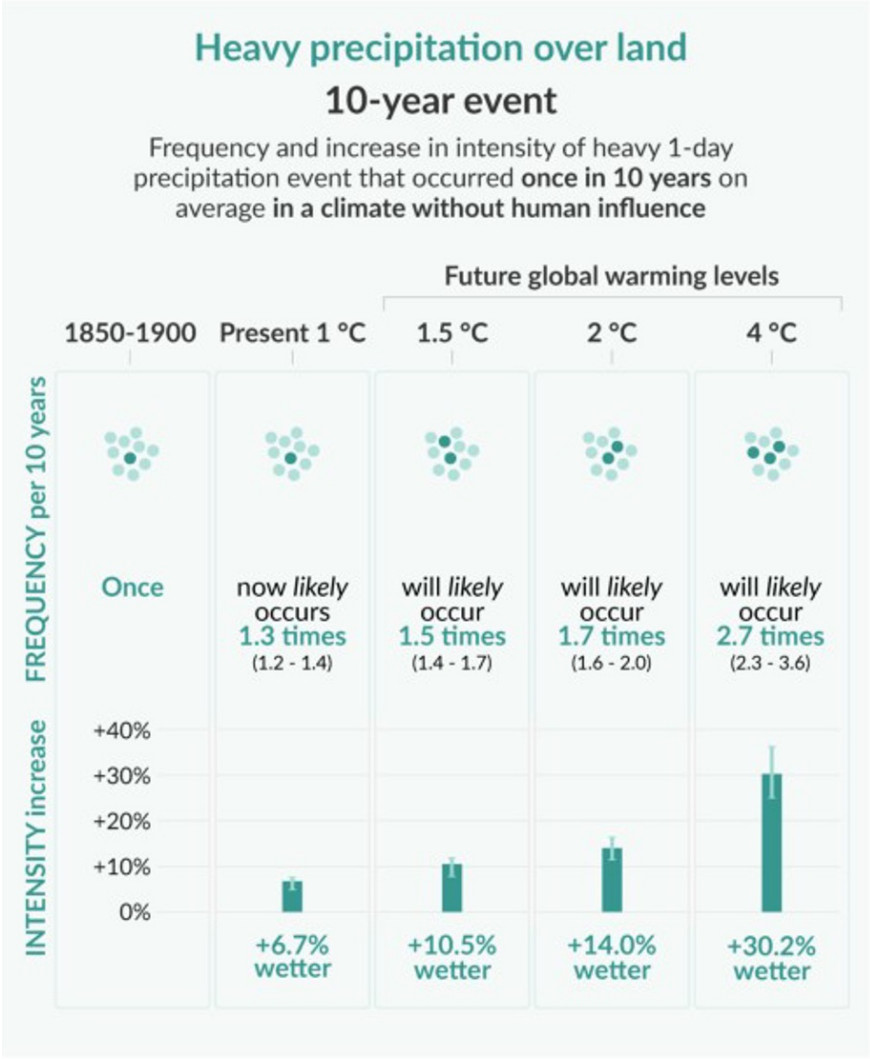
Figure SPM.6



With every increment of global warming, changes get larger in regional mean temperature, precipitation and soil moisture

Figure SPM.5

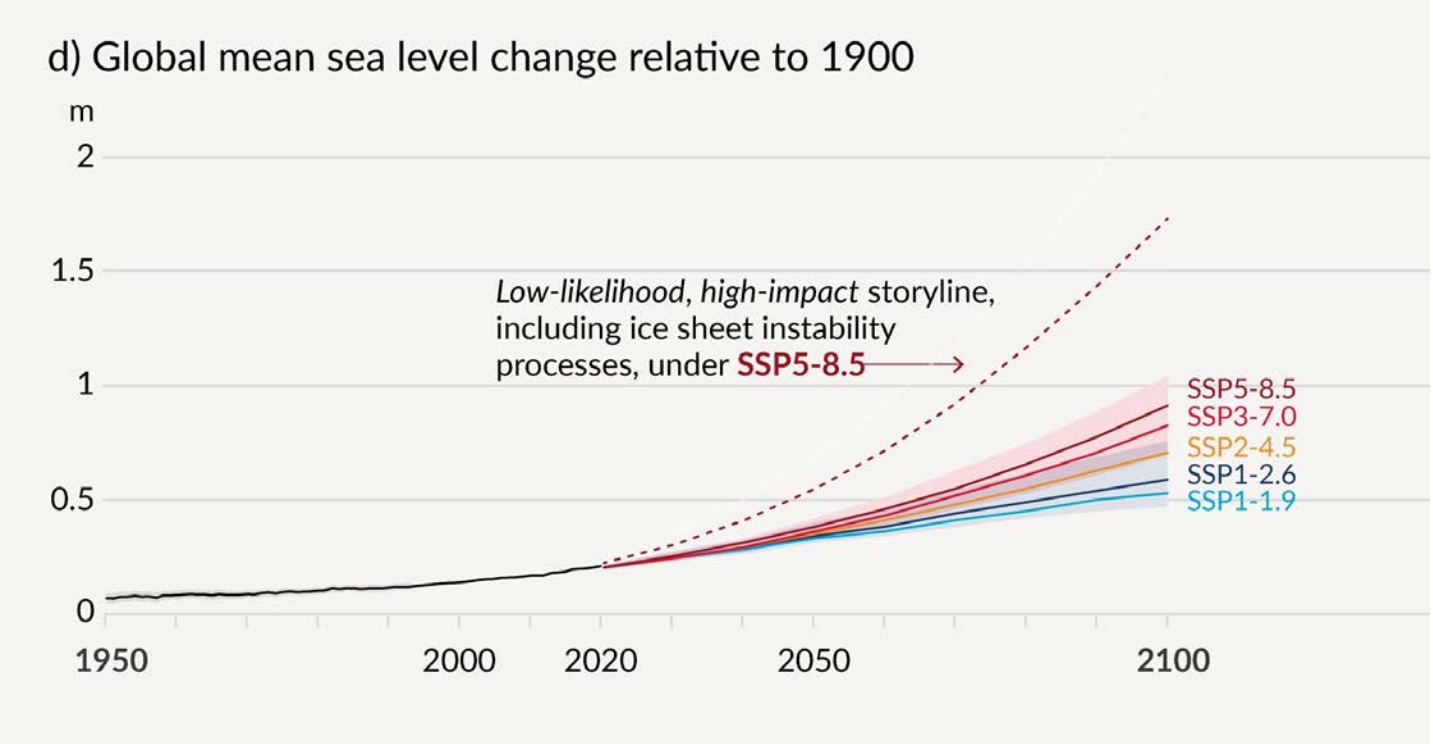




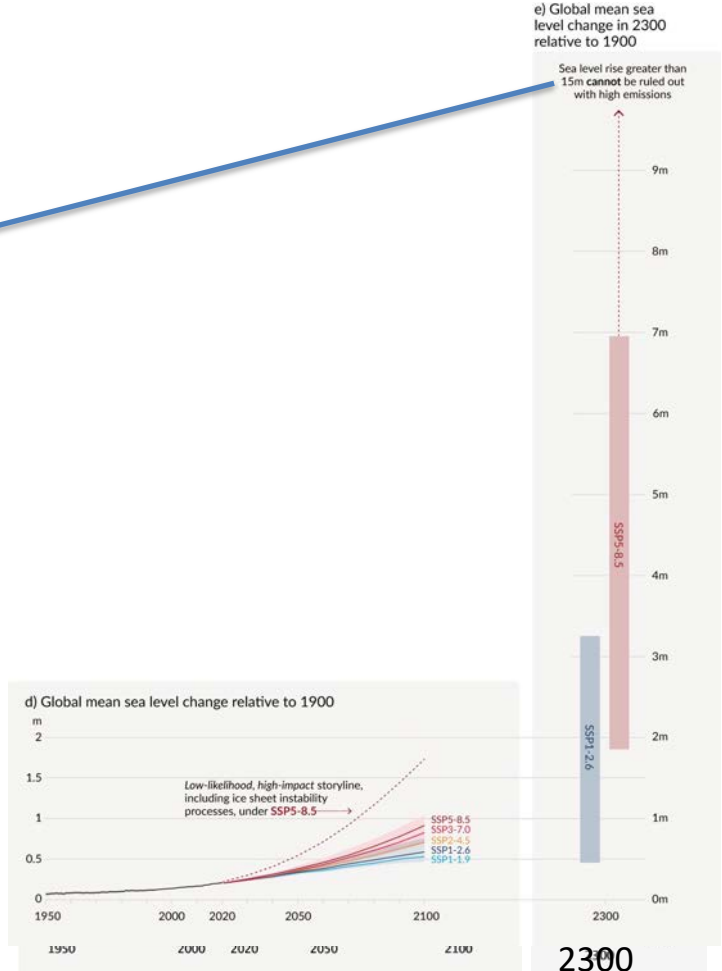
IPCC AR6 WGI SPM
Figure SPM.6

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

Figure SPM.8



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



7 m

2 m

2300

18-20000 years ago (Last Glacial Maximum)

With permission from Dr. S. Joussaume, in « Climat d'hier à demain », CNRS éditions.

3 km thick ice sheets

Sea level: 120 m lower

Today, with +4-5° C globally

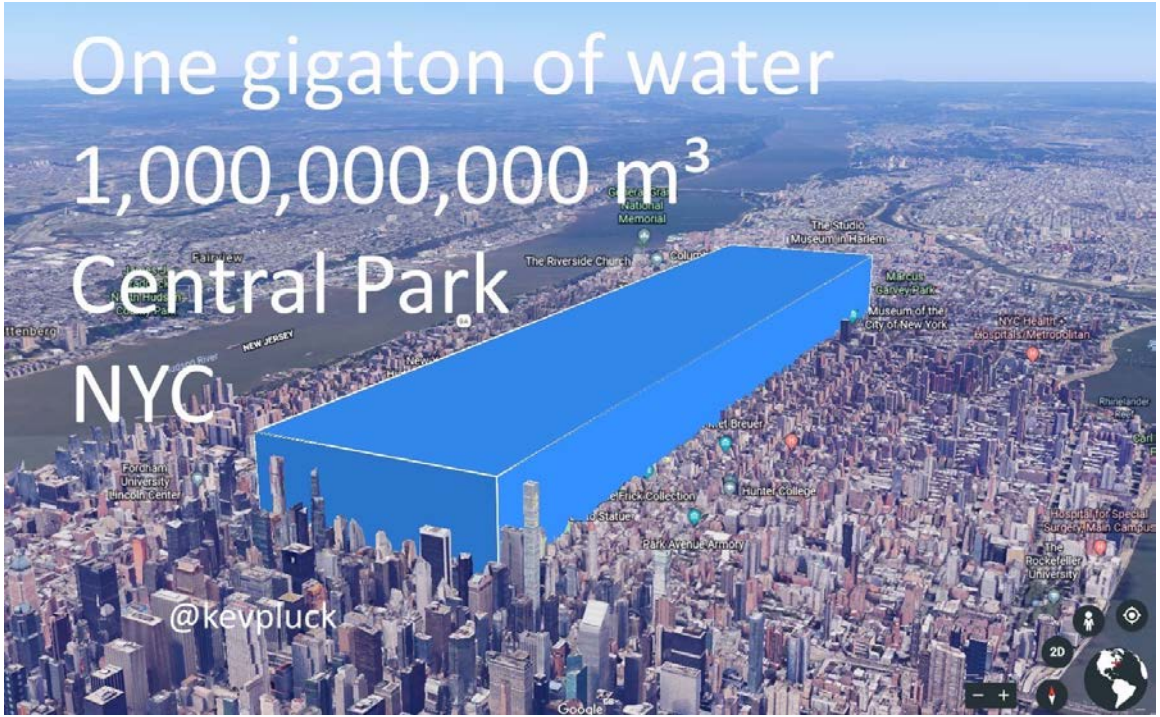
With permission from Dr. S. Joussaume, in « Climat d'hier à demain », CNRS éditions.

Fact: Average temperature is probably on its way to exceed the « conservation temperature » for the Greenland and (some of the) Antarctic ice sheet

There is therefore a very high risk that average sea level would increase by several metres over the next century or two

@JPvanYpersele

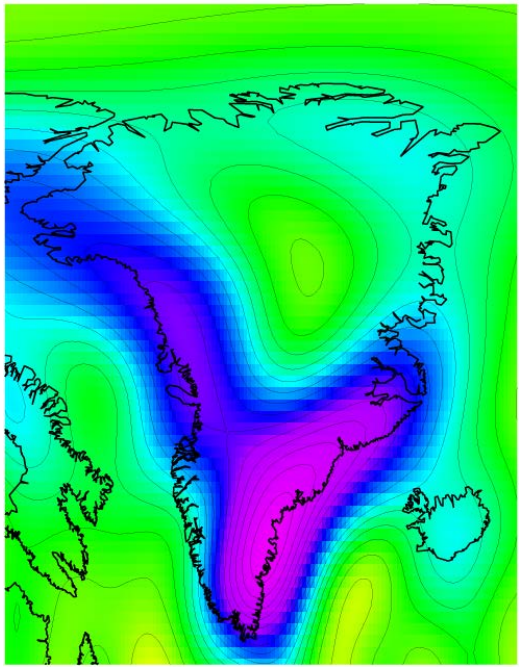
The Antarctic Ice Sheet presently loses 1 Gt of water every 1.5 day



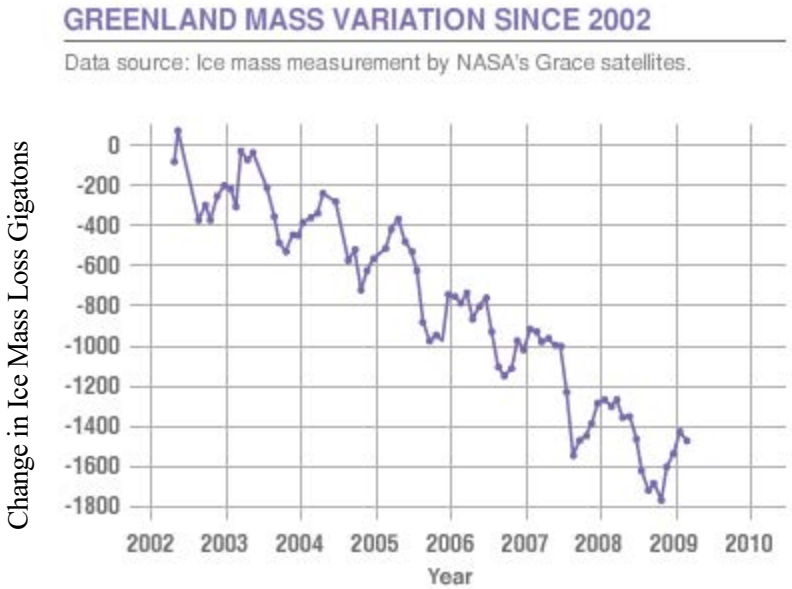
Source: @Kevpluck, June 2018

Greenland Ice Mass Loss 2002-2009
Derived From NASA GRACE Gravity Mission

Greenland



J. Wahr, U. Colorado



Velicogna, Geophysical Research Letters, 2009

•Contributes to sea level rise

B. Holt - JPL

Effets sur le Delta du Nil, où vivent plus de 10 millions de personnes à moins d'1 m d'altitude

(Time 2001)

On the frontline: The Maldives

@JPvanYpersele

In front of Environment Ministry, Maldives, Aug. 2015

@JPvanYpersele

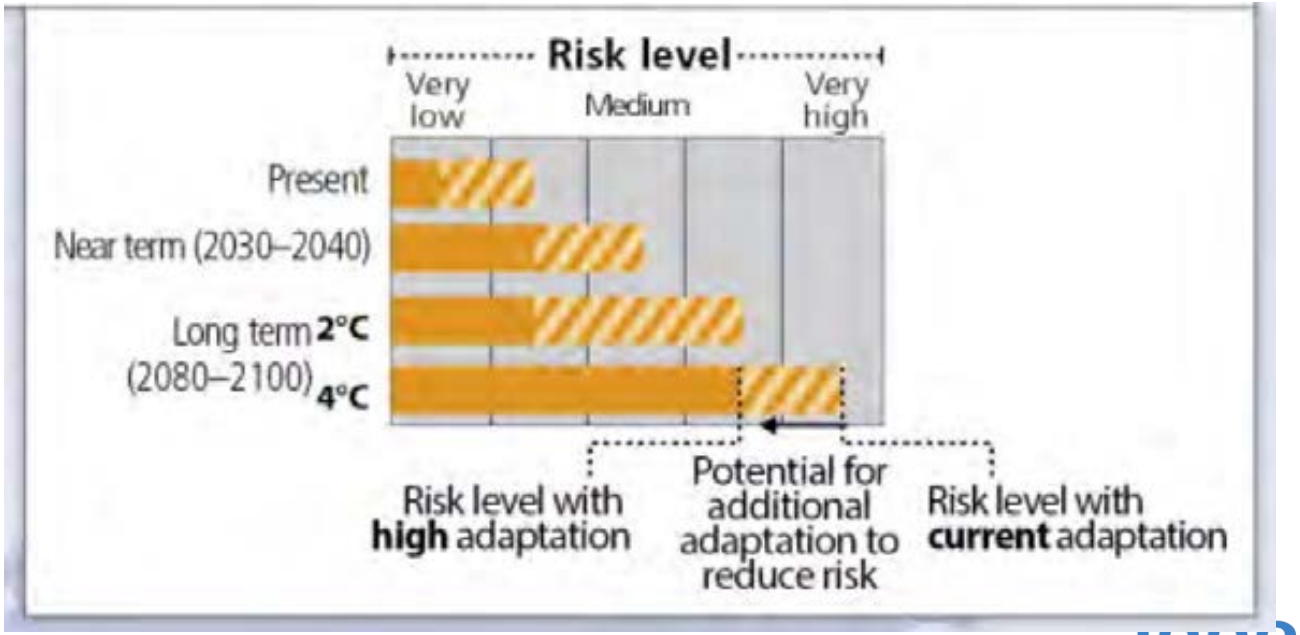
In front of Ministry of Foreign Affairs, Maldives, Aug. 2015

@JPvanYpersele

@JPvanYpersele

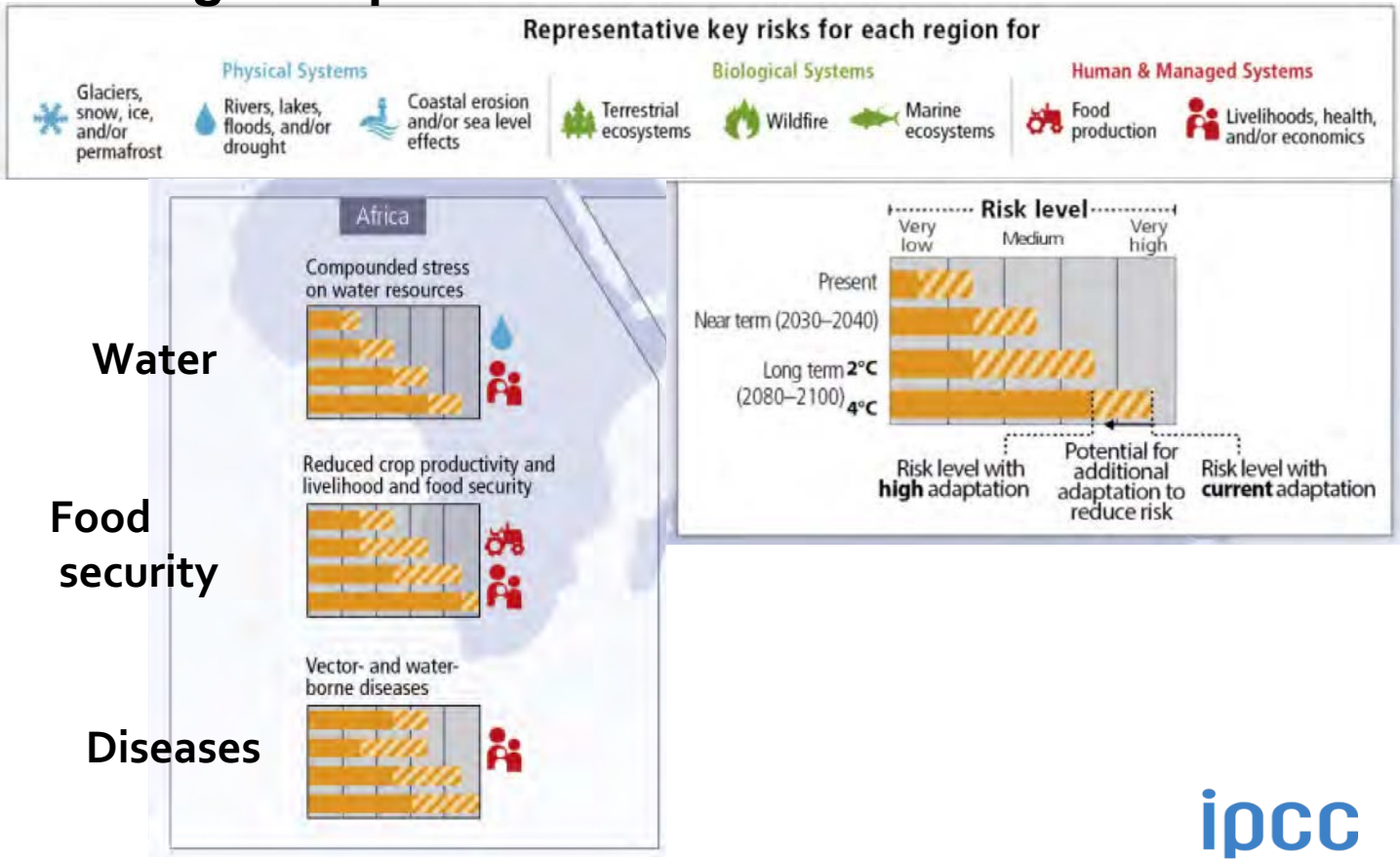

VULNERABILITY
AND EXPOSURE
IN THE ENTIRE WORLD
ipcc
INTERGOVERNMENTAL PANEL ON climate change

Regional key risks and potential for risk reduction through adaptation



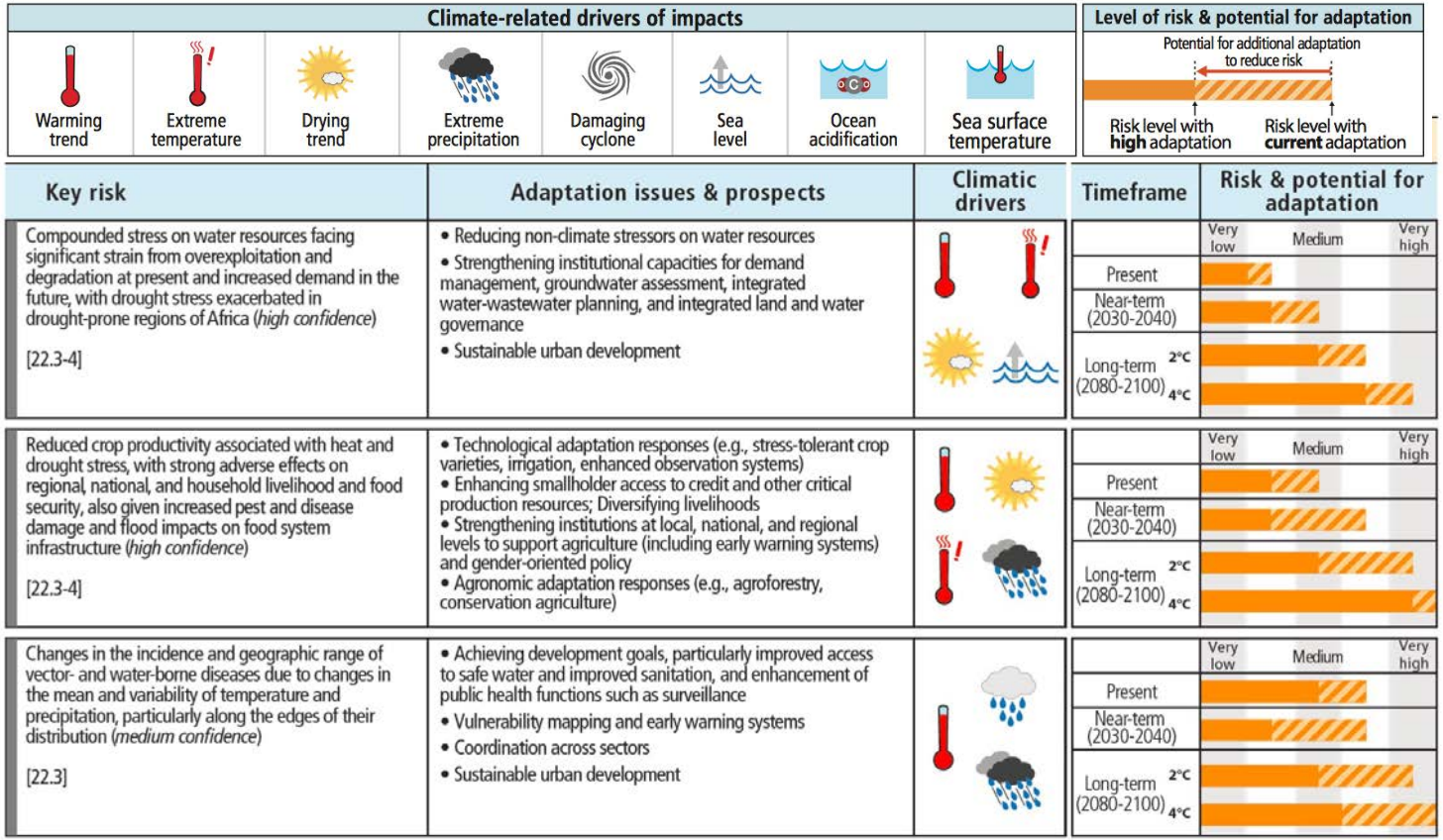
IPCC, AR5, SPM, Figure SPM.8

Regional key risks and risk reduction through adaptation: Africa



IPCC, AR5, SPM, Figure SPM.8

Selected key risks and potential for adaptation for Africa the present day to the long term



IPCC, AR5, WG II, Box SPM.2 Table 1

INTERGOVERNMENTAL PANEL ON climate change

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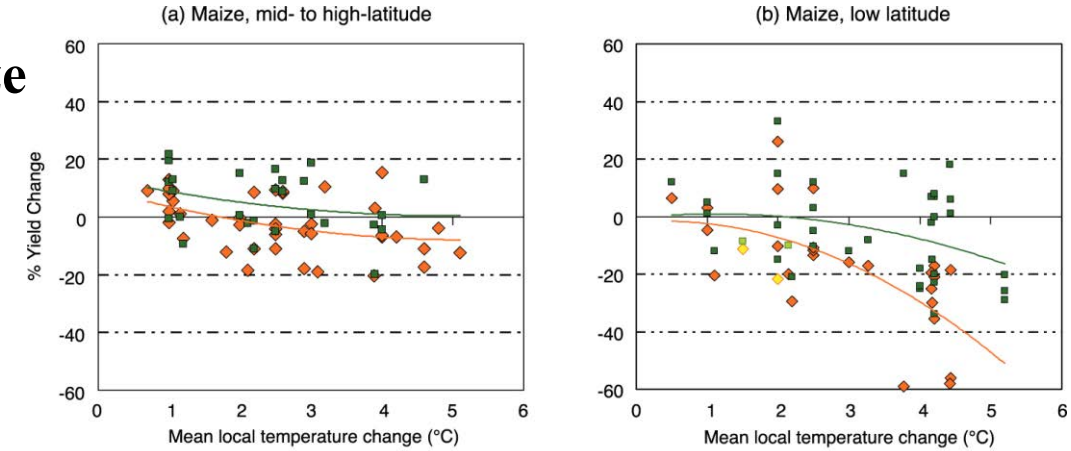
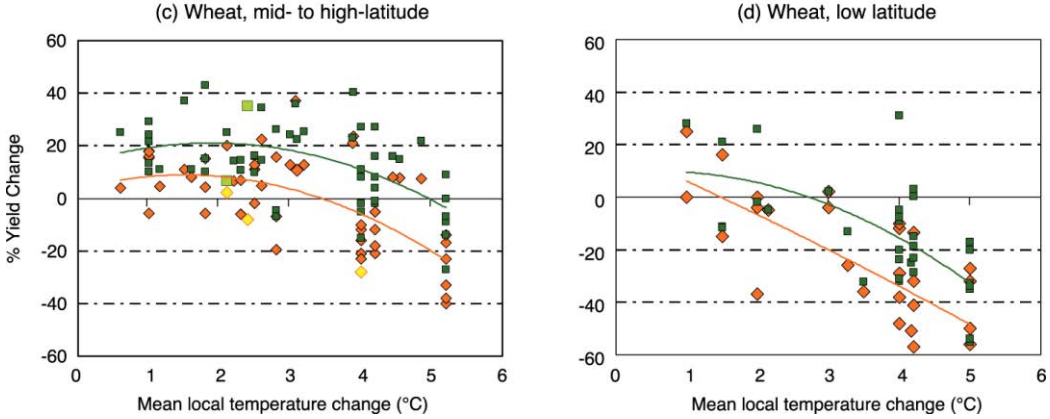
Figure TS.7. Sensitivity of cereal yield to climate change

Maize

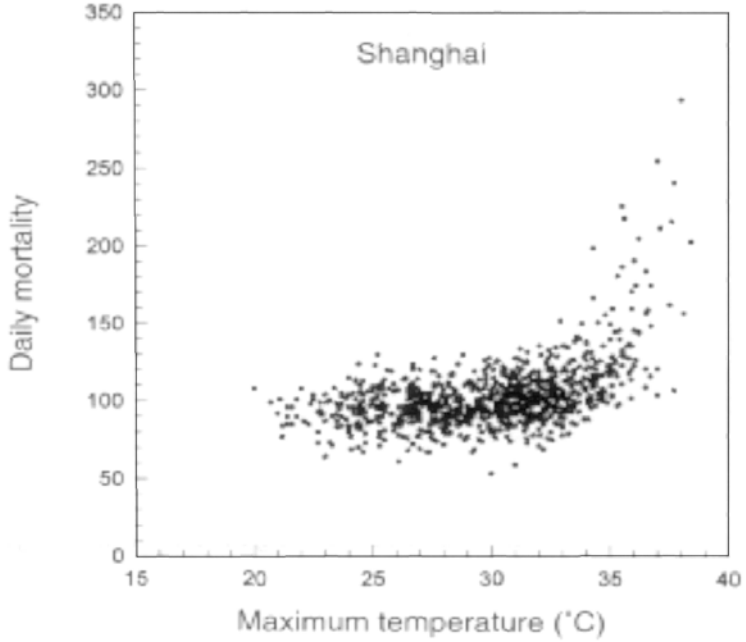


Wheat



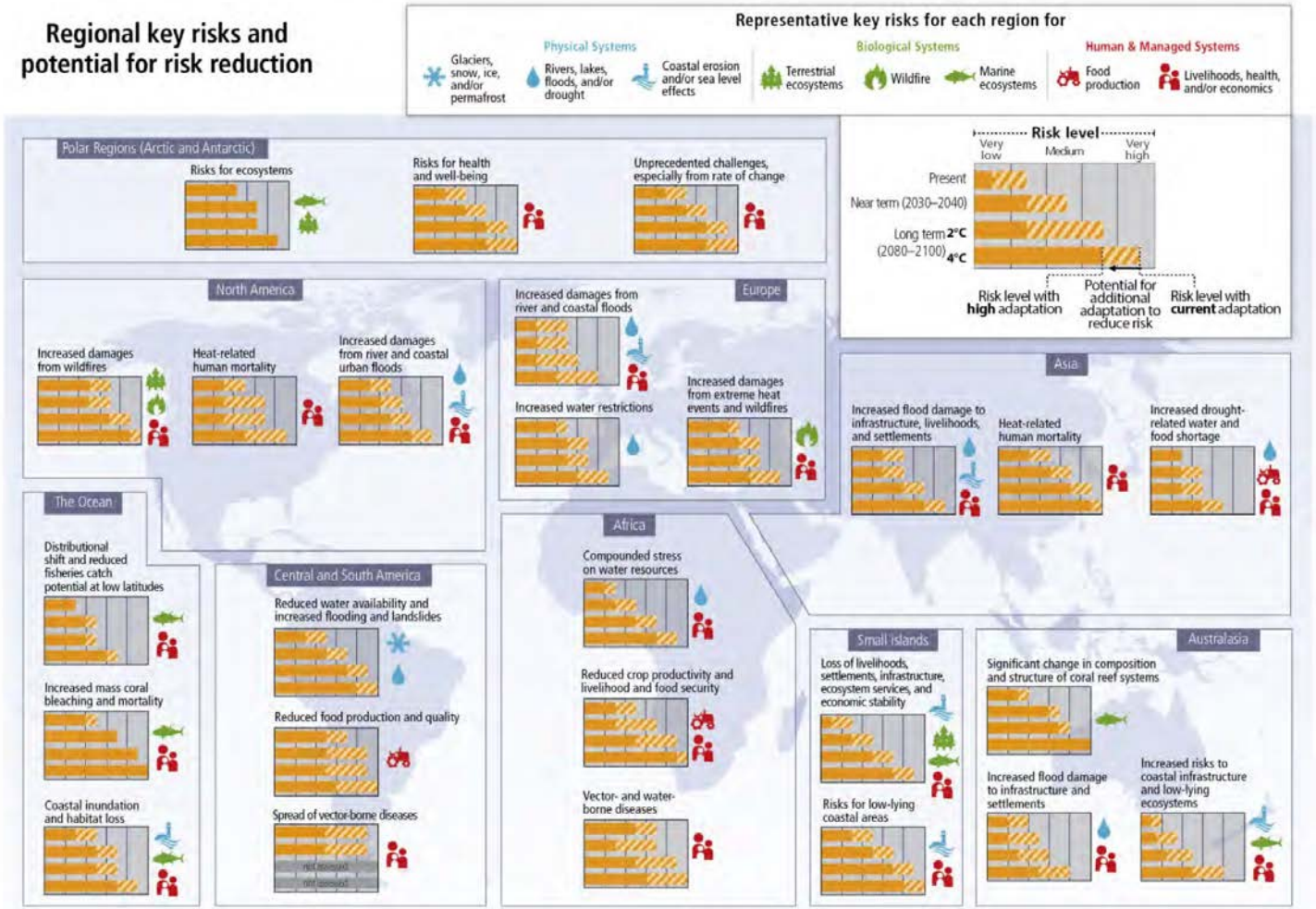
IPCC AR4 WGII

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



Référence : CILIMATE CHANGE AND HUMAN HEALTH, 1996

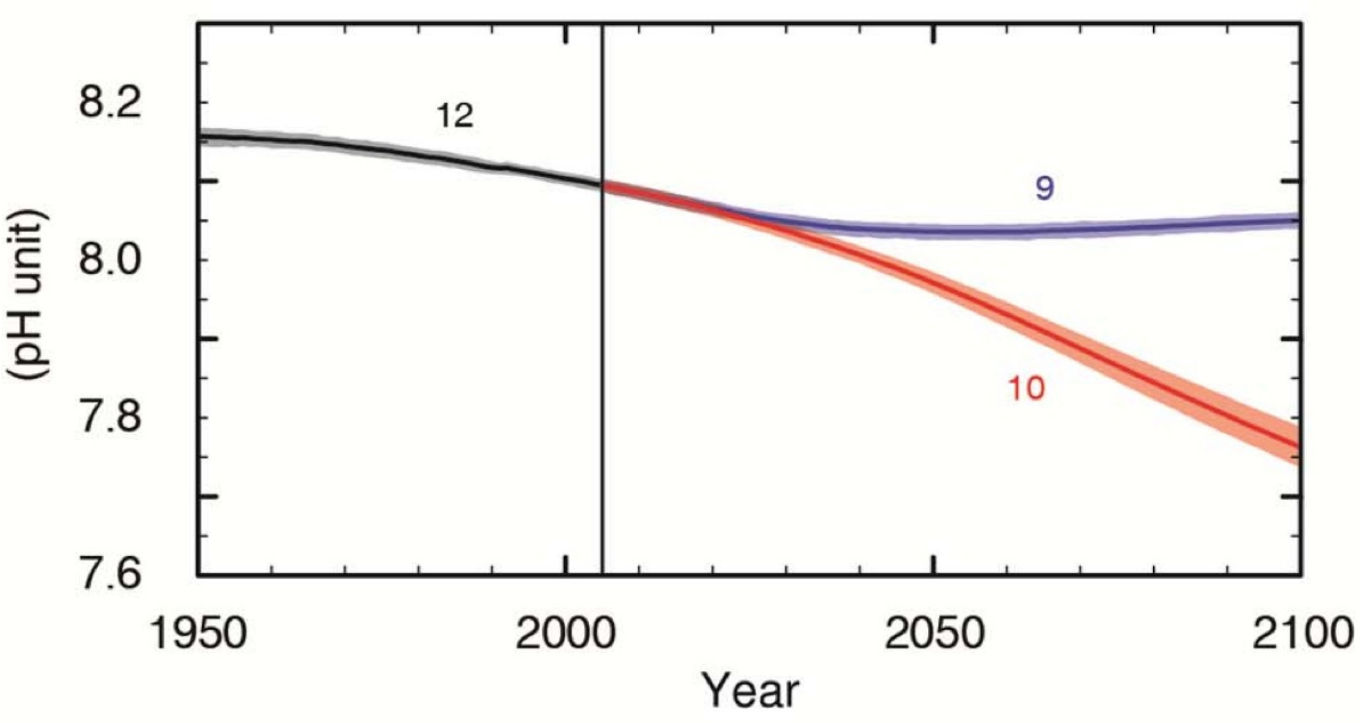
Jean-Pascal van Ypersele
(vanyp@climate.be)



IPCC, AR5, SPM, Figure SPM.8

Global ocean surface pH (projections)

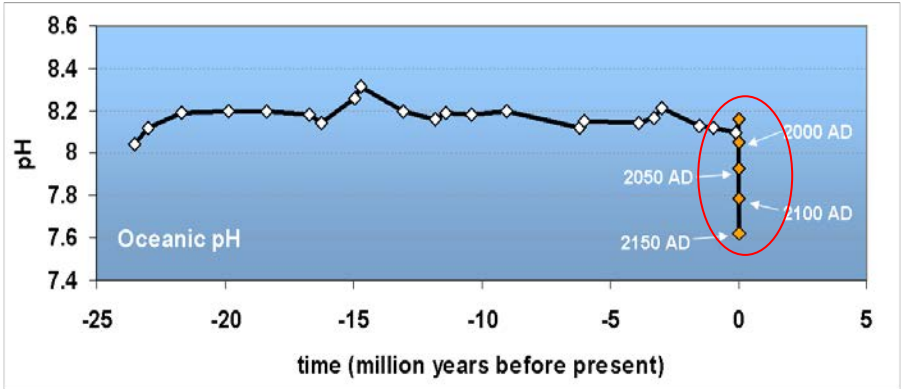
Ocean Acidification, for RCP 8.5 (orange) & RCP2.6 (blue)



IPCC AR5 WGI, Fig SPM 07

Oceans are Acidifying Fast …….

Changes in pH over the last 25 million years



"Today is a rare event in the history of the World"

- **It is happening now, at a speed and to a level not experienced by marine organisms for about 60 million years**
- **Mass extinctions linked to previous ocean acidification events**
- **Takes 10,000's of years to recover**

Turley et al. 2006

Slide courtesy of Carol Turley, PML

Impacts are already underway

- Tropics to the poles
- On all continents and in the ocean
- Affecting rich and poor countries (but the poor are more vulnerable everywhere)




AR5 WGII SPM

Potential Impacts of Climate Change

AR5 WGII SPM

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

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


ADAPTATION IS
ALREADY
OCCURRING
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Flood risk adaptation in Bangladesh (example): cyclone shelters, awareness raising, forecasting and warning

photo: Dr Thorsten Klose/German Red Cross (2010), evaluation of the Community Based Disaster Preparedness Programme run by the Red Cross in1996-2002


RISKS OF
CLIMATE CHANGE
INCREASE
WITH CONTINUED
HIGH EMISSIONS
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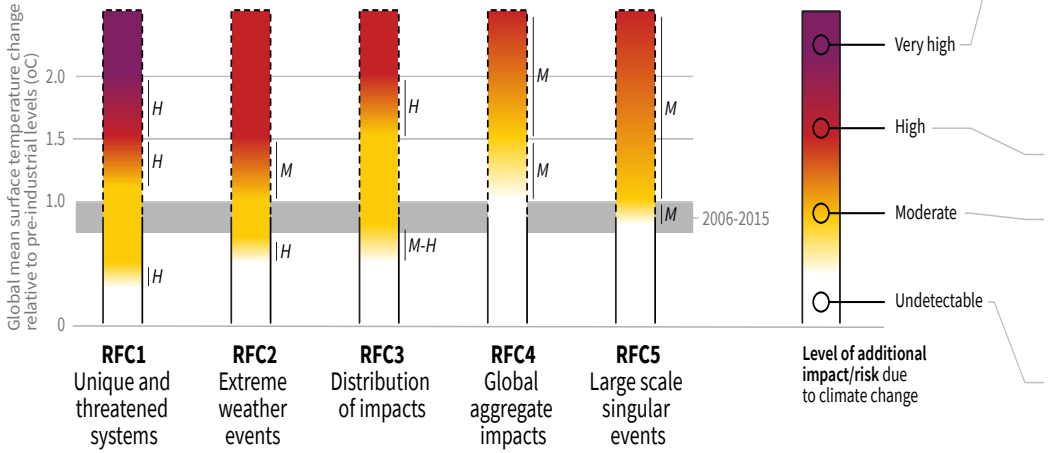
How the level of global warming affects impacts and/or risks associated with the Reasons for Concern (RFCs) and selected natural, managed and human systems

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)

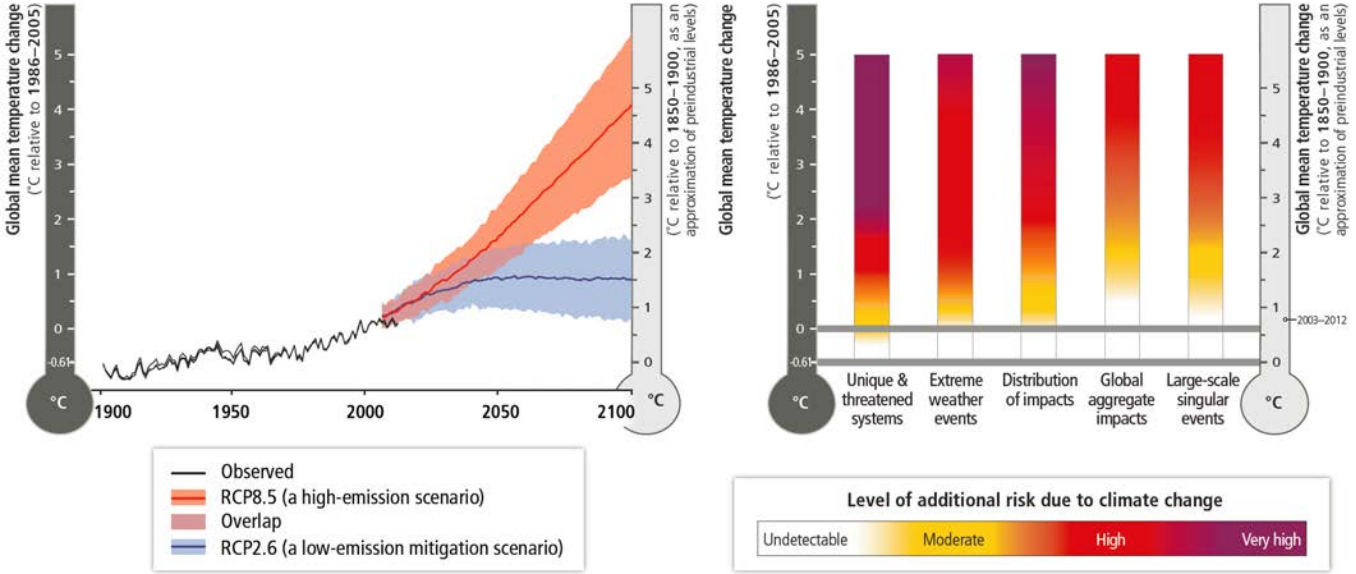


Purple indicates very high risks of severe impacts/risks and the presence of significant irreversibility or the persistence of climate-related hazards, combined with limited ability to adapt due to the nature of the hazard or impacts/risks.

Red indicates severe and widespread impacts/risks.

Yellow indicates that impacts/risks are detectable and attributable to climate change with at least medium confidence.

White indicates that no impacts are detectable and attributable to climate change.



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Why net zero emissions are needed as soon as possiblee

@JPvanYpersele

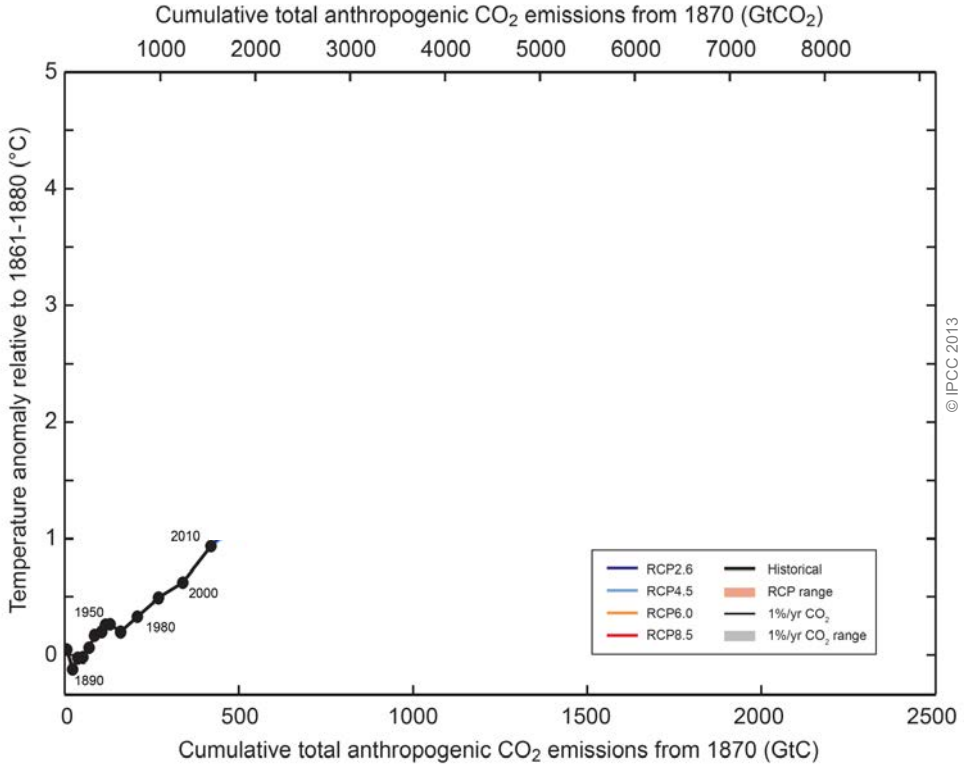


Fig. SPM.10

Cumulative emissions of CO_2 largely determine global mean surface warming by the late 21st century and beyond.

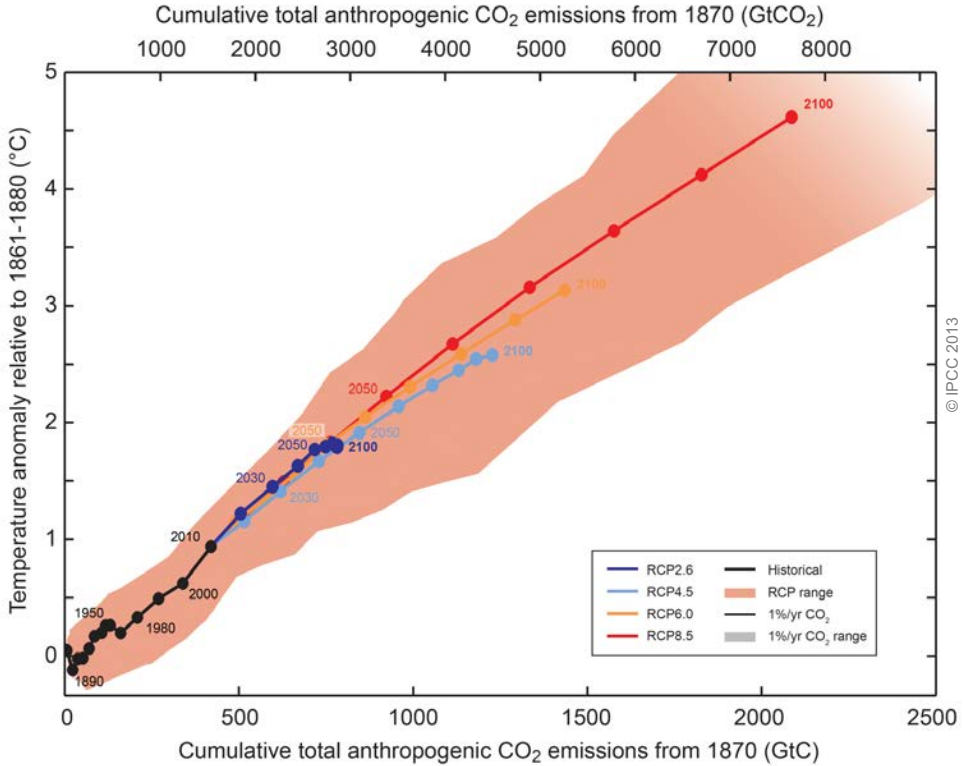


Fig. SPM.10

Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions.

GLOBAL

V

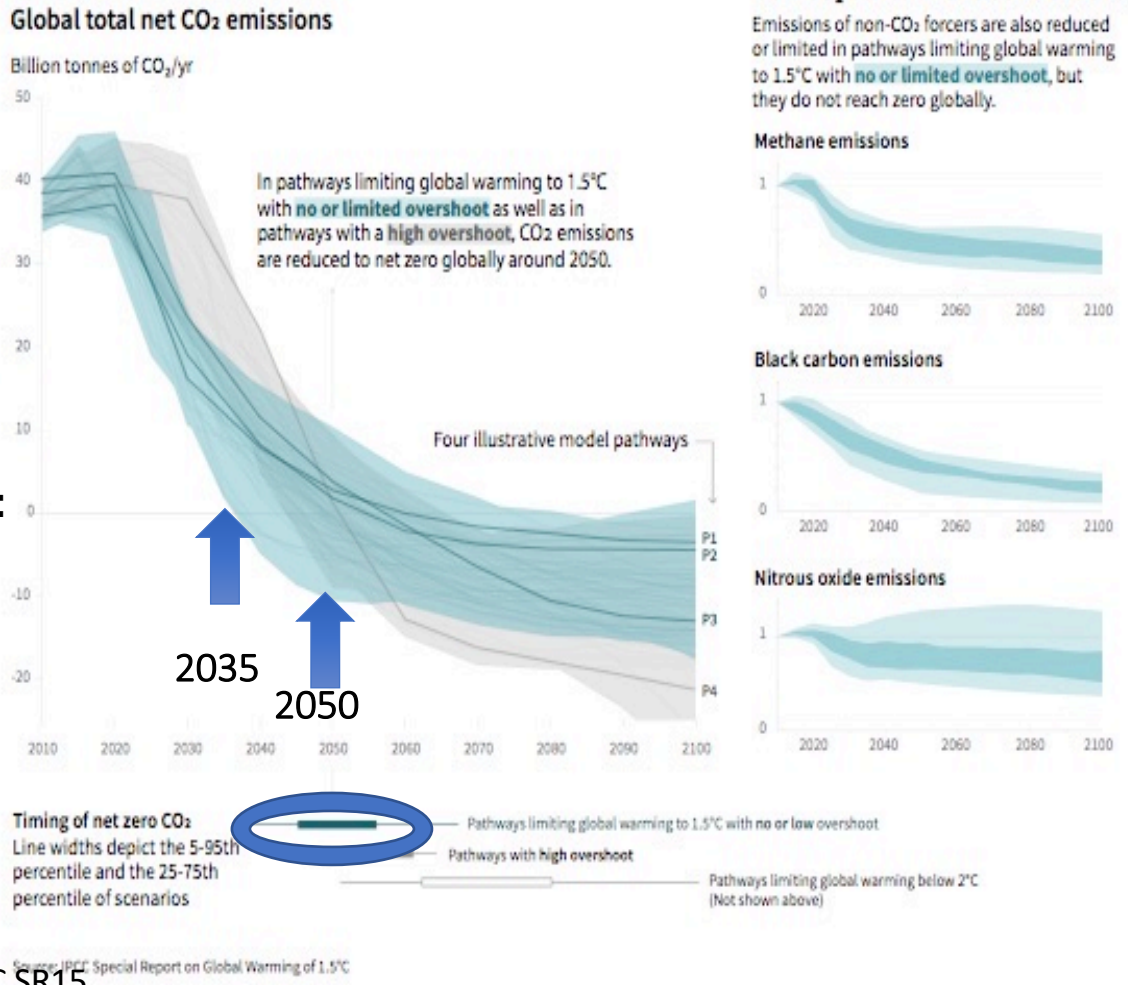
The temperature will stabilise when we reach net zero carbon dioxide emissions

(based on IPCC-assessed scenarios)

Source: Centre for Science and Environment, Delhi

Emission pathways compatible with below 1.5° C warming:

Net ZERO:



Source: IPCC SR15

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

Sixth Assessment Report
WORKING GROUP III – MITIGATION OF CLIMATE CHANGE

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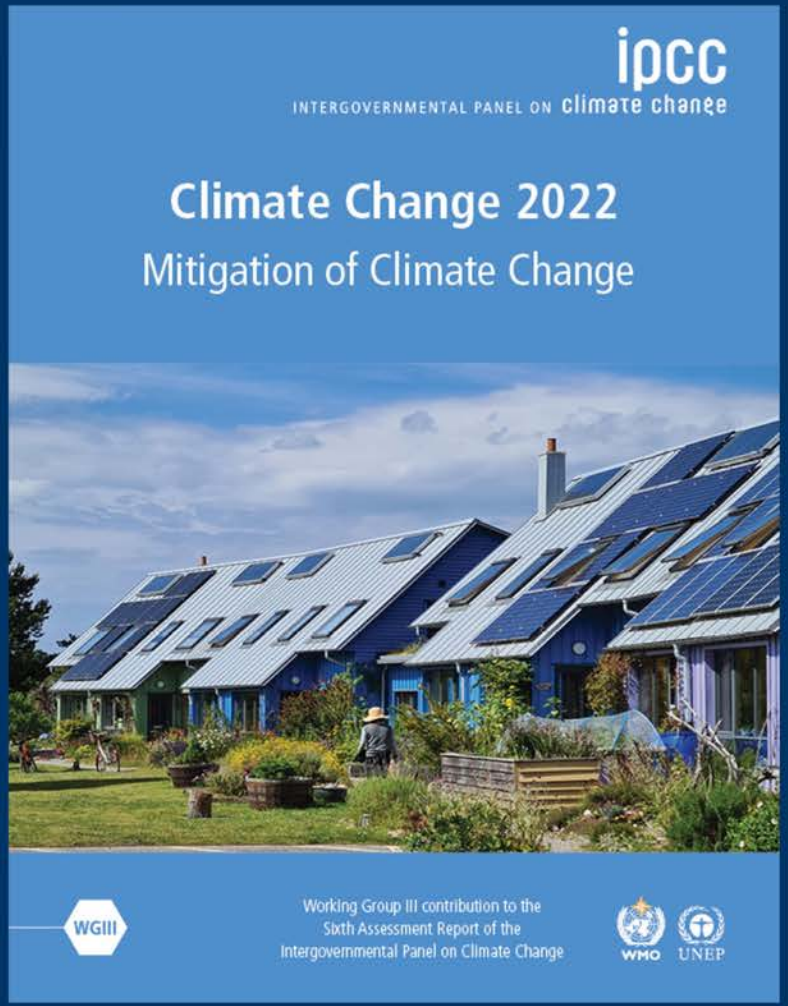
Climate Change 2022

Mitigation of Climate Change

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



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

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2010-2019: Average annual greenhouse gas emissions at highest levels in human history

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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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WMO UNEP

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

Demand and services

Energy

Land use

Industry

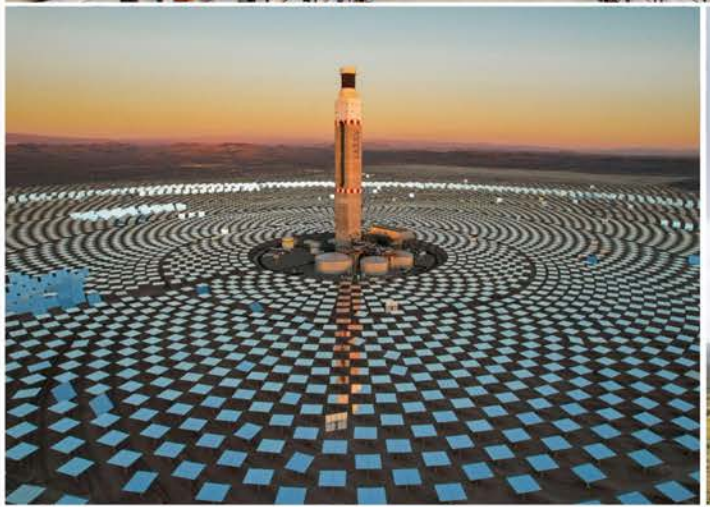
Urban

Buildings

Transport

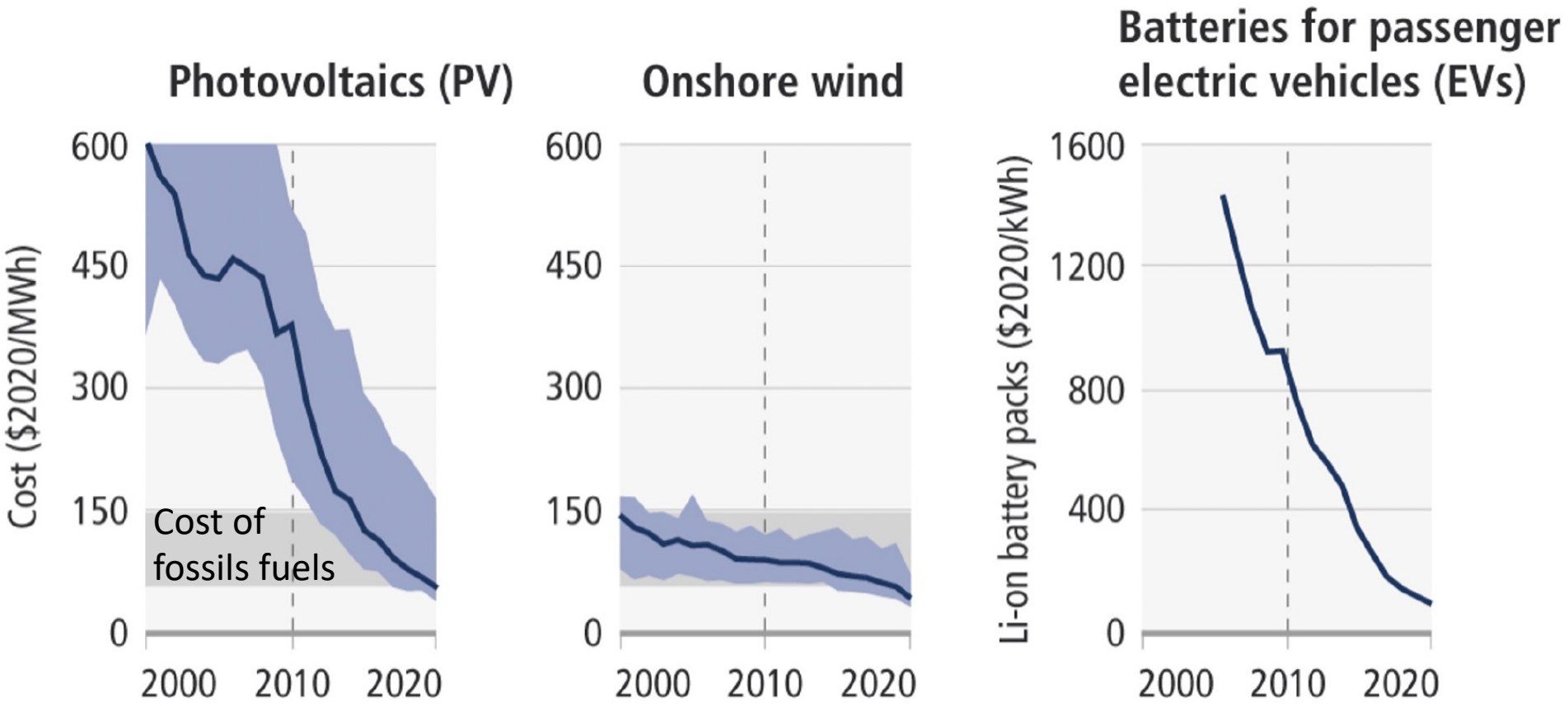
Energy

- **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



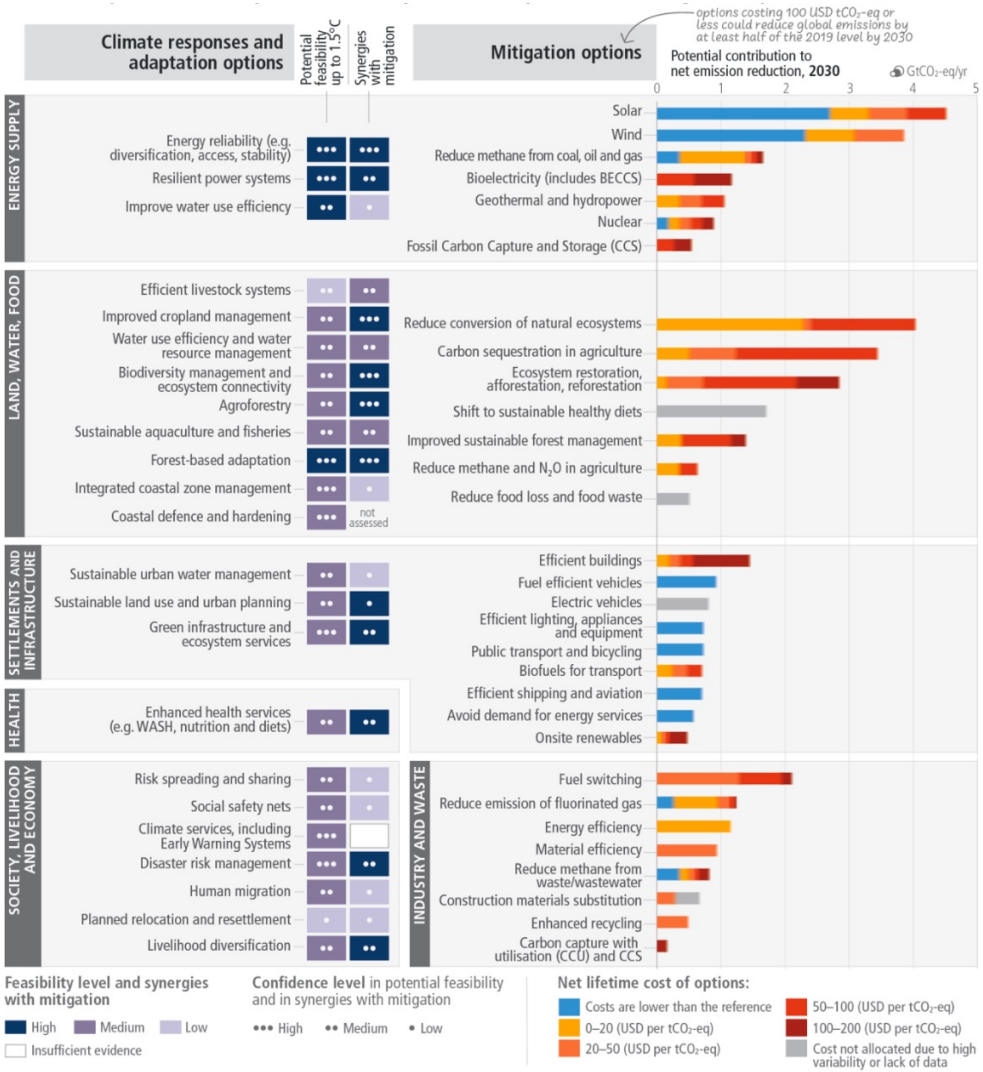
[Portland General Electric CC BY-ND 2.0, Harry Cunningham/Unsplash, Stéphane Bellerose/UNDP in Mauritius and Seychelles CC BY-NC 2.0, IMF Photo/Lisa Marie David, Tamara Merino CC BY-NC-ND 2.0]

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

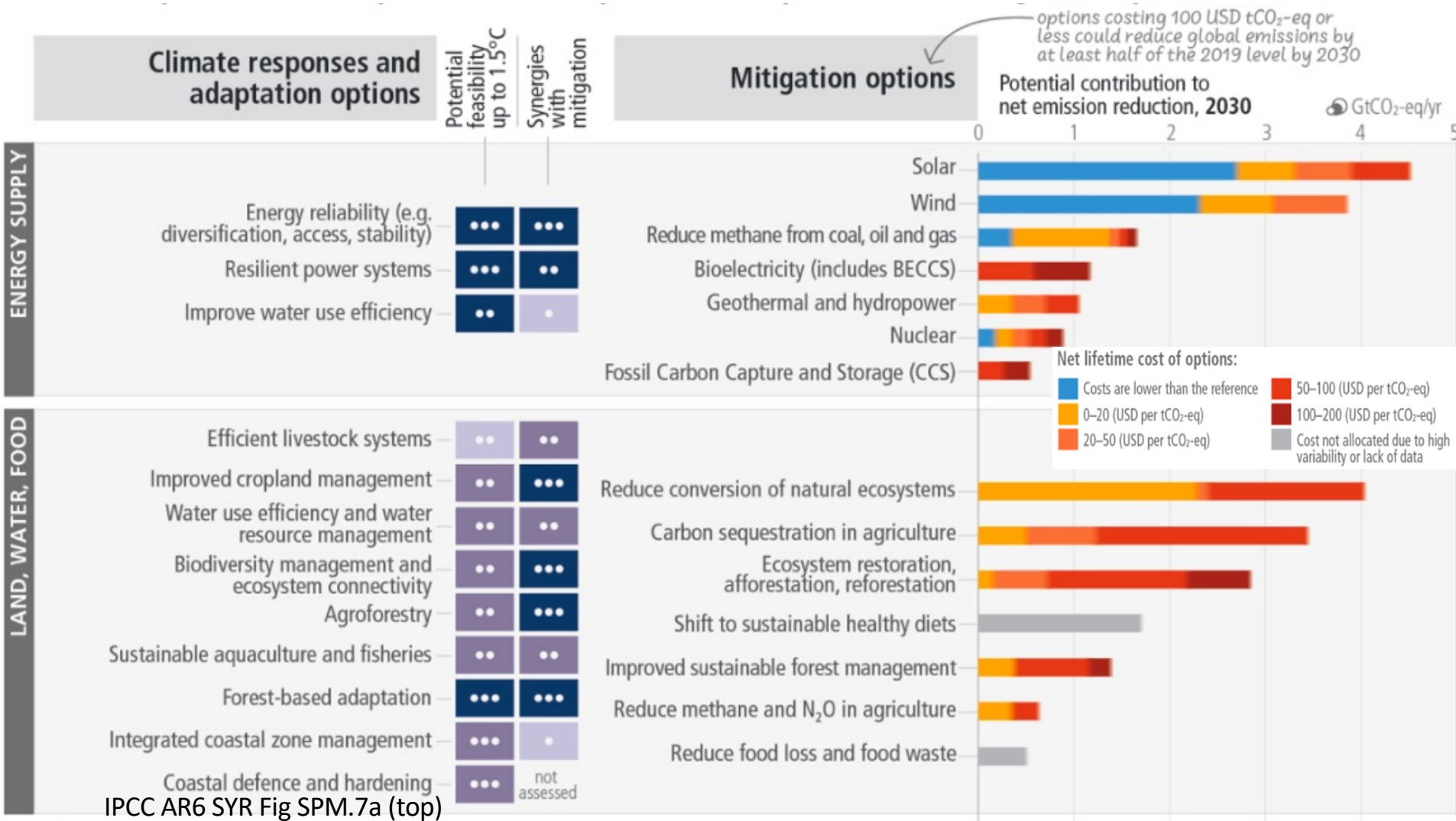


IPCC WG3 (2022)

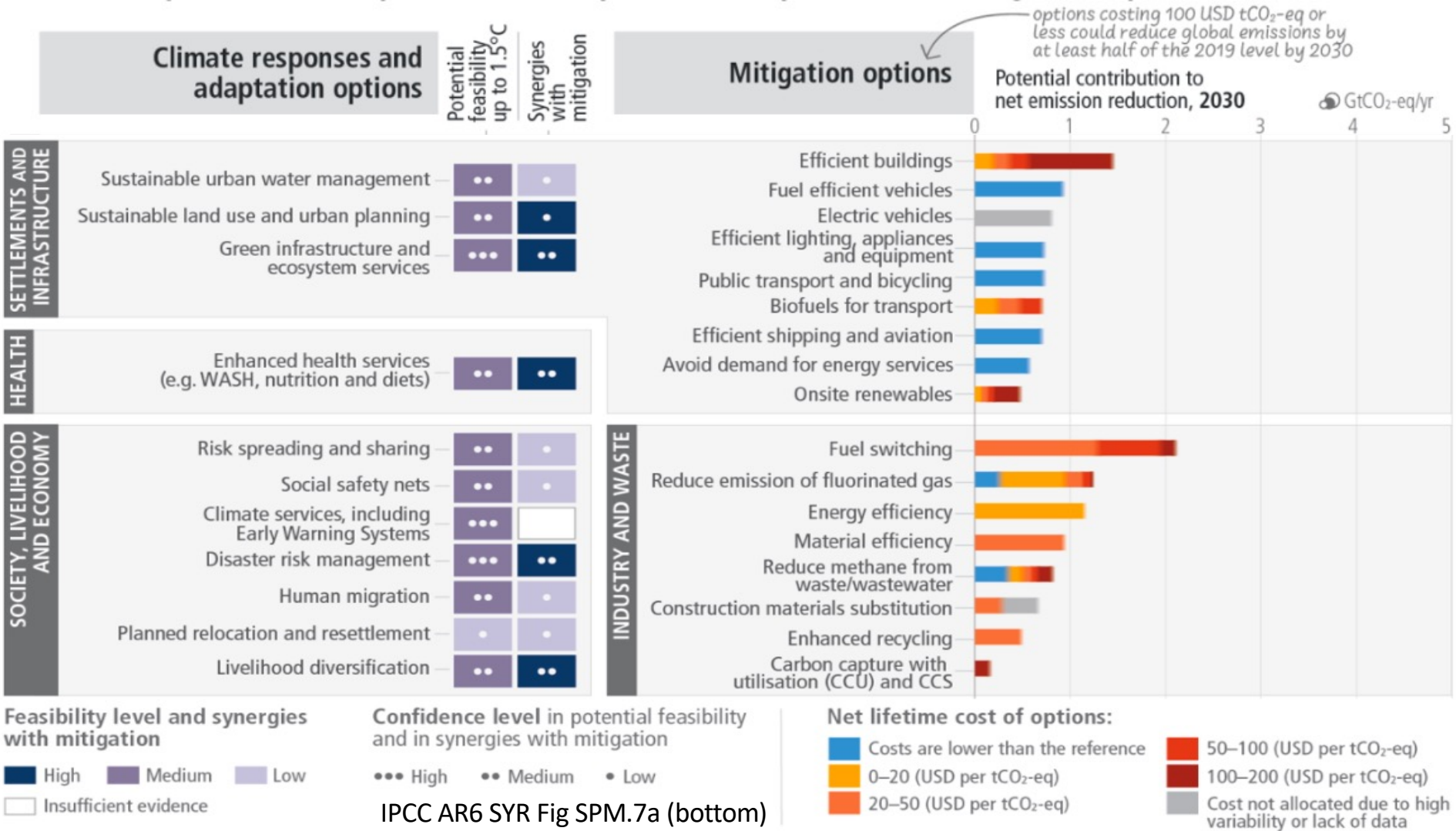
Feasibility of climate responses and adaptation, and potential of mitigation in the near-term



IPCC AR6 SYR Fig SPM.7a



IPCC AR6 SYR Fig SPM.7a (top)



IPCC AR6 SYR Fig SPM.7a (bottom)

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]

Transport

- **reducing demand** and **low-carbon** technologies are key to reducing emissions
- **electric vehicles**: greatest potential
- **battery technology**: advances could assist electric rail, trucks
- **aviation** and **shipping**: alternative fuels (low-emission **hydrogen** and **biofuels**) needed
- Overall, substantial potential but depends on **decarbonising the power sector**.

[United Airlines, Jeremy Segrott CC BY 2.0, Andreas160578/Pixabay]

Cities and urban areas

- better urban planning, as well as:
- sustainable production and consumption of goods and services,
- **electrification** (low-emission energy),
- enhancing **carbon uptake and storage** (e.g. green spaces, ponds, trees)

There are options for existing, rapidly growing *and* new cities.

[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]

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]

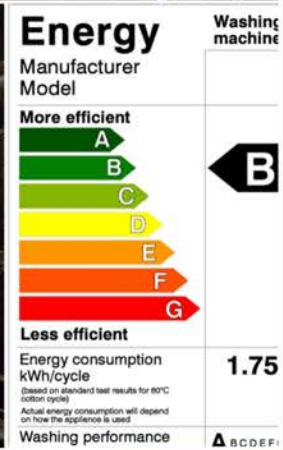
Land use

- can provide large-scale emissions reductions **and** remove and store CO_2 at scale
- protecting and restoring **natural ecosystems** to remove carbon: forests, peatlands, coastal wetlands, savannas and grasslands
- competing demands have to be **carefully managed**
- **cannot compensate** for **delayed** emission **reductions** in other sectors

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

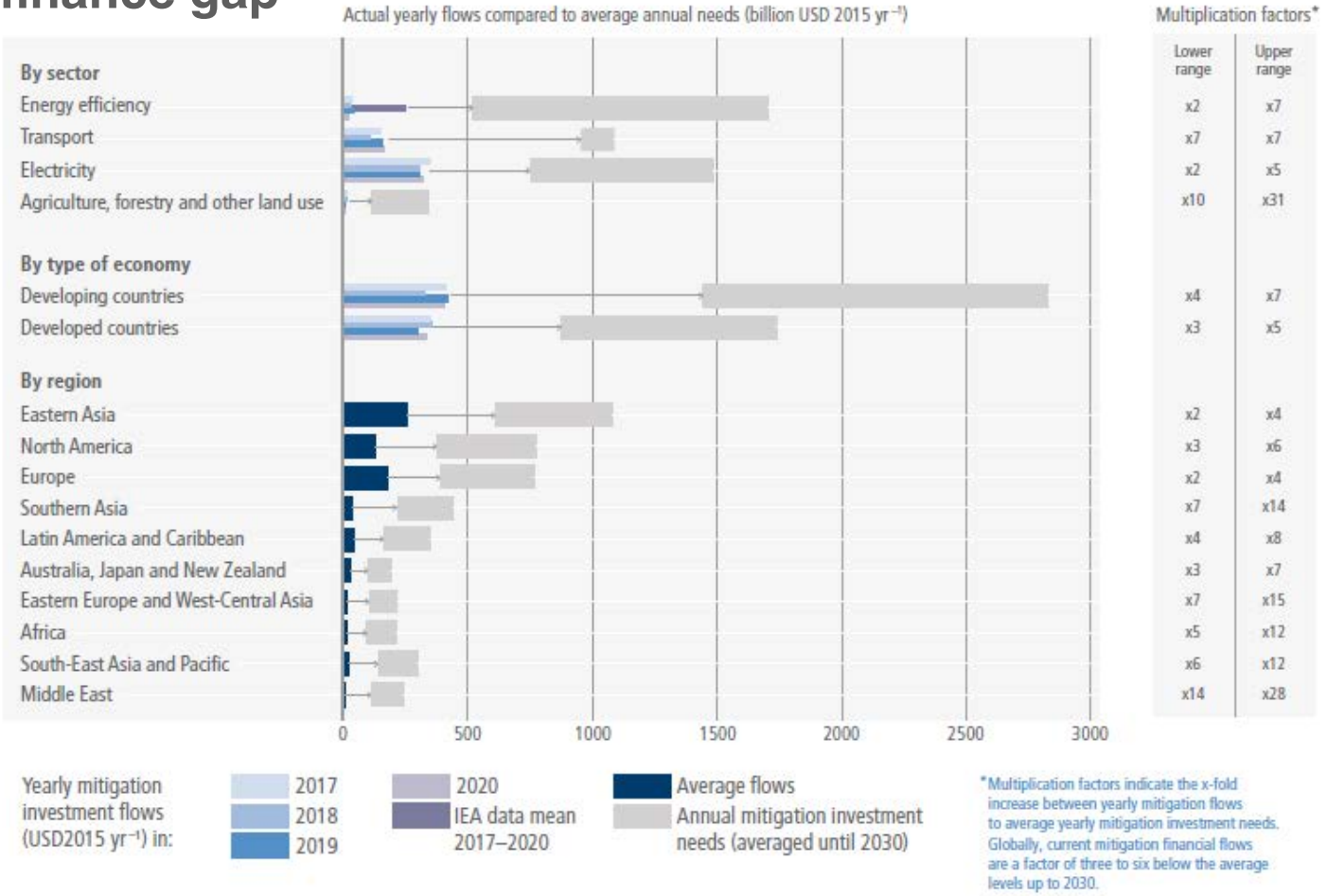
[World Bank/Simone D. McCourtie, Dominic Chavez CC BY-NC-ND 2.0, Trent Reeves/MTA Construction & Development CC BY 2.0, IMF Photo/Tamara Merino CC BY-NC-ND 2.0, Olga Delawrence/Unsplash.]

Closing investment gaps

- 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

[Tobias/Unsplash, Rwanda Green Fund /CC BY-SA 2.0]

Climate finance gap



Source: AR6 WG3 Fig TS.25

UNFCCC COP27: Key outcomes

- **COP27 agreed on an overarching 'cover decision', the Sharm el-Sheikh Implementation Plan.**
  It reuses language on 1.5°C and phasing down coal from last year's Glasgow Climate Pact
  Makes the first ever mentions of food security risks, climate tipping points and the need for financial system reform (next slide).

- **Key delivery was the 'loss and damage' fund. Targeting vulnerable developing countries, the fund will respond to loss and damage, the adverse effects of climate change. A transitional committee is to make recommendations at COP28 next year on operationalising the fund, with an emphasis on finding new and innovative funding arrangements.**

- **COP27 also finalised a mitigation work programme focused on pooling ideas to accelerate action, with no binding elements.**
  NB: Calls to ensure a peak in emissions by 2025 and a phase-down of fossil fuels were not included in the final text.

From the COP27 cover decision

30. *Highlights* that about USD 4 trillion per year needs to be invested in renewable energy up until 2030 to be able to reach net zero emissions by 2050,18 and that, furthermore, a global transformation to a low-carbon economy is expected to require investment of at least USD 4–6 trillion per year;

31. *Also highlights* that delivering such funding will require a *transformation of the financial system* and its structures and processes, engaging governments, central banks, commercial banks, institutional investors and other financial actors;

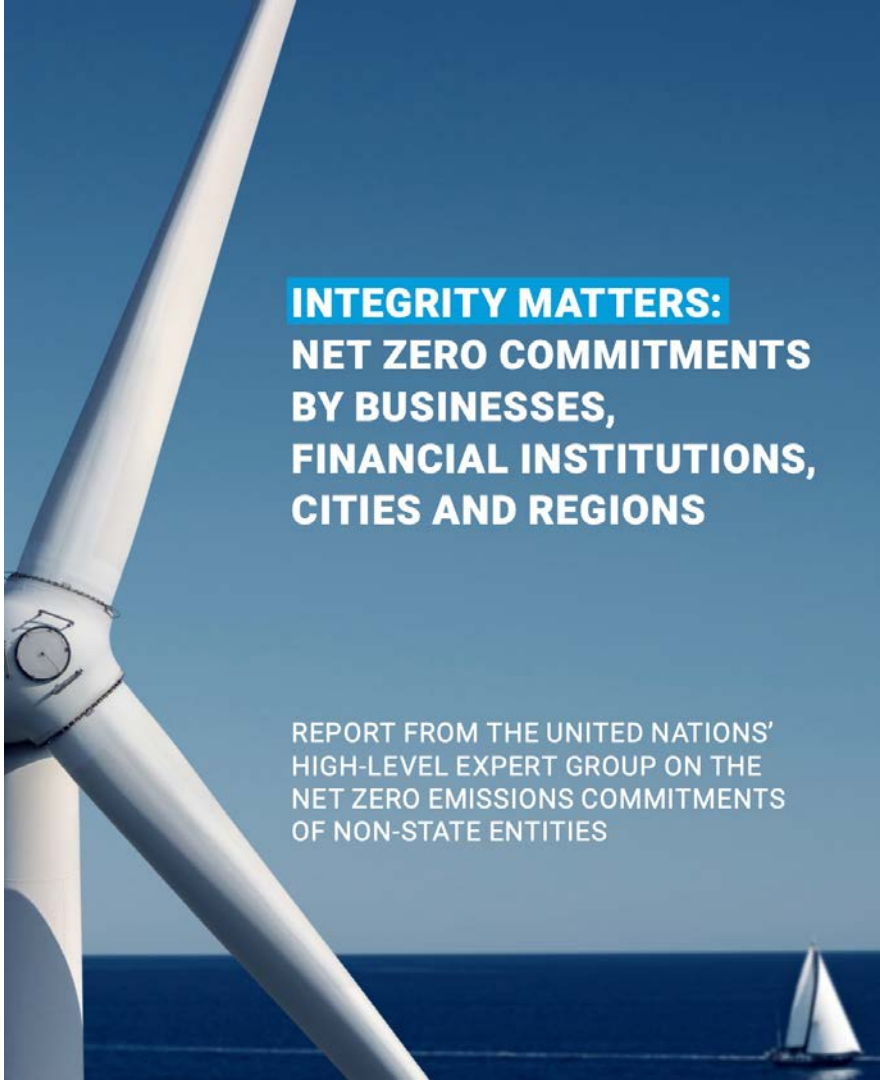
From the COP27 cover decision

32. *Notes with concern* the growing gap between the needs of developing country Parties, in particular those due to the increasing impacts of climate change and their increased indebtedness, and the support provided and mobilized for their efforts to implement their nationally determined contributions, highlighting that such needs are currently estimated at USD 5.8–5.9 trillion20 for the pre-2030 period;

35. *Notes* that global climate finance flows are small relative to the overall needs of developing countries, with such flows in 2019–2020 estimated to be USD 803 billion,23 which is 31–32 per cent of the annual investment needed to keep the global temperature rise well below 2 °C or at 1.5 °C, and also below what would be expected in the light of the *investment opportunities* identified and the cost of failure to meet climate stabilization targets;

« Integrity Matters »

Report published during COP27



« Integrity Matters »

Five Principles

1. Ambition which delivers significant near— and medium —term emissions reductions on a path to global net zero by 2050
2. Demonstrated integrity by aligning commitments with actions and investments
3. Radical transparency in sharing relevant, non-competitive, comparable data on plans and progress
4. Established credibility through plans based in science and third-party accountability
5. Demonstrable commitment to both equity and justice in all actions

« Integrity Matters »

Ten Recommendations

1. Announcing a Net Zero Pledge
2. Setting Net Zero Targets
3. Using Voluntary Credits
4. Creating a Transition Plan
5. Phasing out of Fossil Fuels and Scaling Up Renewable Energy
6. Aligning Lobbying and Advocacy
7. People and Nature in the Just Transition
8. Increasing Transparency and Accountability
9. Investing in Just Transitions
10. Accelerating the Road to Regulation

The priorities I suggest

(Element) of solution n° 1: The survival of humanity and ecosystems must become a much higher political priority

… as if we were all running for our life.

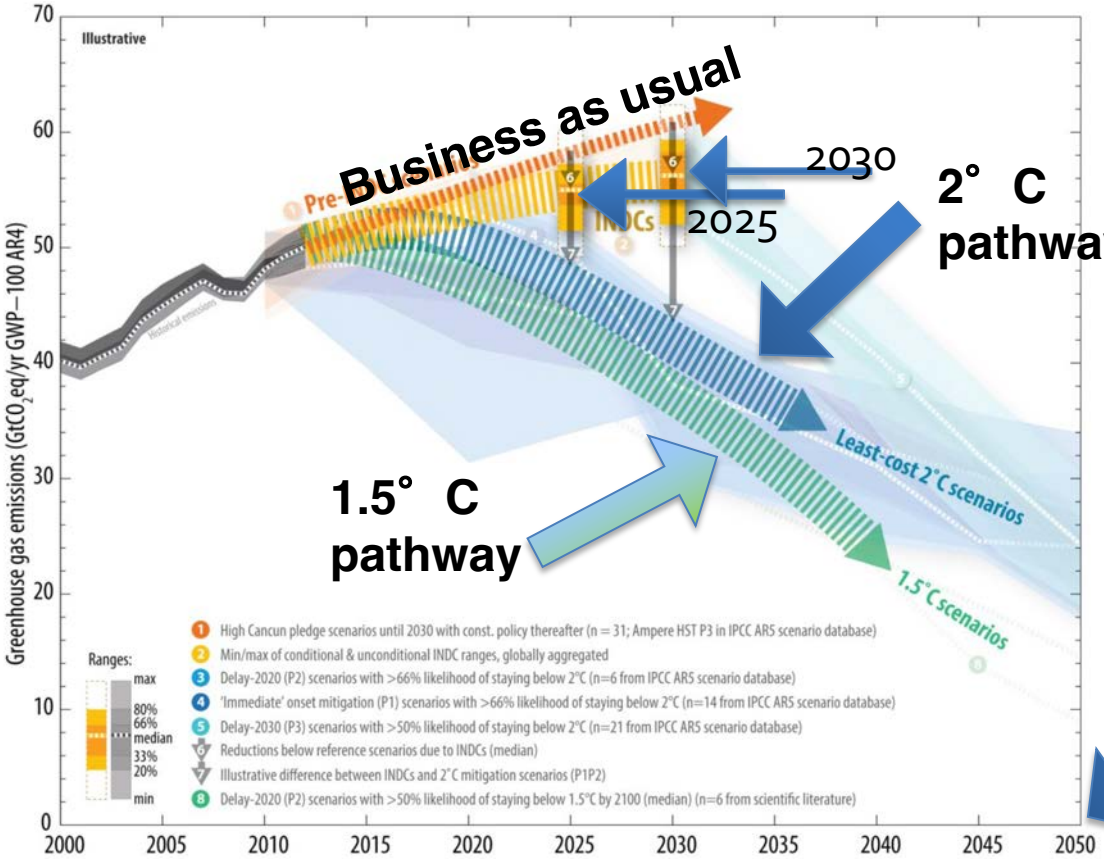
@JPvanYpersele


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

Paris Agreement

- Article 2:
  - (…) to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by:
    - Holding the increase in the global average temperature to **well below 2 °C** above pre-industrial levels and to **pursue efforts** to limit the temperature increase to **1.5 °C** above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;
    - **Increasing the ability to adapt** (…) and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production;
    - Making **finance flows consistent** with a pathway towards low greenhouse gas emissions and climate-resilient development

Paris Agreement: plans not sufficient yet!



UNFCCC, Aggregate effect of the intended nationally determined contributions: an update
http://unfccc.int/resource/docs/2016/cop22/eng/02.pdf

Solution n° 2: Economic actors must be confronted much more clearly with their responsibilities

Degrowth of climate-unfriendly activities must be accepted, while growth of activities helping climate protection and poverty eradication must be encouraged

Yes, the planet got destroyed. But for a beautiful moment in time we created value for shareholders

"Yes, the planet got destroyed. But for a beautiful moment in time we created a lot of value for shareholders."

http://www.newyorker.com/humor/issuecartoons/2012/11/26/cartoons_20121119#slide=6

Solution n° 3: The best understood language is the price. Destroying the environment must become more and more expensive. Collected funds must be used to help the decarbonization, and avoid impacting the poor disproportionately

EU Emission Trading System, CO_2 taxes, fines, internal CO_2 price (firms do « as if » CO_2 emission was expensive). NB: Price must match the effect desired!

Solution n° 4: Transition towards a clean and sustainable economy and energy system must be « just », and other synergies with the SDGs must be seeked

Ex : The Polish energy system cannot be transformed without facilitating the coal miners reconversion

@JPvanYpersele

SUSTAINABLE DEVELOPMENT GOALS

Joel Pett, USA Today

Solution n° 5: Before looking at how to produce energy cleanly, much more attention must be given to reducing energy demand and efficiency, in all sectors

All production and consumption patterns must be reconsidered, helped by energy audits, etc.

- **Substantial reductions in emissions to stay under 2° C would require large changes in investment patterns e.g., from 2010 to 2029, in billions US dollars/year:** (mean numbers rounded, IPCC AR5 WGIII Fig SPM 9)
- **energy efficiency: +330**
- **renewables: + 90**
- **power plants w/ CCS: + 40**
- **nuclear: + 40**
- **power plants w/o CCS: - 60**
- **fossil fuel extraction: - 120**

Solution n° 6: Building sector: offers many opportunities in energy saving, economic activity, improving wellbeing…

Solution n° 7: Mobility : much more space and priority to pedestrians, bicycles, and public transport; reduce priority given too long to individual transport in urban planning

Electrify remaining vehicles (with clean electricity). Fly less, only if essential.

Solution n° 8: Food and agriculture. A possible change with big positive impact: eat less (red) meat and cheese, of better quality! Eat more plant-based food (produced cleanly)

…It is good for health as well!

Solution n° 9: The Sun gives us in two hours about as much energy as the world uses in *one year*, all forms of energy considered

The cost of solar kWh is crashing, wind power, heat and electricity storage, and smart grids are moving forward

@JPvanYpersele

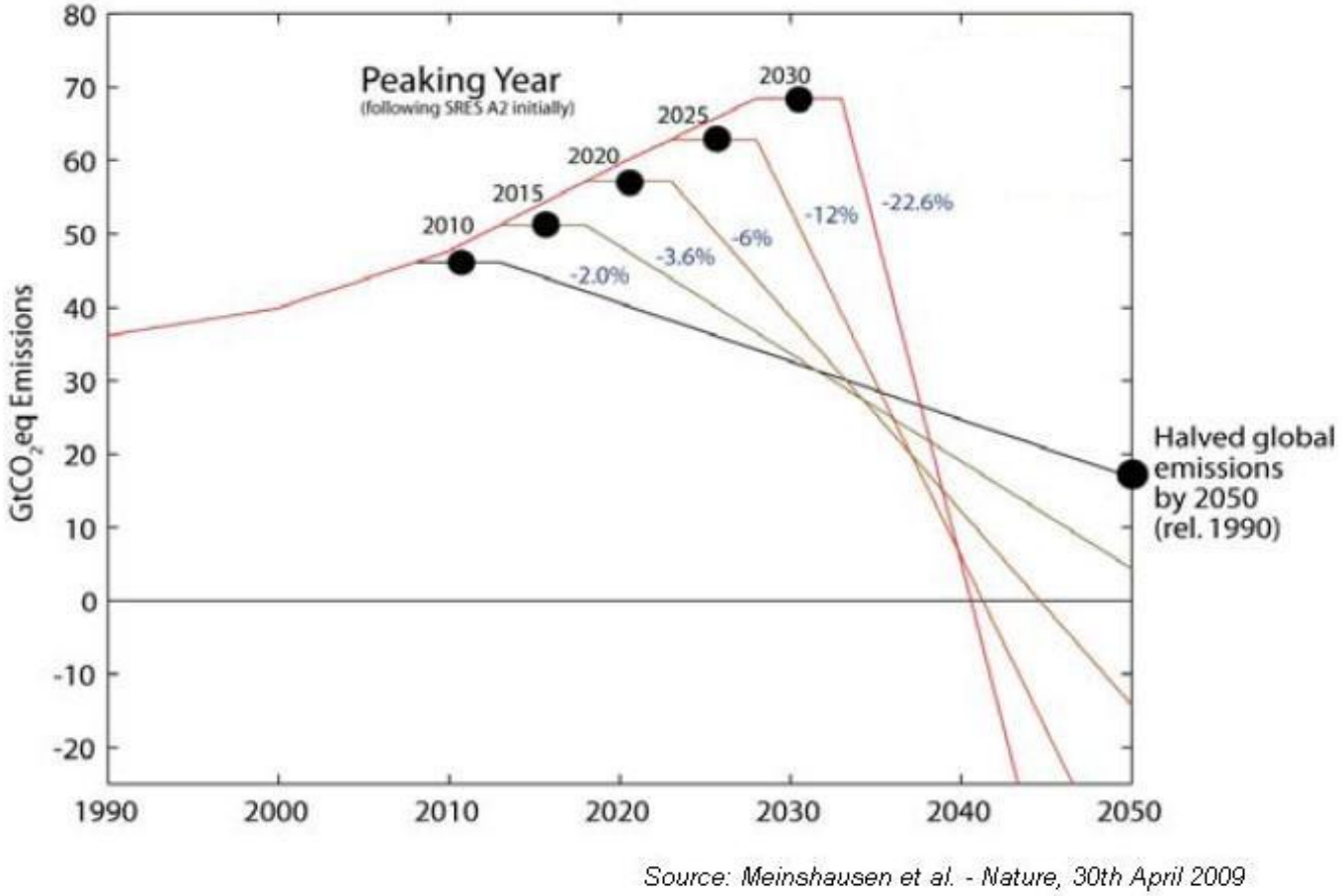
If well designed, measures to prevent climate change could offer so many opportunities:

- **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 and implement sustainable development**
- **Opportunities to integrate research results in a useful, policy-relevant way, accross disciplines (including social sciences)**

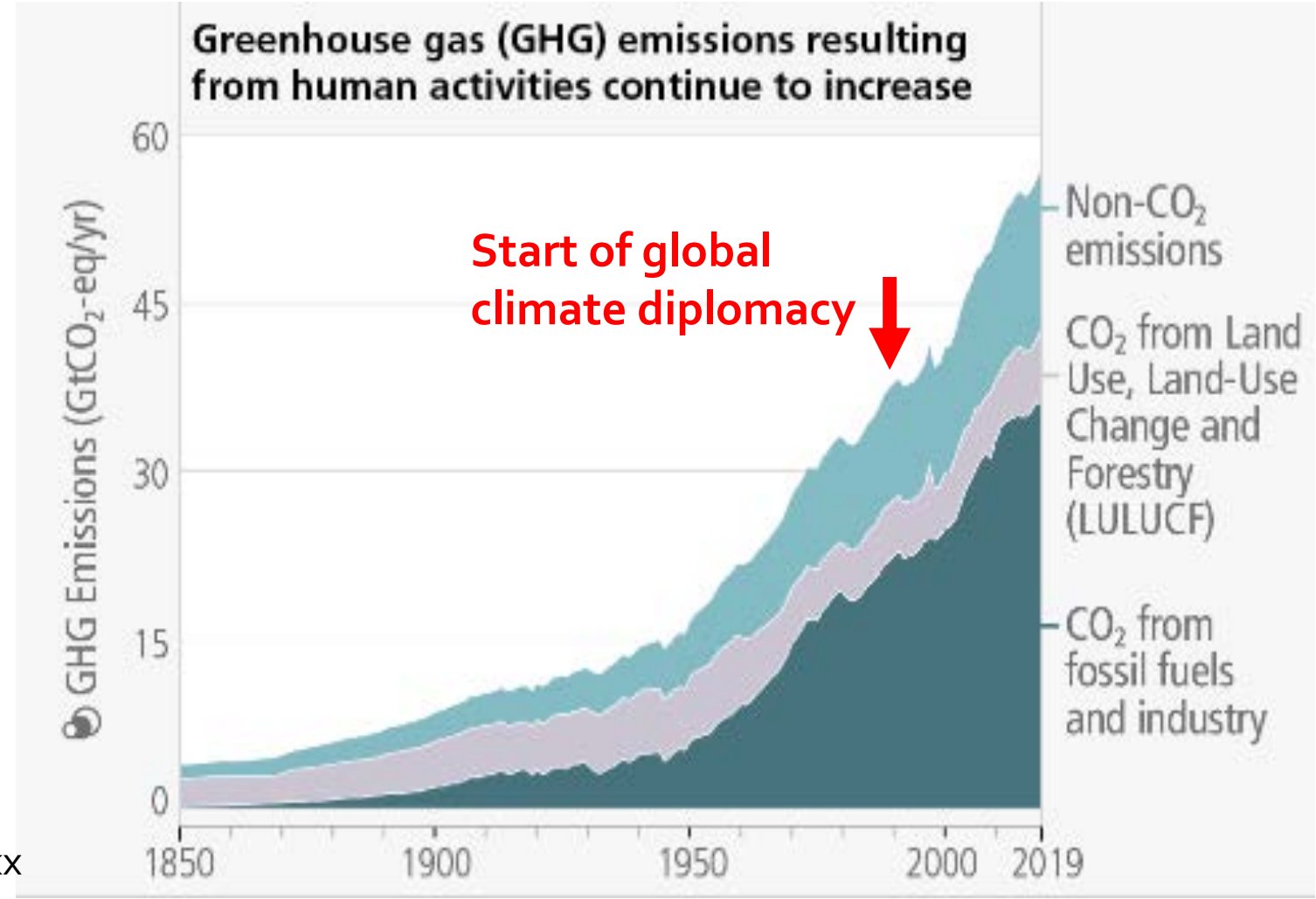
@JPvanYpersele

Joel Pett, USA Today

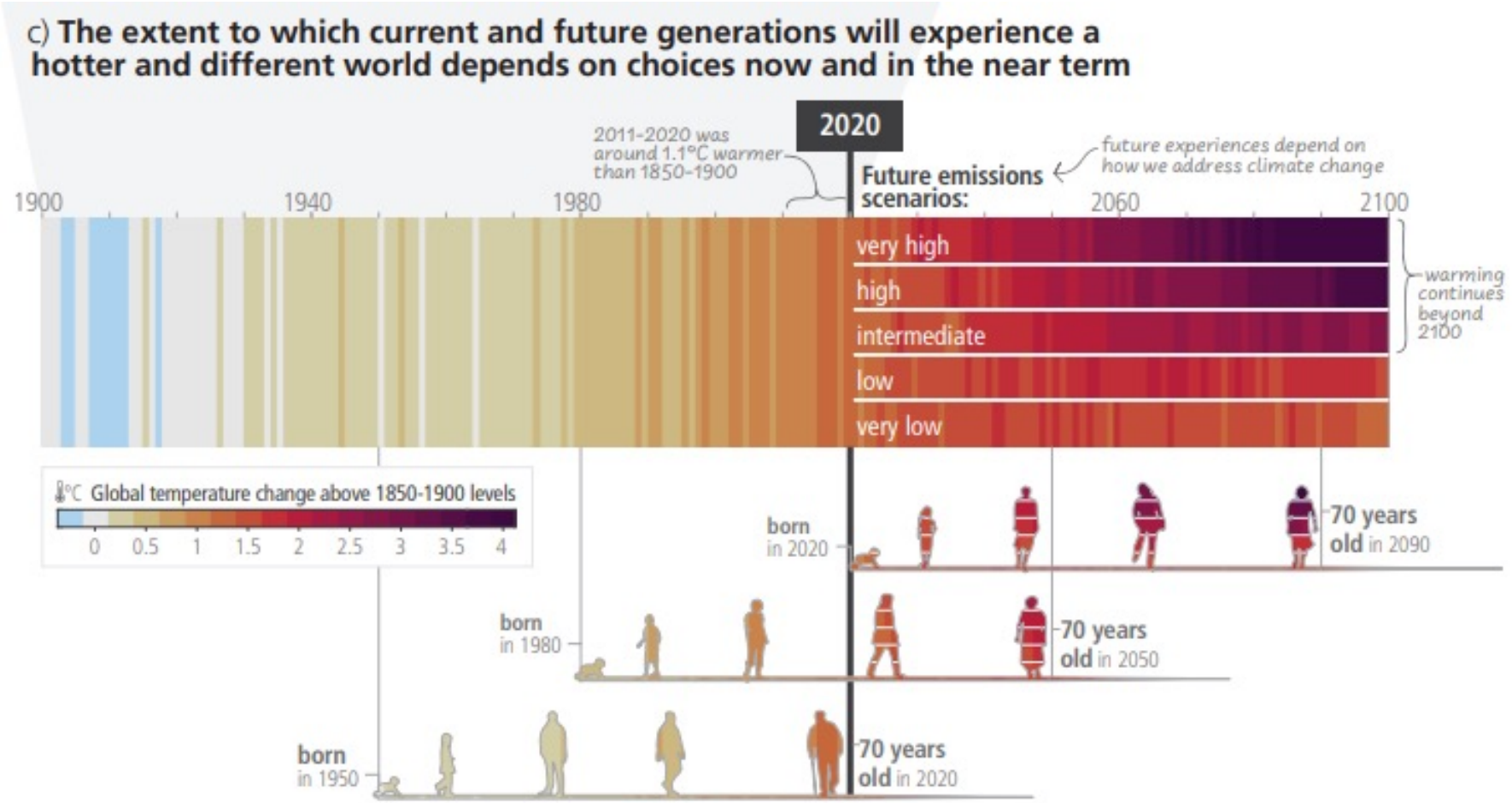
The more we wait, the more difficult it will be



Source: Meinshausen et al. - Nature, 30th April 2009



Modified from IPCC AR6 by Hans Bruyninckx



Source: IPCC AR6 SYR

RCP2.6 RCP8.5

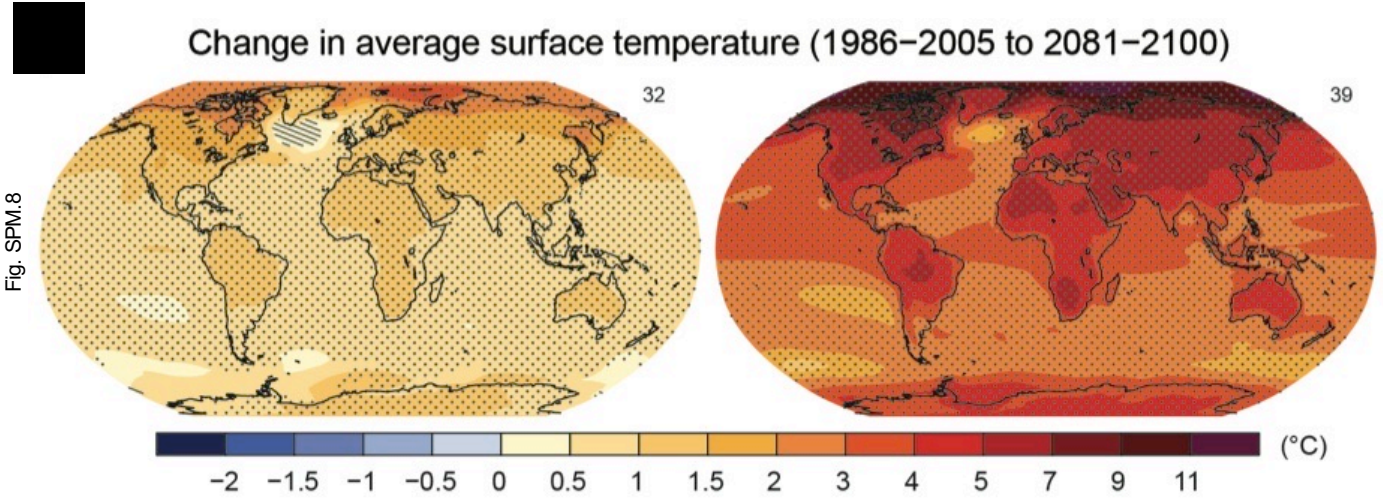


Fig. SPM.8

Humanity has the choice

Conclusions

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 in a few decades

Addressing it open so many opportunities, for research in all disciplines and accross disciplines and for integrating results of this research in meaningful actions by all: governments, cities, businesses, NGOs, and citizens.

It opens also economic opportunities, and opportunities to address in a synergistic manner other societal goals, such as the 17 Sustainable Development Goals.

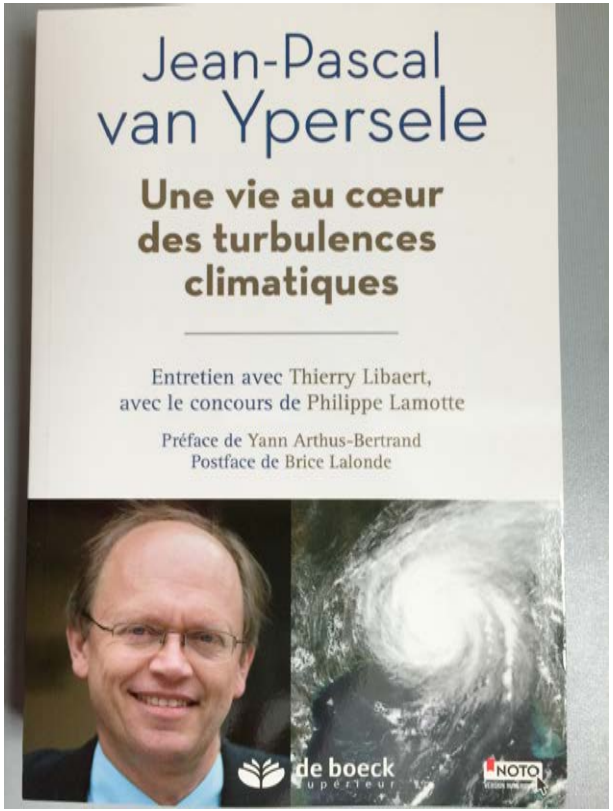
Pour en savoir plus:

Lisez mon livre, où j'aborde tous ces sujets

Publié chez De Boeck supérieur

Préface:Yann Arthus-Bertrand

Postface: Brice Lalonde



Om meer te weten:

Bij EPO (2018)

Voorwoord:
Jill Peeters

Ecrit pour les jeunes (et moins jeunes), avec des liens vers des ressources utiles

Disponible gratuitement, 6X/an: www.plateforme-wallonne-giec.be

Lettre PwG n° 27 (novembre 2022)
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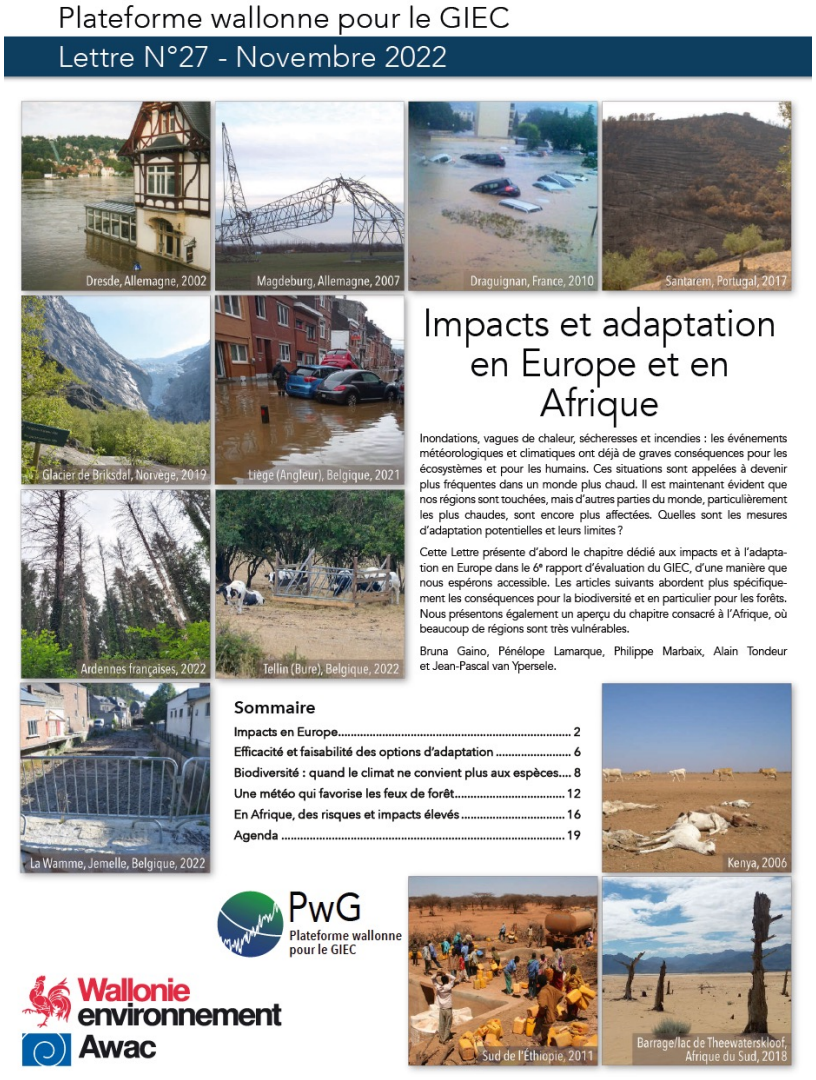
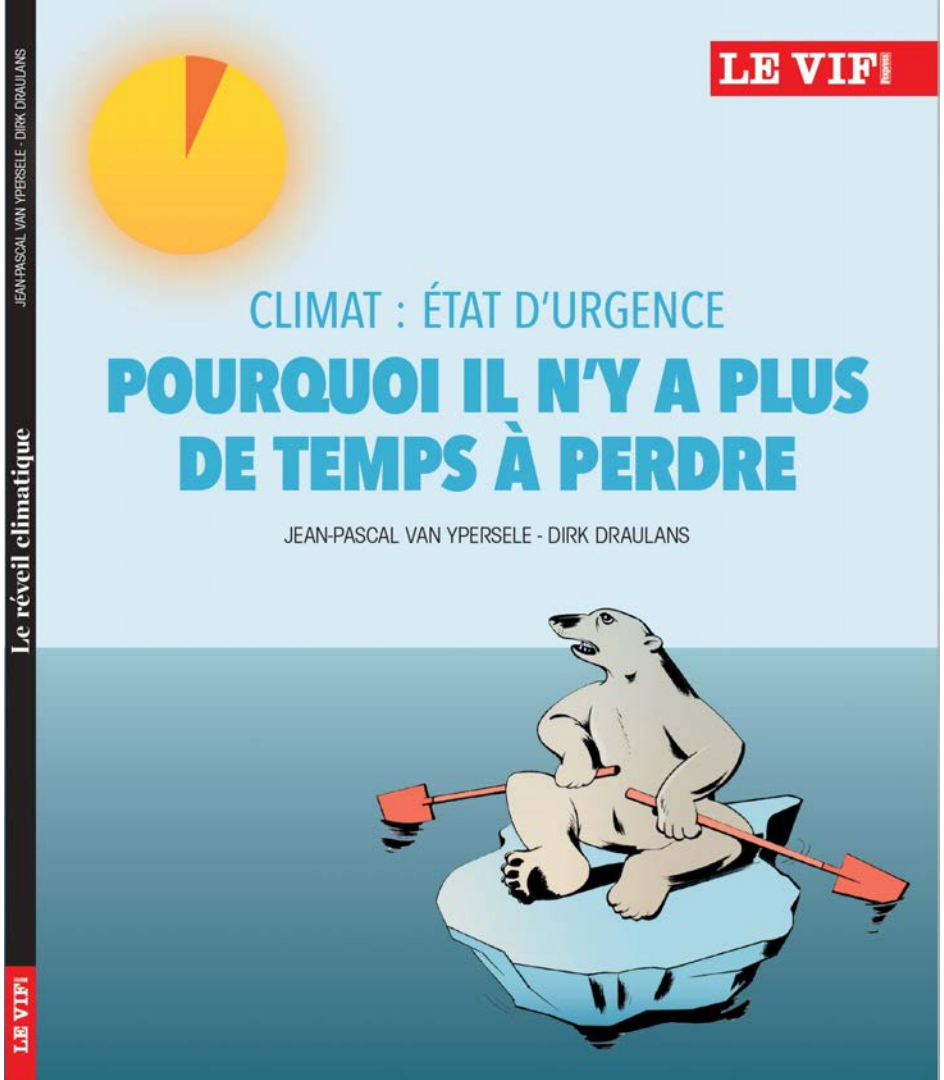


Gratuit sur
www.levif.be/reveil-climatique



Gratis op
www.knack.be/klimaatalarm

DAT POLITICI OVER TWINTIG JAAR NIET KOMEN JANKEN DAT ZE HET NIET WISTEN.

DIRK DRAULANS (1956) is bioloog, doctor in de wetenschappen en was gastonderzoeker aan de University of Oxford. Sinds 1987 is hij journalist bij Knack.

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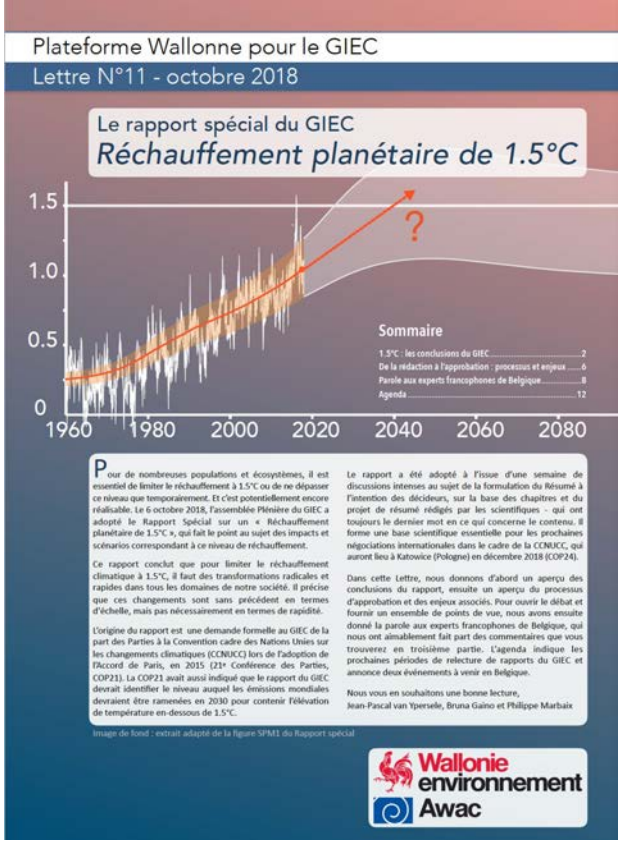
BIJLAGE BIJ KNACK VAN 16 SEPTEMBER 2020. MAG NIET LOS VERKOCHT WORDEN.

HET KLIMAATALARM

HET KLIMAAT ALARM

Dirk Draulans en
Jean-Pascal van Ypersele

Knack



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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**